Volume I

Financial Programming and Policies

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Financial Programming and Policies

Volume I

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PREFACE

This volume was prepared by the IMF Institute for Capacity Development for training courses in Financial Programming and Policies. It is meant to be used as analytical and methodological background for a country case study.

A team of IMF Institute for Capacity Development (ICD) economists led by Enrica Detragiache, Alex Mourmouras, and Ling Hui Tan drafted this volume. The team consisted of Aleš Bulíř, Michael Gapen, Gabriela Inchauste, Yuko Kinoshita, Francesco Luna, Mika Saito, Niamh Sheridan, and Laura Valderrama. Deanna Kaufmann and Maria Jones processed the text. Leslie Lipschitz, Peter Isard, Jorge Roldós, Woon Gyu Choi, Sandra Ospina, and Kazuko Shirono from the IMF Institute also reviewed the manuscript and provided very useful comments.

The volume has been subsequently revised jointly by the IMF Institute for Capacity Development and the IMF Statistics Department (STA). Charis Christofides (ICD) together with Robert Dippelsman (STA) coordinated a team of experts, including Johann Bjorgvinsson (Consultant, STA), Irina Bunda (Joint Vienna Institute, Austria), and Allan Brunner (Professor at Regis University, U.S.A.), and other staff at STA who reviewed the document and provided many comments. Ms. Naseebah Hajjaj (ICD) oversaw the document editing and production.

This volume should not be reported as representing the views of the IMF. The views expressed in this paper are those of the authors and do not necessarily represent those of the IMF or IMF policy.

INTRODUCTION

Financial programming is a simple quantitative approach long used at the IMF to analyze macroeconomic developments in its member countries. In courses on Financial Programming and Policies, participants receive information about the initial economic situation in a given country and are asked to construct a detailed baseline macroeconomic scenario. The scenario is then used to evaluate the macroeconomic performance of the country and identify short- and long-term vulnerabilities. The last step of financial programming is to prepare a policy scenario, which spells out specific macroeconomic targets and a set of policies to achieve those targets. The financial programming exercise simulates what IMF desk economists routinely do in their country surveillance and program work. In surveillance, the baseline scenario is used to form a view of the state of the economy and its likely direction, and is also the basis for policy discussions with the country authorities. In countries with IMF-supported stabilization programs, the policy scenario is developed together with the country authorities and is the basis for the macroeconomic adjustment plan to be supported with IMF resources. The scenario is also used to set specific policy targets that the authorities commit to pursue (conditionality).

This volume provides the basic conceptual elements needed to carry out the financial programming exercise. It is meant to be used as a complement to a detailed case study. The material is designed to be accessible to readers with undergraduate training in economics who deal with practical macroeconomic issues in their daily work in economic agencies. This is the profile of most participants in financial programming courses taught by the IMF Institute. The volume is not targeted at readers with advanced training in modern macroeconomic theory, although some such readers may find it useful as a source of practical advice.

Part I of the volume is dedicated to the construction of a baseline scenario—namely, a set of projections for the main macroeconomic variables that reflects the analyst's best guess of what will happen to the economy in the coming year. To pin down the behavior of policymakers, the baseline scenario assumes that current policies will continue, i.e., that policies that are in place or have already been decided will be implemented. Part I starts with an introduction to the basic quantitative methods that are needed to summarize and interpret economic data, particularly time-series data. Alternative approaches to forecasting are also presented and analyzed. Chapters 2–6 then introduce the four main macroeconomic accounts, summarizing the behavior of the real sector, exchange rate and prices; the balance of payments; the government; and the monetary and financial sector. Practical approaches to forecasting each of the variables are discussed. The final chapter of Part I is dedicated to putting the scenario together, checking for internal consistency by exploiting the accounting relationships across different sectors, evaluating economic performance, and assessing vulnerabilities.

Part II of the volume deals with medium-term issues—specifically, the sustainability of external and public debt. As a number of financial crises have shown, strong macroeconomic performance may be accompanied by a gradual buildup of long-term imbalances, which cannot be identified by considering only short-term flows. To assess this type of vulnerability, it is necessary to track stock variables, particularly external and government indebtedness, and to project their evolution over a longer horizon. This is done using the debt sustainability framework developed and now routinely applied at the IMF.

Part III is dedicated to discussing how macroeconomic policies can be used to address poor performance and reduce macroeconomic imbalances. The first chapter illustrates the workings of monetary, fiscal, and exchange rate policies using a simple Keynesian model of an open economy. This chapter shows how the choice of the policy mix depends on the exchange rate regime and the degree of capital mobility. The next chapters discuss each policy instrument in more detail. A separate chapter is dedicated to structural policies and their interaction with macroeconomic policy, since in most countries the achievement of lasting macroeconomic stabilization requires structural reforms. A chapter reviewing the role of the IMF in fostering macroeconomic stability and the design and implementation of IMF-supported lending programs concludes the volume.

PART I

CONSTRUCTING A BASELINE
SHORT-TERM SCENARIO

I. CHAPTER ONE: BASIC EMPIRICAL METHODS

Financial programming is a practical, hands-on approach to macroeconomic analysis and forecasting. This chapter introduces basic techniques to analyze data and produce forecasts to construct a macroeconomic scenario.

The aim of this chapter is to offer an overview of three main topics that are useful in carrying out the Financial Programming and Policies (FPP) exercise: (i) basic tools to understand macroeconomic data (e.g., plotting and descriptive statistics); (ii) the ordinary least squares (OLS) estimator with particular emphasis on the economic interpretation of OLS estimates; (iii) forecasting methods that can be used in the FPP exercise.

1.0.   Quality and Potential Shortcomings of Data

Data are essential for the financial programming. Lack of data quality, including their availability, could hamper the Fund's financial programming exercise, economic analysis, and surveillance. However, data quality is quite diverse across the Fund's member countries. For example, some countries compile data with relatively weak source data. Also, some countries fail to compile data categories that are important for surveillance.

Against this backdrop, the Fund has developed various measures to enhance data quality and address potential shortcomings of data, including the establishment of data dissemination standards – e.g. the General Data Dissemination System (GDDS), the Special Data Dissemination Standard (SDDS) and the SDDS Plus – together with presentation of metadata in line with the Fund's Data Quality Assessment Framework (DQAF). The details of such standards can be found on the Data Standards Bulletin Board (DSBB, https://dsbb.imf.org), and the following information may be useful for Fund economists to conduct financial programming.

- GDDS is mostly for developing countries and encourages participating member countries to improve macroeconomic and financial data quality. The IMF's Statistics Department (STA) helps GDDS participants to enhance data quality and data dissemination practices to achieve each country's plans for macroeconomic statistics improvements.

- SDDS is a data standard, under which its subscribers disseminated data with prescribed coverage, periodicity, and timeliness. As it covers essential data on real, fiscal, financial, and external sectors, SDDS provides important information to assess a country's data quality, as well as to conduct cross-country analyses.

- Metadata presented under GDDS and SDDS provide essential information to assess appropriateness of data and compilation practices for each country. Metadata are presented in DQAF format, which is a comprehensive framework to assess data and

consist of: 1) assurances of integrity, 2) methodological soundness, 3) accuracy and reliability, 4) serviceability, and 5) accessibility.

- SDDS Plus is the third and latest tier of the Fund's data standards initiative and is targeted to SDDS subscribing member countries that play a systemically important role in global financial markets. An SDDS Plus adherent must observe all SDDS requirements as well as additional requirements covering nine data categories that focus on financial sector and related data. This more demanding standard is in its initial phase; the additional data and metadata have not yet been posted on the DSBB.

1.1   Describing the Data

Before building a scenario, it is important to understand the basic features of the country's macroeconomic data. Much useful information can be gleaned from inspecting the data series, plotting them, and obtaining summary statistics. Data plots show whether the variables of interest are growing or are constant over time, whether growth is at a constant or increasing rate, whether cyclical patterns are in evidence, and so on. Plots may also reveal observations that are very different from all the others in the sample (outliers). These may be true anomalies, or reflect errors in the data series which, if not corrected, may give rise to misleading results. In plotting data, it is useful to remember a few important concepts.

Trends
A trend is a persistent long-term movement of a variable over time. Figure 1.1 plots nominal GDP for Turkey from 1987 to 2000 as an example.

Figure 1.1 Nominal DGP (in Billion Liras)
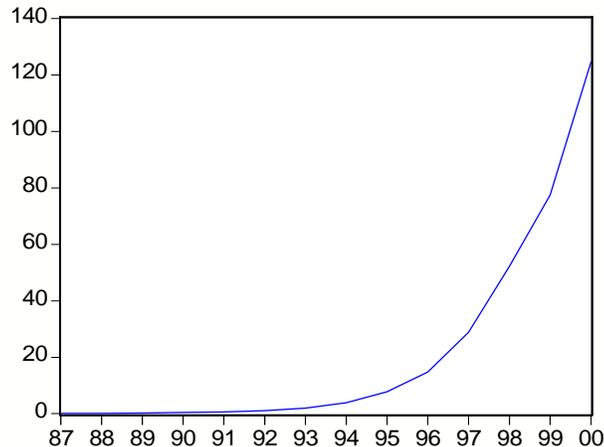
This variable has accelerated during the period under consideration. But does this reflect real growth in the economy, or is it just the case that prices are growing very rapidly? To answer this question, it is useful to decompose nominal GDP into GDP at constant prices (Figure 1.2) and the GDP deflator, which measures the price level (Figure 1.3).

Figure 1.2 Real GDP (In billion Liras, at 2000 prices)
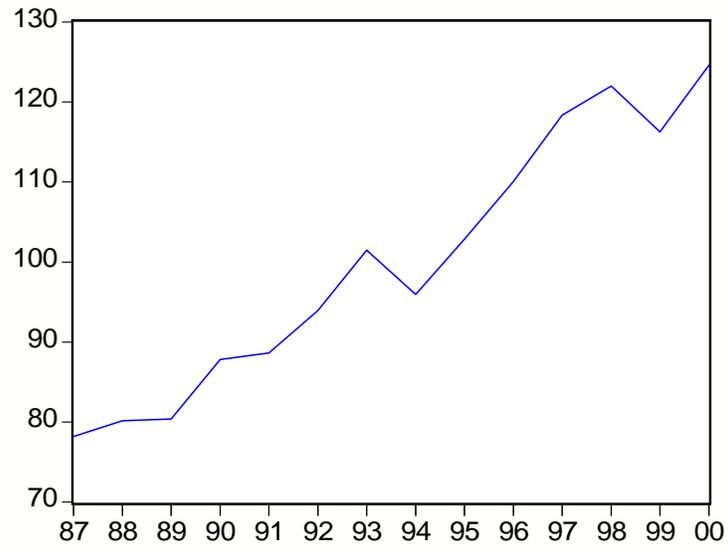
Figure 1.3 GDP Deflator (2000 = 100)
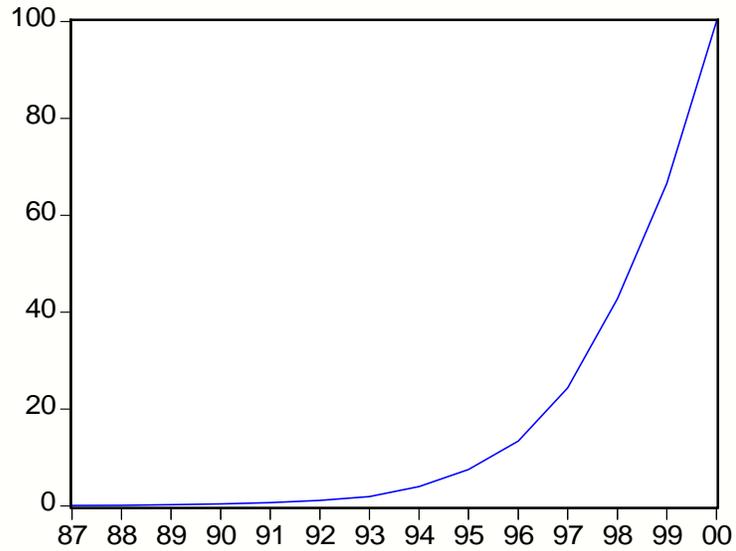
From these figures, it is clear that real output has been increasing by roughly the same amount each year, albeit with a few bumps along the road, while the price level has accelerated. Variables that grow at a constant speed are said to follow a *linear trend*, while other variables follow *nonlinear trends* (or no trends at all).

Sometimes the natural logarithm of a variable exhibiting a nonlinear trend has a linear trend. If this is the case, the variable is said to follow a *loglinear trend*. Figure 1.4 shows the log of the GDP deflator for Turkey, which indeed seems to follow such a loglinear trend.

Figure 1.4 Logo of GDP Deflator
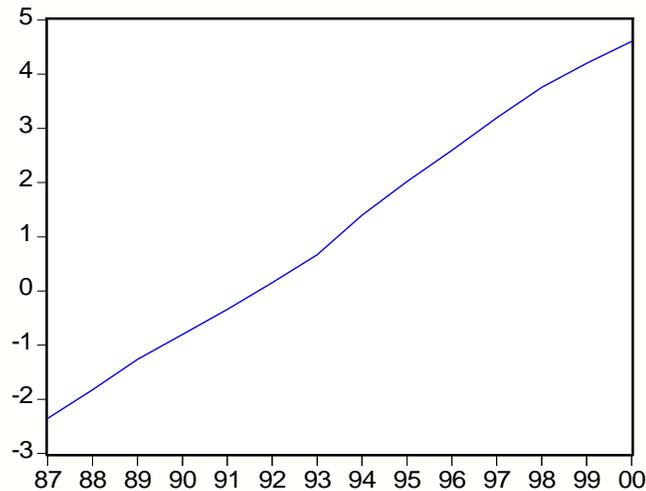
Taking the natural logarithm of economic variables–the so-called *log transformation*–is convenient also because the slope of the logarithm of the variable is equal to the growth rate of the original variable. For example, Figure 1.5 shows the first difference (period-to-period change) in the log of real GDP (LGDP) for Turkey. This difference (denoted DLGDPR) is the growth rate of real GDP. The deep recessions experienced by Turkey in 1994 and 1999 are clearly visible in this plot.

Figure 1.5 First-Difference of LGDPR (DLGDPR)
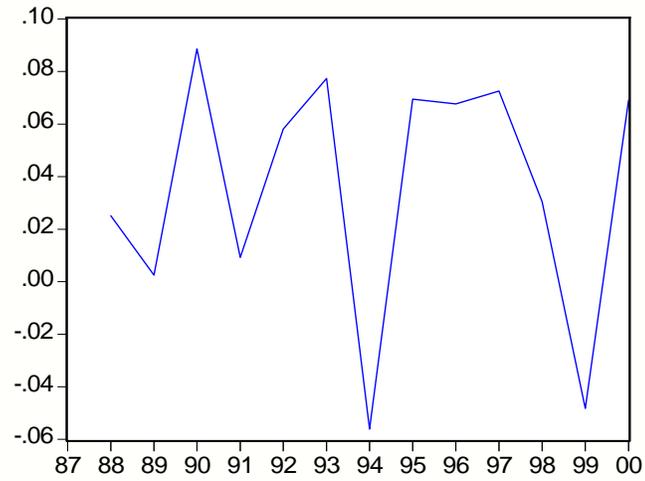
Besides linear, nonlinear, and loglinear trends, econometricians sometimes distinguish between *deterministic* and *stochastic* trends. Deterministic trends do not change over time, while stochastic trends move around over time because of random factors, such as economic shocks. For example, a stochastic trend might exhibit a prolonged period of increase, followed by a prolonged period of decrease, such as the series plotted in Figure 1.6.

Figure 1.6 Stochastic Trend

Cycles

While real GDP in Turkey seems to have followed a linear trend, it has moved around the central tendency in a seemingly cyclical fashion. This cyclical pattern of fluctuations is common to most economies and is referred to as the *business cycle*.[1] Understanding the pattern of a country's business cycle is very useful in predicting future economic developments in the short run, while understanding trends is important to forecast long-term developments. Sometimes economic time series show sharp departures from trends that do not simply reflect cyclical fluctuations but rather amount to a *structural break*, that is, changes in the basic characteristics of the economy. Statistical tests have been developed which can test formally for the existence of structural breaks in time series.[2]

Stationary versus nonstationary series

Another important distinction concerning economic time series is that between stationary and nonstationary series. Intuitively, a time series is *stationary* if it tends to revert to its long-run average value after it is hit by a shock. For example, in Figure 1.5, the *growth rate* of real GDP fluctuates around its long-run average of 3.6 percent. In contrast, when hit by a shock, *nonstationary* series tend not to return to their long-run mean. An example of a *nonstationary* series is the *level* of real GDP in Turkey (Figure 1.2).

In addition, the volatility of a stationary series does not change over time, while the volatility of nonstationary series varies over time. As is well known, some series (e.g., daily equity prices) tend not only to exhibit upward trends in their means but also to go through periods of high volatility followed by periods of low volatility. These series are nonstationary.

Common trends among macroeconomic time series

As we have seen so far, many macroeconomic time series trend upward (or downward) over time. Only some of them, however, share a *common trend*. Whether or not two (or more) macroeconomic variables share a common trend often depends on the existence of a *long-run equilibrium relationship* between them. For example, we know from consumption theory that in the long run, consumption and income are closely related. We would therefore expect consumption and income to share a common trend. This seems to be the case from inspection of Figures 1.7 and 1.8, which plot real private consumption and real disposable income using Thai data between 1976 and 1996, respectively.

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[1] In monthly or quarterly data, departures from trend may also capture seasonal aspects of the data. For example, in several countries consumption and output tend to be larger in the fourth quarter because of Christmas.

[2] For example, if the date of the suspected break (the *break date*) is known, one can split the full sample into two sub-samples at the break date and test for a discrete change, or a break, in the regression coefficients. This is often called a Chow test for a break at a known break date, named for its inventor Gregory Chow (1960).

In general, however, it is hard to detect if two (or more) variables share a common trend by simply plotting the data. Rigorous econometric tests have been developed in recent decades for detecting the existence of a common trend (or the existence of a *cointegrating relationship*).[3] The actual implementation of (or the sound understanding of) these tests are not necessary for this course, but visual inspection for common trends, as shown in Figures 1.7 and 1.8, is strongly encouraged.

Figure 1.7 Real Private Consumption

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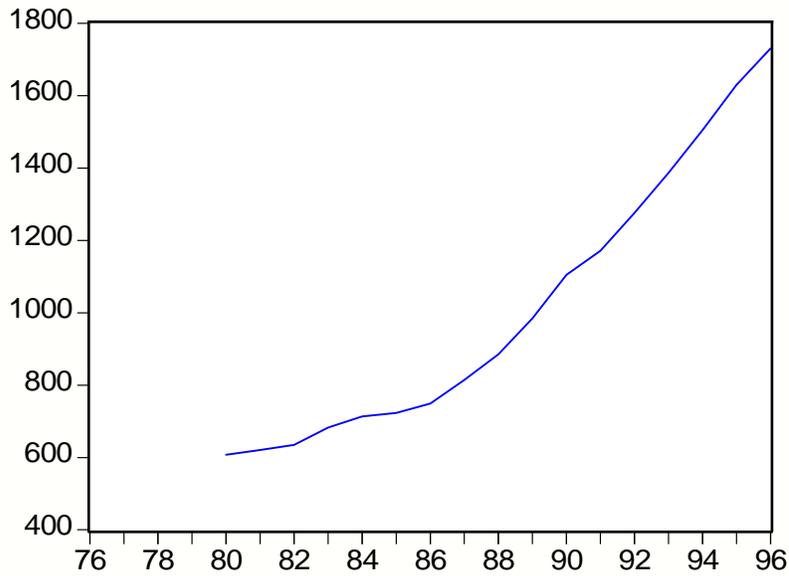
[3] For more detail on cointegration, see chapter 14 in Stock and Watson (2003).

Figure 1.8 Real Disposable Income
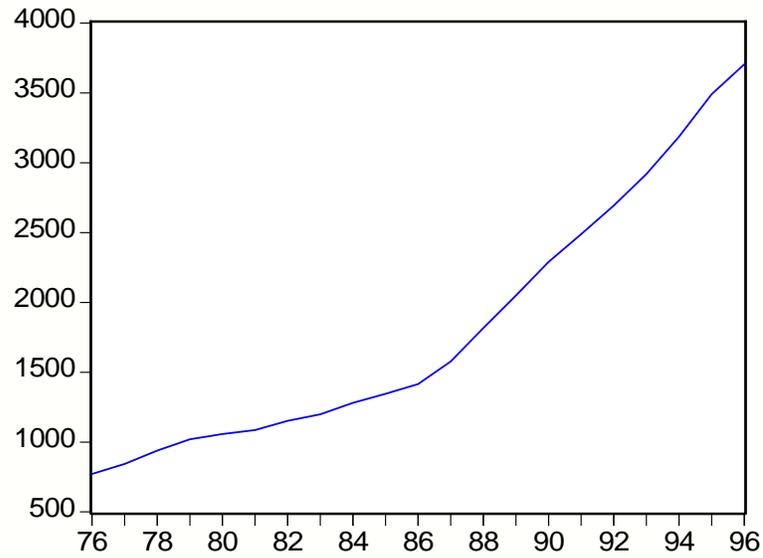
Summary statistics of the data

After a visual inspection of the data, it is useful to compute summary statistics for the variables of interest. Standard statistical packages print out these descriptive statistics. Consider the following printout of descriptive statistics of the growth rate of real GDP (DLGDPR) in Turkey obtained from the econometric software EViews.

Table 1.1. Descriptive Statistics

```
============================
Date: 07/17/06          Time: 18:05
Sample:  1987 2000
============================
                            DLGDPR
============================
Mean                      0.035827
Median                    0.058110
Maximum                   0.088528
Minimum                  -0.056105
Std. Dev.                 0.047506
Skewness                 -0.843209
Kurtosis                  2.470922

Jarque-Bera               1.692128
Probability               0.429100

Sum                       0.465750
Sum Sq. Dev.              0.027081

Observations                    13
============================
```

Mean is the average value of the series, obtained by adding up the series and dividing by the number of observations. Note that the mean of DLGDPR is 0.035827, which implies that the growth rate of real GDP during the sample period was on average about 3.6 percent.

Median is the middle value (or average of the two middle values) of the series when the values are ordered from the smallest to the largest. The median is a robust measure of the center of the distribution that is less sensitive to outliers than the mean. Note that the median of DLGDPR is 0.058110, which implies that the middle value of the growth rate of real GDP during the sample period was about 5.8 percent.

Max (maximum) and *Min* (minimum) are the maximum and minimum values of the series in the current sample. Note that the max and min of DLGDPR is 0.088528 and -0.056105, respectively. This implies that the highest growth rate was as high as 8.9 percent and the lowest growth rate was as low as –5.6 percent.

Std. Dev. (standard deviation) is a measure of dispersion or spread in the series. The higher the standard deviation, the larger the spread.

Skewness is a measure of asymmetry of the distribution of the series around its mean, and *Kurtosis* measures the peakedness or flatness of the distribution of the series (see the manual for more details).

1.2   The Linear Regression Model

This section reviews the linear regression model. This model is used to study how one variable (or more) affects another. For example, we may want to assess the effect of an increase in national income X on aggregate consumption expenditures Y. To this end, we can use a sample of data of these two variables to estimate the relationship between the two, i.e., the consumption function. A scatter plot of observations of real disposable income (GNDI) and real private consumption (CPR) in Thailand between 1976 and 1996 (Figure 1.9) suggests a linear relationship between these two variables, as observations appear to form a straight line. Intuitively, the linear regression model is a methodology to find the "best" straight line that summarizes the relationship between two (or more) variables, where "best" is defined in a precise statistical sense. In Figure 1.10, this straight line is depicted. Naturally, not all points fall on it, as there are changes in consumption that reflect changes in factors other than income, but the errors are relatively small and spread evenly around the straight line.

More formally, the simple (bivariate) linear regression model can be written as:

$$Y_i = \beta_0 + \beta_1 X_i + u_i, \tag{1.1}$$

where the subscript i runs over observations $i = 1, \ldots,$ N (N is the total number of observations); Y_i is called the *dependent variable*, or simply the left-hand variable; X_i is called the *independent variable*, the *regressor*, or the *explanatory* variable; $\beta_0 + \beta_1 X_i + u_i$ is the *population regression line* or *population regression function*; β_0 is the intercept of the population regression line; β_1 is the slope of the population regression line; and u_i is the error term. The intercept, β_0, and the slope, β_1, are the *coefficients* or *parameters* of the population regression line. The slope β_1 is the change in Y_i associated with a unit change in X_i. The intercept is the value of the population regression line when $X_i = 0$; it is the point at which the population regression line intercepts the Y-axis. The error term, u_i, incorporates all factors responsible for the difference between the *i*th observation and the value predicted by the population regression line.

If the coefficients β_0 and β_1 were known, it would be possible to determine the change in the dependent variable associated with a given change in the explanatory variable. In practice, however, the intercept and slope of the population regression line are unknown, and they must be estimated using available data.

Figure 1.9 Consumption and Income
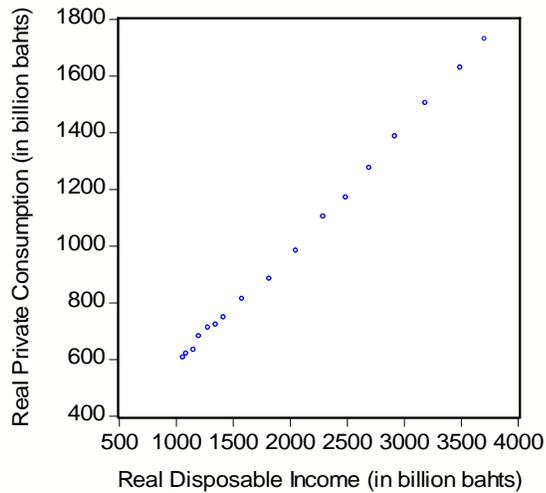
Figure 1.10 OLS Regression Line
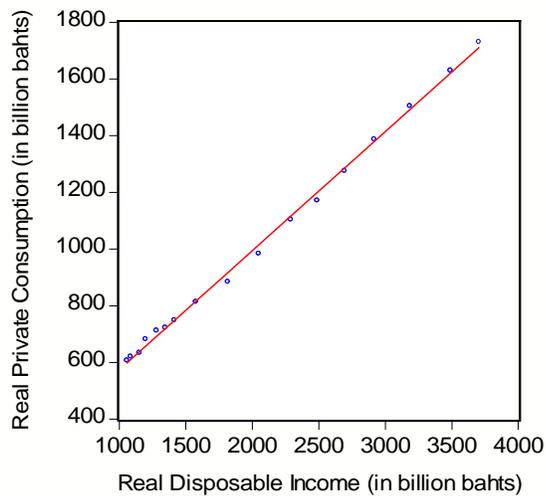
The *ordinary least squares (OLS) estimator* calculates the best-fitting line for the observed data by minimizing the sum of the squares of the vertical deviations from each data point to the line (Figure 1.10).[4] If a point lies on the fitted line exactly, then its vertical deviation is zero. Because the deviations are first squared and then summed by the OLS estimator, positive and negative values do not cancel each other out.

---

[4] An estimator is a function of a sample of data to be drawn randomly from a population. An estimate is the numerical value of the estimator when it is actually computed using data from a specific sample.

The *OLS estimates* of β_0 and β_1 are denoted as $\hat{\beta}_0$ and $\hat{\beta}_1$. The *predicted value* of Y_i given X_i is $\hat{Y}_i = \hat{\beta}_0 + \hat{\beta}_1 X_i$. The *residual* is the difference between the actual value of Y_i and its predicted value. The formulas for $\hat{\beta}_0$ and $\hat{\beta}_1$ are found by minimizing the sum of squared residuals.

The OLS estimator is the dominant method used by econometricians because it is simple and has a number of desirable properties. Under a general set of assumptions, the OLS estimator is *unbiased* (positive and negative mistakes roughly offset each other), is *consistent* (it gets more accurate as the sample size grows), and its sampling distribution is approximately normal.[5]

A quick and easy way to check whether the general set of assumptions is satisfied or not is to plot the regression residuals. If the sum of the residuals is close to zero, then the OLS estimates are unbiased and consistent. Another desirable property of the residuals is that they be *serially uncorrelated,* that is, there be no tendency for negative (positive) residuals to follow other negative (positive) residuals. In general, well-behaved residuals should be scattered around a zero mean in a random fashion, with no systematic pattern (e.g., white noise), as shown in Figure 1.11.[6] When this is the case, all systematic patterns in the variable of interest are captured by the explanatory variables in the regression, and what is left in the residual is just random noise.

Note that so far we have described a *linear* model of the data. But what if the relationship between the two variables of interest is nonlinear? In macroeconomic time series, nonlinearity is especially important since many series seem to behave in a logarithmic or exponential fashion (see for example Figures 1.1 and 1.3). In such cases, one can apply a simple transformation, such as the log-transformation to one of the variable to make the relationship linear.

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[5] For details on the underlying assumptions and the properties of OLS estimators, see Stock and Watson (2003).
[6] Statistically speaking, white noise is defined by the lack of serial dependence in a series (Granger, 1983). As an example of white noise, we often define a series x_t as being equal to a serially independent, normally distributed random error ε_t that has a zero mean and variance σ^2 (denoted $N(0,\sigma^2)$):

$$x_t = \varepsilon_t, \quad where \quad N(0,\sigma^2).$$

Figure 1.11 White Noise
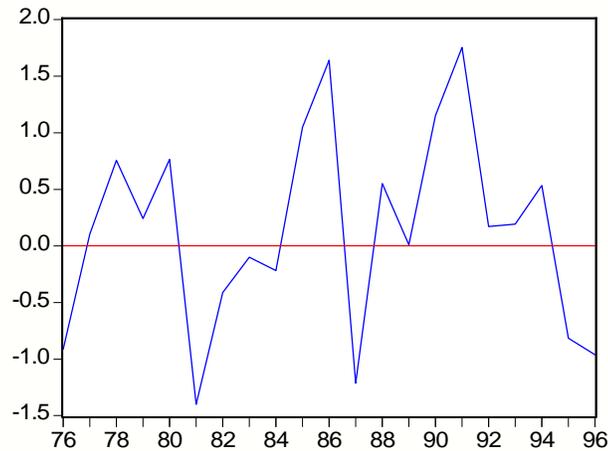
The linear trend model

The linear regression model can be used to identify a trend in a time series and is more rigorous than just a visual plot.[7] The linear trend model can be written as follows:

$$\ln Y_t = \beta_0 + \beta_1 Time_t + u_t .$$ (1.2)

The explanatory variable *Time* takes the value of one for the first year of the sample period, the value of two for the second year, and so on. Notice that the dependent variable Y_t is in natural logarithm, so the estimated regression coefficient of *Time* can be thought of as the rate of growth of Y_t. For example, let us estimate a linear trend using Thai data for 1976-96. The OLS estimate of the coefficient yields:

$$LGDPR_t = \underset{(0.023)}{6.487} + \underset{(0.002)}{0.076} \ Time,$$ (1.3)

where LGDPR is the log of real GDP. According to these estimates, real GDP in Thailand grew at an average of 7.6 percent during this period.

This is the EViews output presenting the summary statistics of equation (1.3), which is useful to understand how the equation fits the data.

---

[7] In most cases, it is more appropriate to model economic time series data as having a stochastic rather than a deterministic trend. This is because it is typically hard to reconcile the predictability implied by a deterministic trend with the complications and surprises common in economics and reflective of the actions of workers, businesses, and governments.

```
==============================================================
Dependent Variable:  LGDPR
Method:  Least Squares
Date:  09/06/06      Time:  09:57
Sample:  1976 1996
Included observations:  21
==============================================================
        Variable      Coefficient   Std. Error   t-Statistic    Prob.
==============================================================
           C           6.487455      0.023037    281.6067      0.0000
        @TREND         0.076078      0.001971     38.60651      0.0000
==============================================================
R-squared              0.987413    Mean dependent var      7.248238
Adjusted R-squared     0.986750    S.D. dependent var      0.475052
S.E. of regression     0.054682    Akaike info criter     -2.884167
Sum squared resid      0.056813    Schwarz criterion      -2.784689
Log likelihood         32.28375    F-statistic             1490.462
Durbin-Watson stat     0.174575    Prob(F-statistic)       0.000000
==============================================================
```

The *standard errors of the coefficient estimates* (Std. Error), which are also reported in parentheses in equation (1.3), measure the statistical reliability of the coefficient estimates. The larger the standard errors, the more statistical noise in the estimates, and the less reliable are the coefficient estimates.[8]

The *adjusted R^2* (Adjusted R-squared) measures how much of the variability of the dependent variable is explained by the variability in the independent variables. This statistic equals one if the regression fits perfectly, and zero if it fits no better than the simple mean of the dependent variable. An adjusted $R^2 = 0.987$ therefore indicates a very good fit.

The *standard error of the regression* (S.E. of regression), another measure of the fit of the model, is 0.055. This is a summary measure based on the estimated variance of the residuals of the regression, so the smaller the statistic, the better the fit.

The *Durbin-Watson (D.W.) statistic* (Durbin-Watson stat) measures the serial correlation of the residuals. As a rule of thumb, if the D.W. is less than 2, there is evidence of positive serial correlation. Therefore, D.W. = 0.175 suggests that equation (1.3) is not a good description of the data. Indeed, the plot of the residuals of this linear trend model, depicted in Figure 1.12, suggests that there is serial correlation in the residuals. Changes in the specification to address residual serial correlation are discussed below.

---

[8] See Stock and Watson (2003) for more detail on hypothesis testing.

Figure 1.12 Residuals of the Linear Trend Model
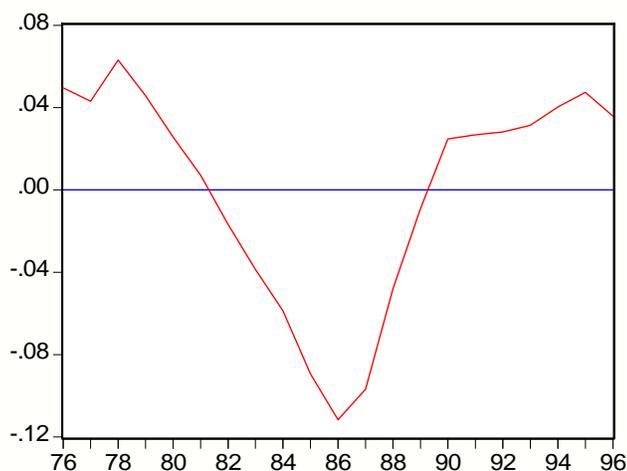
The static linear regression model

Another application of the linear regression model is *the static model*, which uses contemporaneous (or current values of) independent variables to explain the dependent variable (i.e., past values of X or Y are not included to explain current levels of Y). For instance:

$$\ln Y_t = \beta_0 + \beta_1 \ln X_t + u_t .$$ (1.4)

It is common to see in these models that both dependent and independent variables are in logs. The convenience of transforming both dependent and independent variables into logs as in equation (1.4) is that one can interpret the coefficients as *elasticities*. That is, a one percent change in X_t will lead to a $\hat{\beta}_1$ percent change in Y_t.

In Section 1.1 above, we discussed the possible existence of a long-run equilibrium relationship (or a common trend component) between consumption and income. Using Thai data for 1980-96, the estimated static model of consumption is the following:

$$\text{LCPR}_t = \underset{(0.115)}{0.653} + \underset{(0.015)}{0.824} \ \text{LGNDI}_t ,$$ (1.5)

where LCPR is the log of real private consumption and LGNDI is the log of real disposable income. The slope coefficient of this regression equation has a nice economic interpretation: the slope coefficient 0.82 implies that when there is a 1 percent increase in real income, real private consumption tends to increase by 0.82 percent. It is important to point out that the economic interpretation of the coefficients is different if the variables are not in logs. In that case, the slope coefficient in the consumption function would be interpreted as the *marginal propensity to consume*. Once the variables are transformed into logs, the slope coefficient should be interpreted as the *income elasticity* instead.

Before taking these estimates too seriously, however, we need to check if the regression has all the desirable properties. Some of the summary statistics of this regression are as follows: Adjusted $R^2 = 0.995$, D.W. = 0.567, and S.E. of Regression = 0.026. Note that again, there is evidence of positive serial correlation, which is evident from D.W. statistic and the residuals shown in Figure 1.13.

```
=================================================================
Dependent Variable:  LCPR
Method:  Least Squares
Date:  09/05/06      Time: 17:02
Sample:  1980 1996
Included observations:  17 after adjustments
=================================================================
        Variable        Coefficient     Std. Error    t-Statistic     Prob.
=================================================================
           C             0.653122        0.114512      5.703540       0.0000
         LGNDI           0.823725        0.015177      54.27589       0.0000
=================================================================
R-squared               0.994934      Mean dependent var       6.858655
Adjusted R-squared      0.994596      S.D. dependent var       0.358511
S.E. of regression      0.026354      Akaike info criter      -4.324237
Sum squared resid       0.010418      Schwarz criterion       -4.226212
Log likelihood          38.75601      F-statistic              2945.873
Durbin-Watson stat      0.566694      Prob(F-statistic)        0.000000
=================================================================
```

Figure 1.13 Residuals of the Static Model of Consumption
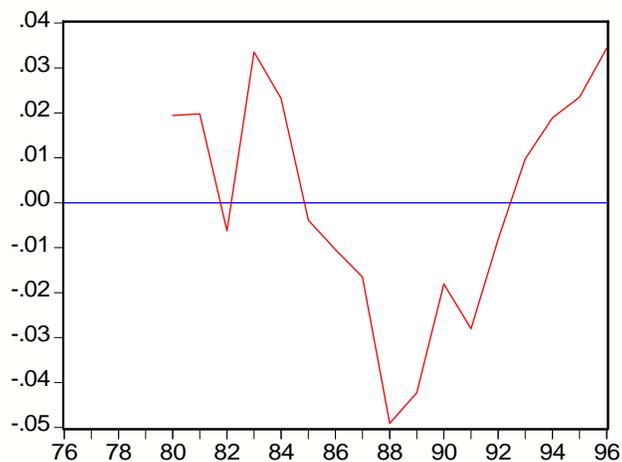
The dynamic model

In many economic time series, simple trend models or static models result in residuals that are serially correlated, casting doubt on the reliability of the estimated coefficients. To address this problem, economists often turn to *dynamic models*, which use the current and past values of both dependent and independent variables to explain the current value of dependent variable.

The autoregressive distributed lag (ADL) model

An autoregression is a model that relates a time series variable to its past values. The simplest model of this kind is a first-order *autoregression*, abbreviated as AR(1), where the "1" indicates that it is a regression of the series onto its own first lagged value. The *autoregressive distributed lag* (ADL) *model* adds not only the lagged values of dependent variable in the right-hand side of the equation, but also current and lagged values of some other explanatory variables. For example, the first-order ADL model looks as follows:

$$\ln Y_t = \beta_0 + \beta_1 \ln X_t + \beta_2 \ln Y_{t-1} + \beta_3 \ln X_{t-1} + u_t. \tag{1.6}$$

The ADL model of consumption using the same Thai dataset looks as follows:

$$LCPR_t = \underset{(0.152)}{0.230} + \underset{(0.168)}{0.343}\ LGNDI_t + \underset{(0.202)}{0.416}\ LCPR_{t-1} + \underset{(0.303)}{0.164}\ LGNDI_{t-1}. \tag{1.7}$$

The corresponding EViews output is as follows:

```
=================================================================
Dependent Variable:  LCPR
Method: Least Squares
Date: 09/05/06   Time: 17:53
Sample (adjusted): 1981 1996
Included observations: 16 after adjustments
=================================================================
```

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.230373	0.152468	1.510963	0.1567
LGNDI	0.342607	0.168488	2.033423	0.0647
LCPR(-1)	0.415672	0.202058	2.057191	0.0621
LGNDI(-1)	0.163900	0.303014	0.540899	0.5985

R-squared	0.998512	Mean dependent var		6.886767
Adjusted R-squared	0.998140	S.D. dependent var		0.350382
S.E. of regression	0.015112	Akaike info criter		-5.334376
Sum squared resid	0.002740	Schwarz criterion		-5.141228
Log likelihood	46.67501	F-statistic		2683.985
Durbin-Watson stat	2.175392	Prob(F-statistic)		0.000000

Neither the D.W. statistic nor the plot of the residuals, shown in Figure 1.14, shows evidence of positive serial correlation.[9]

Figure 1.14 Residuals of the ADL Model of Consumption
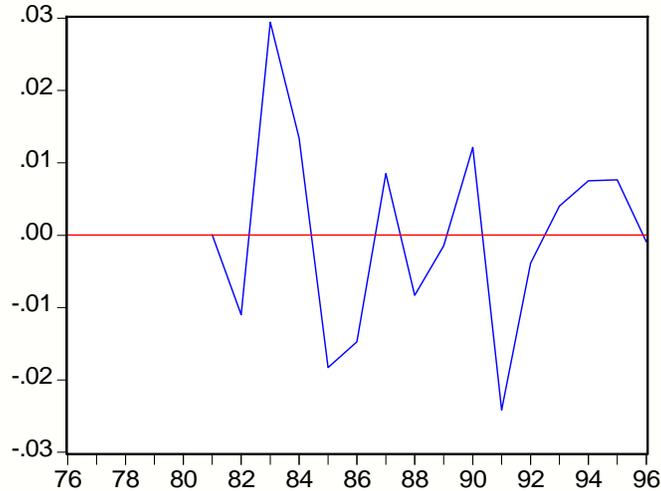
One of the drawbacks of the ADL models is that economic interpretations of the regression coefficients are no longer obvious.

The error correction model

One way to provide nice economic interpretations to the regression coefficients of the ADL model is to use the error correction representation of the ADL model, known as *the error correction model*:

$$\Delta \ln Y_t = \beta_0 + \beta_1 \Delta \ln X_t - \gamma \cdot \left(\ln Y_{t-1} - \delta \ln X_{t-1} \right) + u_t, \tag{1.8}$$

where $\left(\ln Y_{t-1} - \delta \ln X_{t-1} \right)$ is called the error correction term in a first lag. Note that the first difference term would be zero in a long-run equilibrium, so that the error correction term, together with the intercept term, can be regarded as describing a long-run equilibrium. The exact relationship between the ADL and the error correction models is provided in the Appendix.

As in the case of the ADL model, the error correction model does not suffer from serial correlation of the residuals, and yet its regression coefficients (i.e., β_1, γ, and δ) can offer nice economic interpretation. To see this, let's go back to consumption in Thailand. The error correction model regresses the *change* in the log of consumption (DLCPR) on the *change* in

---

[9] Strictly speaking, however, if there are lagged dependent variables on the right-hand side of the regression, the D.W. test is no longer valid. In this case, it is appropriate to use a Breusch-Godfrey Lagrange Multiplier test for general, higher order serial correlation (Godfrey, L. G., 1988).

the log of income (DLGNDI) as well as on the so-called error correction term (ECM) in a first lag.[10]

$$\text{DLCPR}_t = \underset{(0.071)}{0.274} + \underset{(0.162)}{0.337} \ \text{DLGNDI}_t - \underset{(0.164)}{0.620} \ \text{ECM}_{t\text{-}1}. \qquad (1.9)$$

The slope coefficient of DLGNDI captures the *short-run income elasticity*. For example, the slope coefficient 0.34 implies that when there is a one percent increase in real disposable income, real private consumption tends to increase by 0.34 percent in the short run. The slope coefficient on ECM in a first lag captures the *speed of adjustment* to the long-run equilibrium. For example, the slope coefficient –0.62 implies that if the consumption level in the previous period was higher than what the long-run equilibrium relationship predicts by 1 percent, then there will be an adjustment to reduce the consumption level by 0.62 percent in this period to restore the long-run equilibrium relationship between consumption and income.

---

[10] The ECM term is often created by storing residuals from the regression equation that captures the long-run equilibrium relationship such as equation (1.5). Alternatively, one can find δ by estimating a cointegrating relationship and then constructing the ECM term. Here we have estimated the cointegrating vector using the so-called Johansen procedure and found it is (1 −0.86). Therefore, the ECM term is created as follows:
$ECM_t = LCPR_t - 0.86 LGDNI_t$.

The summary statistics of this regression are as follows:

```
==============================================================
Dependent Variable: D(LCPR)
Method: Least Squares
Date: 07/19/06   Time: 19:17
Sample (adjusted): 1981 1996
Included observations: 16 after adjustments
==============================================================
```

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C0.274244	0.071442	3.838677	0.0021	
D(LGNDI)	0.337497	0.161915	2.084406	0.0574
ECM(-1)	-0.620246	0.164120	-3.779224	0.0023

R-squared	0.802340	Mean dependent var	0.065453
Adjusted R-squared	0.771930	S.D. dependent var	0.030539
S.E. of regression	0.014584	Akaike info criter	-5.450389
Sum squared resid	0.002765	Schwarz criterion	-5.305528
Log likelihood	46.60311	F-statistic	26.38468
Durbin-Watson stat	2.094551	Prob(F-statistic)	0.000027

The plot of the residuals looks identical to Figure 1.14.

Spurious regressions

There are many situations in which regressions that are estimated by OLS have reasonable goodness of fit (e.g., high R^2 or low S.E. of Regression) but are nonetheless invalid. As an example, if you run a regression of U.S. inflation on Japanese GDP between 1965 and 1981, the fit would be very good, and you might conclude that Japanese GDP growth led to higher U.S. inflation. However there are no compelling economic reasons for this to be true. In fact, if you ran this regression for a different sample period, you would find no relationship at all. The truth is that these regressions are *spurious*; it just happens that the series have stochastic trends that were coincidentally aligned between 1965 and 1981. This example illustrates the point that regression results, if not grounded in economic theory, can be misleading, particularly when the series contain stochastic trends.

Implications of nonstationarity

To make sure standard regression methods *are* reliable, it is important to verify that the series under study share a common stochastic trend, that is, they are *cointegrated* (Granger, 1983; Engel and Granger, 1987). Econometric methods have been developed in recent decades for detecting and analyzing cointegrated economic time series. These tests examine whether there exists a *long-run equilibrium relationship between the macroeconomic variables* under study, or any apparent relationship is spurious. More advanced knowledge of statistics and econometrics than required in this course is needed to understand those techniques.

1.3.   Overview of Forecasting Methods

General considerations about forecasting

Building macroeconomic forecasts is an art form involving economic theory, data construction, econometric and statistical estimation and forecasting techniques, and much judgment. Economic theory gives forecasters behavioral relationships and accounting identities that can be used to see how economic variables are linked to one another and over time. With the help of econometric and statistical methods, the forecaster calibrates or estimates the parameters of the relationships supplied by economic theory to arrive at values that are reasonable for the country in question. In this process, good judgment plays an important role because economists often do not have a complete or clear understanding of the quantitative links between variables. Leads and lags in economic relationships are often country-specific and vary over time. Changing perceptions of future events can have large effects on the economy today, as illustrated by Lucas's (1976) celebrated critique of econometric policy evaluation. Measurement error, due to weaknesses of real life statistical systems, adds to the uncertainties macroeconomic analysts and policymakers must contend with.[11]

In such an uncertain world, macroeconomic analysts and policymakers have to rely on a great variety of sources of data and other qualitative information in making judgments that enter into their projections. Reasonable analysts often come up with different forecasts. They are likely to disagree about many things, including the most likely future course of policies and the quantitative impact of a given policy on the economy; and they may also use different information sources in their analyses.[12]

Evaluating alternative forecasts

Typically several forecasts are available for the same variable. One way of selecting between them is on the basis of statistical "goodness of fit" tests. This must be done carefully. One strategy is to use the methodologies that one wants to assess and compute "forecasts" of past values. These forecasts can then be compared with actual realizations to compute forecast errors. Models that yield the smallest forecast errors are superior.

Averaging forecast errors can be misleading, because positive and negative errors tend to offset each other. Economists and statisticians have developed more sophisticated metrics to compare forecasts, such as:

---

[11] See http://dsbb.imf.org/Applications/web/dsbbhome/ for work the IMF has been undertaking with member countries to establish standards on timeliness, comprehensiveness, and other dimensions of data quality.
[12] Consensus forecasts have been developed that "pool" or average individual forecasts (see Hendry and Clements, 2004).

Box 1.1. The Forecasting Process Used in the World Economic Outlook

The IMF produces for individual countries and regions macroeconomic forecasts that are published twice a year in the *World Economic Outlook* (WEO). The initial responsibility for the preparation of each country's forecasts lies with individual country desks. The decentralized nature of the process allows desks to fully incorporate country-specific information into the forecast. Desks rely on different methodologies to arrive at their forecasts, ranging from econometric models to informed judgments, which reflect the considerable differences in the availability and quality of economic and financial data.

With such a decentralized process, it is important to ensure that forecasts are mutually consistent across countries. This is done in several ways. First, desks use common assumptions with regard to some basic variables (e.g., oil prices and other commodity prices, exchange rates, short-term interest rates). For these variables, a set of forecasts is provided at the beginning of each forecasting round. The forecasts for many commodities and interest rates are based on futures prices. The exchange rate forecasts are based on the assumption of constant real exchange rates for the U.S. dollar, the Euro, and the yen. For other currencies, a constant real exchange rate is usually assumed.

At the individual country level, desk forecasts are compared with a set of "global economic environment" forecasts for a particular country. These forecasts are derived from those of partner countries (e.g., export-weighted partner country growth or import demand). Large differences between the global economic environment forecasts and individual country forecasts are another indication of potentially inconsistent forecasts. Identified inconsistencies result in iterations on the original country forecasts until an acceptable set of global forecasts is obtained. A third mechanism to ensure mutual consistency of forecasts is to examine aggregate balances. For instance, the sum of all trade and current account balances in the world should be roughly equal to the regular statistical discrepancy found in the historical data. If that is not the case, exports or imports of some economies must be mutually inconsistent, and macroeconomic forecasts must be revised.

- Mean Absolute Error (MAE) is the mean of absolute values of forecast errors.

- Mean Square Error (MSE) is the mean of squared forecast errors.

- Root Mean Square Error (RMSE) is the square root of MSE.

- Relative RMSE is the ratio of the forecast RMSE to the RMSE of a benchmark forecast.

With these criteria, positive and negative forecast errors are treated symmetrically. In practice, when forecasts are used for decision making, overpredicting a variable may be more costly than underpredicting it, or vice versa. More generally, the preferences, opportunities, and constraints of the decision maker are likely to enter into the ex post evaluation of a forecast and the comparison of alternative forecasts. In these cases, it may be useful to

specify appropriate *decision-based loss functions* that can be used to compare and evaluate different forecasts (Granger and Machina, 2006).

In the context of Financial Programming, which method to use for forecasting a particular variable should be based on four key considerations:

- the availability and quality of information

- the time you have to do your work

- the success of your method in the past

- the confidence you have in the method

The rule of thumb is that the less reliable are the data you have, the less complicated should be the forecasting methods.

After you have selected a method and calculated your forecast, you should realize that the forecast is subject to a margin of error. The error occurs because no matter what forecasting method you choose, you depend on a sample of data that is inevitably limited and does not allow you to conclude with certainty that the relationships you observe in the past will remain constant. For example, you cannot be certain that the ratio to GDP of the variable is constant, or that its trend is constant, or that the coefficients of an estimated regression remain constant. In addition, certain qualitative information may force you to modify your forecast. A forecast is not simply the raw output of a mathematical operation; it must take into account all the information you have, even if that means that you depart significantly from the prediction that resulted from the method you selected.

In this process, seeking the input of colleagues with different expertise and information can be useful. For the major variables, it may be useful not to rely on a single model; suites of models as well as judgement should be used.

Simple forecasting models

The naïve model (random walk)

The simplest assumption about the future behavior of a variable is that it will take on the same value as its current value. This assumption is reasonable if we believe that future deviations of the variable from today's value are purely random or unpredictable. For example, with the observation of current year's output, y_t, we can forecast output for the

following year $\hat{y}_{t+1|t}$:

$$\hat{y}_{t+1|t} = y_t .$$ (1.10)

This forecasting method is obviously misleading if plotting past data reveals a clear trend or cyclical pattern, but it may be appropriate for variables that tend to remain stable over time or for which there is relatively little information available.[13]

Let us look at how the naïve forecast performs in the case of real GDP for Thailand for 1994-96. The forecast is computed using data up to 1993 (see Table 1.2). The RMSE reported in the last column of Table 1.2 is the square root of the mean of squared forecast errors. This statistic can be used to compare different forecasts of the same variable. Given that real GDP typically has a trend, it is not surprising that the naïve forecast does a poor job forecasting real GDP, especially for a longer forecast horizon. For example, the forecast error is as large as 647.10 billion bahts (20 percent of actual real GDP) for the three-period ahead forecast.

Table 1.2. Real GDP Forecast Using the Naïve Model

Year		1976	...	1993	1994	1995	1996	RMSE
						Actual		
GDPR	billion bahts, at 1988 prices	690.24	...	2470.70	2689.60	2923.00	3117.80	
						Forecast		
Naïve model								
GDPR_f					2470.70	2470.70	2470.70	
Forecast error					218.90	452.30	647.10	819.29

The linear trend model

Next, let's consider forecasting using the linear trend model discussed in Section 1.2. With the estimates for parameters, $\hat{\beta}_0$ and $\hat{\beta}_1$, we can obtain the forecasts of output for the following year, $\hat{y}_{t+1|t}$ as follows:

$$\hat{y}_{t+1|t} = \hat{\beta}_0 + \hat{\beta}_1 \cdot (time + 1). \tag{1.11}$$

---

[13] For some variables, such as asset prices, economic theory suggests that, if markets are efficient, in conditions of equilibrium, price changes should be purely random, as all relevant information about future behavior should be already reflected in the current price. For these variables, the naïve model in fact provides a reasonable forecast.

This method may be appropriate if the trend has been stable over time, and little is known about the factors that may explain temporary departures from trend. Taking logarithms of the variable to be forecast and applying the same formula, we can fit a loglinear trend. As discussed in Section 1.2, when the forecast variable is in logs, the slope coefficient on the trend variable $\hat{\beta}_1$ can be interpreted as the proportional growth rate of the variable.

Let us estimate trend models for real GDP and the logarithm of real GDP using 1976-93 data for Thailand and obtain forecasts for 1994-96 for these variables; forecasts of these variables are denoted by GDPR_f and LGDPR_f, respectively (see Table 1.3).

Table 1.3. Real GDP Forecast Using the Trend Model

Year		1976	...	1993	1994	1995	1996	RMSE
					Actual			
GDPR	billion bahts, at 1988 prices	690.24	...	2470.70	2689.60	2923.00	3117.80	
LGDPR		6.54	...	7.81	7.90	7.98	8.04	
LGDPDEF		3.86	...	4.85	4.90	4.96	5.01	
					Forecast			
Trend model								
GDPR_f	the slope coeff. is 99.38				2287.33	2386.72	2486.10	
Forecast error					402.27	536.28	631.70	921.12
LGDPR_f	the slope coeff. is 0.073				7.82	7.90	7.97	
Forecast error					0.07	0.08	0.07	0.13
GDPR_f* 1/					2501.50	2692.04	2897.09	
Forecast error					188.10	230.96	220.71	370.73

1/ GDPR_f* is calculated as an exponential function of LGDPR_f.

First, the linear trend model of real GDP does worse than the naïve model shown in the previous section in forecasting real GDP (e.g., RMSE is 921.12 instead of 819.29). Plotting the actual data and the forecasts can help us understand why (Figure 1.15). The model assumes that the trend is linear, i.e., GDP grows at a constant rate, but Thai GDP growth experienced a clear acceleration in the mid-1980s. The linear trend model ignores this structural change and severely underpredicts growth. In this case, the naïve model does better than a model that fits the data badly, especially at short forecasting horizons.

A better strategy yet may be to use a loglinear model, which might capture some of the growth acceleration in the Thai data. In fact, the loglinear model does significantly better than the naïve model, yielding a much smaller RMSE (i.e., 370.73 instead of 819.29).[14]

---

[14] Note that we cannot directly compare RMSE for LGDPR_f and GDPR_f since units are different. To compare the loglinear model and the naïve model, we need to obtain GDPR_f* by taking an exponential function of LGDPR_f and compare RMSE of GDPR_f* and GDPR_f.

According to the loglinear model, the average growth rate of real GDP during 1976-93 was 7.3 percent.[15]

Figure 1.15 In-Sample Real DGP Forecasts for Thailand

Constant ratio to another variable

For some variables, an easy way of obtaining a forecast is to assume that the variable grows at the same rate as another variable, so that the ratio between the two remains constant over time. For instance, it may be reasonable to assume that government spending in some areas grows in line with the size of the economy. In this case, a forecast for government spending can be obtained using the forecast for nominal GDP. This method could be interpreted as a variant of the naïve model. The advantages of this method are that it is simple to use and that it provides a reasonable forecast in some situations. In fact, it is often used as a benchmark against which to judge other forecasts. The disadvantage of this method is that it requires a reliable forecast of nominal GDP or another aggregate.

Let us look at forecast of tax revenue, REV_f, for Thailand for 1994-96 (see Table 1.4). For example, REV_f for 1994 is computed by multiplying nominal GDP forecast for 1994, 3538.20 billion bahts, by the revenue-to-GDP ratio in 1993, 22.89 percent. Here, the nominal GDP forecast is obtained from the trend models estimated for the log of real GDP (LGDPR) and the log of GDP deflator (LGDPDEF).[16] It is important to note that sources of forecast errors are twofold in this method: the revenue-to-GDP ratio may not be constant over time; and the forecast for nominal GDP may not be accurate.

---

[15] 0.073 is slightly different from 0.076 in equation (1.3). This is because of the difference in the sample size; to forecast for 1994-96, 1976-93 is used as the sample period here.

[16] GDP_f is computed as follows: GDP_f = exp(LGDPR_f)*exp(LGDPDEF_f)/100, where LGDPR_f and LGDPDEF_f are the forecast for LGDPR and LGDPDEF, respectively.

Table 1.4. Revenue Forecast Using a Constant Ratio to GDP

Year		1976	...	1993	1994	1995	1996	RMSE
					Actual			
REV	Billion bahts	54.80	...	724.10	857.05	1003.47	1114.50	
GDP	Billion bahts	327.75	...	3163.80	3600.40	4173.00	4665.40	
REV/GDP		16.72	...	22.89	23.80	24.05	23.89	
					Forecast			
Constant-Ratio-to-GDP model								
REV_f	Billion bahts				809.79	956.95	1098.34	
GDP_f 1/	Billion bahts				3538.20	4020.04	4567.50	
Forecast error					47.26	46.53	16.16	68.26

1/ GDP_f is obtained from estimating trend models for LGDPR and LGDPDEF.

In this example, using the revenue-to-GDP ratio in 1993 to forecast leads to an underestimate of tax revenues in Thailand. Closer inspection shows that both nominal GDP and the revenue-to-GDP ratio have been underestimated.

Other econometric models

The static and dynamic models discussed in Section 1.2 aimed at identifying an empirical relationship between two variables. This relationship can be exploited to produce forecasts. One of the advantages of this approach is that by taking this behavior into consideration by means of an economic model, forecasters can give an economic interpretation to their forecasts. For example, one could say that consumption is likely to fall because income falls during a recession, other things being equal. One of the disadvantages of this method is that we need reliable forecasts of the explanatory variables. For example, in the case of consumption forecast, we need to have a forecast of income.

Let us look at the forecast of real private consumption, CPR_f, natural logarithm of real private consumption, LCPR_f for Thailand for 1994-96 using the *error correction model* discussed in Section 1.2 (see Table 1.5).

This model works quite well and gives rise to small forecast errors in the period under consideration.

Table 1.5. Forecast for Real Private Consumption Using the Error Correction Model

Year		1980	...	1993	1994	1995	1996	RMSE
					Actual			
CPR	billion bahts, at 1988 prices	607.20	...	1387.00	1504.90	1629.80	1730.40	
LCPR		6.41	...	7.23	7.32	7.40	7.46	
					Forecast			
Error correction model								
CPR_f 1/	billion bahts, at 1988 prices				1488.37	1592.81	1686.13	
Forecast error					16.53	36.99	44.27	60.01
LCPR_f					7.31	7.37	7.43	
Forecast error					0.01	0.02	0.03	0.04

1/ CPR_f is calculated as an exponential function of LCPR_f.

More sophisticated forecasting models

Structural models

Structural models are not typically used to forecast variables in the FPP exercise, mainly because of their complexity. These models, however, are commonly used by policymakers and professional forecasters.

Structural models are built using economic theory, and estimated using econometric and statistical methods. For example, let's consider a situation where we want to forecast both output and price of coffee beans for next year. Suppose that economic theory tells us that the demand for coffee depends on the price of coffee and income, and the supply of coffee depends on the price level and the weather. These demand and supply relationships behavioral equations) can be expressed as follows:

$$q_t^d = a_1 p_t + a_2 y_t + u_{1t}, \quad u_{1t} \sim N(0, \sigma_1^2),$$
$$q_t^s = a_3 p_t + a_4 we_t + u_{2t}, \quad u_{2t} \sim N(0, \sigma_2^2),$$

$$(1.12)$$

where q_t^d and q_t^s are the demand for and supply of coffee, p_t is the price of coffee, y_t is income, and we_t is weather. Parameters, a_1, a_2, a_3, and a_4, are known as *structural parameters* since they describe the underlying structure of economic behavior. For example, if the variables are in logs, these structural parameters represent elasticities (e.g., a_1 is the price elasticity and a_2 is the income elasticity with respect to demand). Note that in equilibrium, $q_t^d = q_t^s = q_t$ must hold.

These equations are not easy to estimate since both equations include variables that are simultaneously determined by the system (also called *endogenous* variables) in the right-

hand side of equations. One thing we could do is to rewrite the model in *reduced* form so that each endogenous variable depends only on variables that are determined outside of the system (also called *exogenous* variables):[17]

$$
\begin{aligned}
q_t &= d_1 y_t + d_2 we_t + v_{1t}, \\
p_t &= d_3 y_t + d_4 we_t + v_{2t},
\end{aligned}
\tag{1.13}
$$

where

$$
\begin{pmatrix} d_1 & d_2 \\ d_3 & d_4 \end{pmatrix} = \frac{1}{a_3 - a_1} \begin{bmatrix} a_3 a_2 & -a_1 a_4 \\ -a_2 & a_4 \end{bmatrix}.
\tag{1.14}
$$

Parameters d_1, d_2, d_3, and d_4 are known as *reduced form parameters* and they are complex function of structural parameters, as shown above.

Since all the right-hand side parameters are attached to exogenous variables, we can estimate these equations. With the estimates for parameters, $\hat{d}_1$, $\hat{d}_2$, $\hat{d}_3$, and $\hat{d}_4$, together with reliable forecast of exogenous variables for next year, $\hat{y}_{t+1|t}$ and $\hat{we}_{t+1|t}$, we can obtain the forecasts of output and price of coffee beans for the following year, $\hat{q}_{t+1|t}$ and $\hat{p}_{t+1|t}$:

$$
\begin{aligned}
\hat{q}_{t+1|t} &= \hat{d}_1 \hat{y}_{t+1|t} + \hat{d}_2 \hat{we}_{t+1|t}, \\
\hat{p}_{t+1|t} &= \hat{d}_3 \hat{y}_{t+1|t} + \hat{d}_4 \hat{we}_{t+1|t}.
\end{aligned}
\tag{1.15}
$$

One of the advantages of this method is that it takes into account relationships identified as relevant by economic theory. The model can also be used to simulate the effects of possible changes in the exogenous variables resulting from policy changes or other events, so it can be useful to study alternative scenarios. For example, we can simulate the effect of different weather conditions on the price and output of coffee beans.

Structural models also have disadvantages. First, building good structural models is not easy, especially if the model needs to describe the whole economy (such a model is typically known as a *macroeconometric* model). Second, as a model becomes more complex a lot of observations are necessary to estimate the parameters. Third, forecasts of exogenous variables are needed to generate forecasts of endogenous variables. Fourth, the structure of the model can be very subjective; what variables are treated as endogenous or exogenous depends on model builders' tastes and priors.

---

[17] Explicitly rewriting structural equations into reduced form equations, as shown in this example, is only possible when the number of endogenous variables in the model equals the number of equations.

VAR models

Vector autoregressive models (VARs) estimate statistically the dynamic interactions between a set of variables without imposing a specific structure on the interactions. Therefore, VARs are useful for capturing the main features of dynamic correlations between economic variables without restrictions imposed by economic theory or the modeler's preferences. They can help to identify empirical questions that models with a more robust theoretical structure can be used to answer.

To illustrate how VARs are constructed, let's continue with the coffee bean example. The VAR model for output and price of coffee beans would look as follows:

$$q_t = \alpha_{11}q_{t-1} + \alpha_{12}q_{t-2} + \beta_{11}p_{t-1} + \beta_{12}p_{t-2} + u_{1t}, \quad u_{1t} \sim N(0, \sigma_1^2),$$
$$p_t = \alpha_{21}q_{t-1} + \alpha_{22}q_{t-2} + \beta_{21}p_{t-1} + \beta_{22}p_{t-2} + u_{2t}, \quad u_{2t} \sim N(0, \sigma_2^2). \tag{1.16}$$

The price and quantity of coffee beans simply depend on past values of both of these variables. Simple econometric methods (e.g., OLS) and inference tests can be used to identify the optimal number of lags and to estimate the coefficients. When we have two endogenous variables with two lags each as in this example, we typically describe the model as a VAR(2,2) model. Notice that this model does not include exogenous variables such as income and the weather.

With the estimates for eight parameters, $\hat{\alpha}_{11}$, $\hat{\alpha}_{12}$, $\hat{\alpha}_{21}$, $\hat{\alpha}_{22}$, $\hat{\beta}_{11}$, $\hat{\beta}_{12}$, $\hat{\beta}_{21}$, and $\hat{\beta}_{22}$, we can obtain the forecasts of output and price of coffee beans for the following year, $\hat{q}_{t+1|t}$ and $\hat{p}_{t+1|t}$:

$$\hat{q}_{t+1|t} = \hat{\alpha}_{11}q_t + \hat{\alpha}_{12}q_{t-1} + \hat{\beta}_{11}p_t + \hat{\beta}_{12}p_{t-1},$$
$$\hat{p}_{t+1|t} = \hat{\alpha}_{21}q_t + \hat{\alpha}_{22}q_{t-1} + \hat{\beta}_{21}p_t + \hat{\beta}_{22}p_{t-1}. \tag{1.17}$$

One of the advantages of this method is that it is easy and fast. Typically, it has no exogenous variables (and hence this model does not suffer from the problem of subjectivity of modelers that is present in structural models).[18] One of the disadvantages is that it needs a large sample size especially if one wants to forecast more than four or five variables; for example, in the example above, there are eight parameters to estimate, but for a VAR(4,2) model, i.e., a model with four endogenous variables, each with two lags—there are 32 parameters in all to estimate! Another important disadvantage is that there is no economic "story" to tell, although the choice of variables can be associated with an economic interpretation.

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[18] A VAR model can be designed to account for exogenous variables like oil prices.

Structural VARs (SVARs) represent an intermediate method between basic VARs and the more structural approach of traditional macroeconometric models discussed above: they combine the statistical method of basic VARs with a number of widely accepted restrictions derived from economic theory, and thereby aim to capitalize on the strengths of both approaches.

Appendix A. Relationship Between the ADL Model and the Error Correction Model

ADL model.
$$\ln Y_t = \beta_0 + \beta_1 \ln X_t + \beta_2 \ln Y_{t-1} + \beta_3 \ln X_{t-1} + u_t$$

$$\ln Y_t - \ln Y_{t-1} = \beta_0 + \beta_1 \ln X_t + (\beta_2 - 1)\ln Y_{t-1} + \beta_3 \ln X_{t-1} + u_t$$

$$\Delta \ln Y_t = \beta_0 + \beta_1(\ln X_t - \ln X_{t-1}) + (\beta_2 - 1)\ln Y_{t-1} + (\beta_3 + \beta_1)\ln X_{t-1} + u_t$$

$$= \beta_0 + \beta_1 \Delta \ln X_t + (\beta_2 - 1)\ln Y_{t-1} + (\beta_3 + \beta_1)\ln X_{t-1} + u_t$$

$$= \beta_0 + \beta_1 \Delta \ln X_t + (\beta_2 - 1)\left(\ln Y_{t-1} + \left(\frac{\beta_3 + \beta_1}{\beta_2 - 1}\right)\ln X_{t-1}\right) + u_t$$

ECM model.
$$\Delta \ln Y_t = \beta_0 + \beta_1 \Delta \ln X_t - \gamma\left(\ln Y_{t-1} - \delta \ln X_{t-1}\right) + u_t$$

$$\text{where } \gamma = 1 - \beta_2 \quad \text{and} \quad \delta = -\frac{\beta_1 + \beta_3}{\beta_2 - 1}$$

II.   CHAPTER 2. OUTPUT AND AGGREGATE DEMAND

2.1   The System of National Accounts

The analysis of macroeconomic developments and the design of appropriate policies require accurate economic information and the timely release of statistics. The System of National Accounts 2008[19] (2008 SNA) provides a useful framework for this purpose. Developed as an accounting framework within which macroeconomic data can be compiled and presented, it provides an internationally recognized system for organizing a continuous flow of information related to a country's economic performance.

The main sectors

There are five important groups of economic agents: households, enterprises, financial intermediaries, the government, and nonresidents.

The five institutional sectors identified in the 2008 SNA are as follows: financial corporations, non-financial corporations, general government, households, and non-profit institutions serving households (NPISHs).

Households supply land, labor, and capital to producers in factor markets and demand goods and services in good markets. Households may also work as producers by forming unincorporated enterprises. They make decisions about how much to spend on consumption, how much to save, and how much to invest in financial markets based on their perception of the prevailing economic environment and their expectations about future developments.

The non-financial corporations are mainly responsible for the production of market goods or non-financial services.

The *financial sector* provides financial intermediation services for the economy. Financial corporations are principally engaged in providing financial services, including insurance and pension funding services, to other institutional units.

The general *government*'s economic role involves: creating an effective regulatory and legal framework; providing certain public goods, such as education, infrastructure, national security, and a social safety net; and levying taxes to finance government expenditures.

NPISHs consist of non-market NPIs[20] that are not controlled by government.

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[19] European Commission, International Monetary Fund, Organization for Economic Cooperation and Development, United Nations, and World Bank, 2008, *System of National Accounts 2008* (New York: United Nations)

[20] Non-market NPIs provide most of their output to others free or at prices that are economically significant.

The *rest of the world* sector groups together all of an economy's transactions with nonresidents.

The main aggregates

The following concepts play a central role in macroeconomic analysis:
Output is the value of all goods and services produced in an economy. This concept is problematic because of what is called double-counting. For example, the value of wheat may be counted twice: first, when it is used in the production of bread, and again as the value of bread output.

Value added (VA) is the value of output less the value of intermediate consumption and is not subject to the double counting problem. Value added represents the contribution of labour and capital to the production process.

Gross domestic product (GDP) is the sum of the gross value added of all resident sectors engaged in production, plus any taxes, and minus any subsidies, on products not included in the value of their outputs).

Consumption is divided into two distinct kinds: intermediate and final consumption. Intermediate consumption refers to value of goods and services consumed as inputs into production excluding fixed assets whose consumption is recorded as consumption of fixed capital. *Final consumption* refers to goods and services—both imported and domestically produced—used by households, NPISHs, and the general government sectors.

Gross investment or gross capital formation refers to the total value of gross fixed capital formation, change in inventories and acquisitions less disposals of valuables. It is also sometimes defined as output produced during the current year but not used for present consumption. Gross fixed capital formation in the macroeconomic sense includes the building of machinery, factories, and houses. Thus, purchasing a bond or a stock, which is referred to as an investment in everyday language, is not an investment in a macroeconomic sense, because it reflects only the transfer of financial assets among different economic agents.

Consumption of fixed capital is used to differentiate net from gross investment. Since capital stock wears out over time, the cost of replacing the capital used up during a period—is subtracted from gross investment to derive *net investment*. Net investment is a more accurate measure of the addition to productive capacity than gross investment.

Absorption (A), also called aggregate domestic demand, is defined as the sum of total final consumption (*C*) and gross investment (*I*):

$$A = C + I. \tag{2.1}$$

Net exports, which are equal to the value of exports of goods and services less the value of imports of goods and services, are used to measure the impact of foreign trade on aggregate demand.

Alternative approaches to measuring GDP

The most basic macroeconomic aggregate, GDP, can be defined using three basic approaches: the production approach, the income approach, and the expenditure approach. These alternative approaches yield equivalent results.

According to the *production approach*, GDP is equal to the sum of value added across all sectors in the economy:

$$GDP = \sum VA + \text{(taxes less subsidies) on products} \tag{2.2}$$

According to the *income approach*, GDP is equal to the sum of incomes generated by resident producers:

$$GDP = W + OS + TSP, \tag{2.3}$$

where: *W* = compensation of employees (includes wages and salaries in cash or kind, and social insurance contributions payable by employers;)
OS = gross operating surplus of enterprises (including profits, rents, interest, and depreciation); and *TSP* = taxes less subsidies on production and imports.[21]

According to the *expenditure approach*, GDP is equal to the sum of its final uses:

$$GDP = C + I + \left(X - M \right), \tag{2.4}$$

where: *C* = final consumption of the government and private sectors (includes households and non-profit institutions serving households)*; I* = gross investment*;*
X = exports of goods and services*;* and *M* = imports of goods and services.

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[21] The activities of the government in the economy cause a discrepancy between the sum of all factor payments or incomes (output valued at "factor cost") and aggregate expenditure (valued at "market prices"). The final price paid in a transaction differs from the sum of the receipts of the factors of production because of taxes on production and government subsidies. As a result, in order to move from the concept of GDP measured from the income side at factor cost to the concept of GDP measured from the expenditure side at market prices, one must add the amount of taxes (net of any subsidies to business).

Problems with GDP measurement

Although GDP is widely used to measure production and income, it is not a perfect measure. For instance, some types of production, such as volunteer and charitable services or subsistence farming, are inaccurately measured because they may not be traded in the market. In addition, improvements in the quality of goods may not be adequately reflected in the national accounts, thus production growth may be underreported.

Another major reason why economic output is often inaccurately measured is the activity of the black market or underground economy. Economic agents attempt to conceal transactions for a variety of reasons: to avoid taxes, to evade laws or government regulations, or to hide illegal activities such as drug trafficking and smuggling. Because black-market transactions are conducted mostly in cash, changes in the economy's holdings of currency may be used to obtain a rough estimate of the market's size. Alternative estimates are based on inconsistencies in the national account measures of GDP—that is, the difference between total income and total expenditures. If the underground economy grows relative to official measures of the economy, the measured growth rate of output will be below the true growth rate.

A different kind of problem arises if national accounts statistics indicate a statistical discrepancy. National accounts data are based on both production and expenditure approaches, and coverage may not be the same in the two sources. The statistical discrepancy, *SD*, may be defined as:

$$SD = GDP - \left(C + I + X - M \right). \tag{2.5}$$

In the above equation, GDP refers to GDP from production approach obtained in equation (2.2). Alternatively,

SD = GDP from production approach – GDP from expenditure approach.

Some countries combine the discrepancy with one of the expenditure components, usually final consumption, so that it does not appear explicitly in the reported accounts. In addition, if deflators for expenditure categories are not prepared using a consistent methodology[22], the statistical discrepancy in national accounts data in real terms may differ from the discrepancy in the data in nominal terms.

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[22] Refer to 2008 SNA (15.139-15.166) for methodology on volume measures of the expenditure components of GDP.

Other standard aggregates

The SNA defines two additional income aggregates: gross national income (GNI) and gross national disposable income (GNDI).

Because GDP measures output produced by residents, it ignores income received from or paid to nonresidents. In contrast, *gross national income (GNI)* captures also net factor income from abroad (*Yf*). Thus, GNI is equal to GDP plus factor incomes receivable from nonresidents less factor incomes payable to nonresidents:

$$GNI = GDP + Yf \ . \tag{2.6}$$

Such factor incomes are primarily: (i) capital income, which includes investment income in the form of dividends on direct investment and interest on external borrowing or lending; (ii) labor income of migrant and seasonal workers; and (iii) service income on land, building rentals, and royalties. Unlike GDP, which is a concept of both production and income, GNI is a concept only of income. In previous versions of the SNA, GNI at market prices was called gross national product (GNP).

Gross national disposable income (GNDI) is the total income available to residents for either final consumption or saving. It is obtained by adding net current transfers received from abroad (*TRf*) to GNI:

$$GNDI = GNI + TRf \ . \tag{2.7}$$

Net current transfers from abroad are equal to current transfers received from nonresidents, which are unrelated to income earned with factors of production, minus such transfers remitted abroad. These transfers may be either private or public. Private transfers include mostly workers' remittances; public transfers include mostly government grants. The distinction between current and capital transfers is often blurred, potentially affecting the calculation of aggregate saving.

Gross national saving (S) is defined as the difference between GNDI and final consumption (*C*):

$$S = GNDI - C \ . \tag{2.8}$$

2.2.   Accounting Relationships

The national income accounting framework yields two important relations that lie at the heart of macroeconomic analysis and therefore deserve special emphasis. These key relations are derived from the identity linking GDP with its expenditure counterparts.

Income, absorption, and the external current account balance

As detailed in Box 2.1, the external current account balance (*CAB*) is, ex post, identical to the gap between GNDI and absorption:

$$CAB = GNDI - A. \tag{2.9}$$

This identity forms the basis for the so-called absorption approach to the balance of payments. The intuitive interpretation of this relation is that a current account deficit occurs whenever a country spends beyond its means or absorbs more than it produces. In other words, current account deficits mirror an excess of absorption over income. Accordingly, in order to reduce a current account deficit, the country's income must be increased and/or absorption must be reduced. Increasing output (and therefore income) in the short term requires unused production capacity, and in the medium term, increased production capacity through investment, labor force participation, and adequate structural policies to promote gains in productivity. Domestic absorption can be reduced by contracting final consumption (*C*) and/or gross investment (*I*).

Saving, investment, and the external current account balance

A second way to develop a relationship between the national account aggregates and the external current account balance is through the saving-investment balance of the economy. As detailed in Box 2.1, the current account balance is, ex post, equivalent to the gap between the saving (*S*) and investment (*I*) of the economy:

$$CAB = S - I. \tag{2.10}$$

In other words, the economy's saving-investment balance and the external current account balance, which can be viewed as the country's use of foreign saving, are equivalent.

In a closed economy, ex post aggregate saving is necessarily equal to aggregate investment. In an open economy, however, the difference between aggregate saving and investment is the current account balance. Put differently, excess of investment over saving must be covered by foreign saving. In principle, then, a current account deficit can be reduced by increasing saving and/or reducing investment. As seen in Box 2.1, the identity between the saving-investment balance and the current account balance is a corollary to the income-absorption identity. These relationships are identities that always hold ex post, but they do not provide an explanation of any imbalances in the economy, the underlying behavior of economic agents, or the desirability (or otherwise) of a particular imbalance.

**Box 2.1. Relations between Aggregate Income and Demand, and
the External Current Account Balance**

Gross domestic product:	GDP	$=$	$C + I + (X - M) \ = \ A + (X - M)$ (1)
Gross national income:	GNI	$=$	$GDP + Yf$
		$=$	$C + I + (X - M + Yf) \ = \ A + (X - M + Yf)$ (2)
Gross national disposable income:	$GNDI$	$=$	$GNI + TRf$
		$=$	$C + I + (X - M + Yf + TRf)$ (3)
		$=$	$A + (X - M + Yf + TRf)$
Hence:	$GNDI - A$	$=$	$X - M + Yf + TRf$
		$=$	CAB (4)
Since:	$GNDI - C$	$=$	S, by definition,
and:	$GNDI - C$	$=$	$I + X - M + Yf + TRf$, from (3)
it follows that:	$S - I$	$=$	$X - M + Yf + TRf \ = \ CAB$ (5)

where:

A = Domestic absorption ($A = C + I$) or domestic demand
X = Exports of goods and nonfactor services
M = Imports of goods and nonfactor services
Yf = Net primary income from abroad
TRf = Net secondary income from abroad
C = Final consumption
I = Gross investment (including changes in inventories)
S = Gross national saving
CAB = Current account balance

2.3.   Nominal and Real GDP

Nominal GDP measures the value of output for a given year in the prices of that year. Changes over time in nominal GDP will therefore reflect changes both in prices and in volumes.

To capture only the changes in volumes and to obtain real GDP, economists work at a very detailed level of nominal GDP, deflating each component by a strictly appropriate price index. The cases for which price deflation is not possible, other approaches such as revaluation and extrapolation are normally used. The implicit GDP deflator is an index that measures the average price level of an economy's output relative to the base year. The index has a value of 100 in the base year. Thus, the percentage change in the GDP deflator measures the rate of price increases for all goods and services in the economy. (For more on the GDP deflator, see Chapter 3.)

Real GDP, referred to as "GDP at constant prices" in the SNA, measures the value of an economy's output using the prices of a fixed base year. While it is not an ideal measure of

real income or living standards, real GDP is by and large the most widely used measure of real income.

Nominal GDP, real GDP, and the implicit price deflator are linked by the following relationship:

$$Real\ GDP = \left(\frac{Nominal\ GDP}{GDP\ deflator} \right) \times 100 \ . \qquad (2.11)$$

In terms of rates of growth:

$$1 + \frac{v}{100} = \left(1 + \frac{q}{100}\right) \times \left(1 + \frac{p}{100}\right), \qquad (2.12)$$

where: v = the rate of growth of nominal GDP (in percent); q = the rate of real GDP growth (in percent); and p = the rate of inflation, as measured by rate of growth of the GDP deflator (in percent).

2.4. Labor Market Indicators

From a macroeconomic perspective, labor is the main production factor along with land and capital.[23] Thus, it is essential to review aggregate definitions and measures of the quantity and cost of this factor.

Employment and unemployment

The following are some key concepts needed to describe developments in employment and unemployment in an economy:

- The *labor force* includes all individuals of working age (usually 16 or older) who are either working or actively looking for work during any particular reference period.

- Population of a country can be subdivided into three categories: employed, unemployed and not in the labor force.

- Employment is defined as all persons, both employees and self-employed persons, engaged in some productive activity

- The *unemployment rate* measures the percentage of those in the labor force who do not have regular employment and are seeking work.

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[23] For notational simplicity, land is usually subsumed in capital, so we will use only labor and capital in the rest of this volume.

- The *labor force participation rate* is defined as the ratio of the labor force to the working age population. Changes in the labor force participation rate can significantly influence the rate of unemployment. Cultural and institutional factors affecting the labor force participation rate include female access to the labor market, the average school-leaving age, and the average retirement age.

- *Full employment* denotes the optimum employment level of an economy. It does not refer to zero unemployment. In a market economy, where shifts in demand, technology, and products are constantly occurring, there will always be some unemployment as workers transition from one job to another.

- The *non-accelerating inflation rate of unemployment*, or NAIRU, is an equilibrium rate of unemployment. The NAIRU is defined as the rate of unemployment that does not cause inflation to accelerate or decelerate. This concept is related to that of potential output, which is discussed in the next section.

Labor productivity

Productivity is defined as the ratio of output to input use. There are many different productivity measures—these can be broadly classified into single factor productivity measures (relating output to a single input) or multifactor productivity measures (relating output to a bundle of inputs). The simplest and most frequently encountered productivity measure is *labor productivity*, which is the defined as output (*Y*) per unit of labor input (*L*):

$$Labor\ productivity = \frac{Y}{L},$$ (2.13)

where *Y* is typically measured using a quantity index of value added (such as real GDP), and *L* is measured using a quantity index of labor input (such as hours worked).[24] Labor productivity thus measures how efficiently labor is used to generate output. At the aggregate level, labor productivity translates, with some adjustments, into income per capita, a measure of living standards.[25]

However, labor productivity only partially reflects the productivity of labor in terms of the personal capacities of workers or the intensity of their effort. This is because labor is seldom the only input into the production process: the ratio of output to labor input depends to a

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[24] In practice, labor input (the denominator) can be measured in various ways, including: total hours worked, the number of full-time equivalent persons, and the number of employed persons (head counts). The data series used to measure labor input can have a profound effect on the resulting labor productivity index and its growth. Hence, knowledge of the institutional features of the labor market (and the economy) is valuable in interpreting labor productivity statistics.

[25] Trends in labor productivity are similar, but not identical to, those in per capita output, because the denominator in the latter case is population, not labor input. Because of changes in labor force participation rates or hours worked per person, per capita output can change while labor productivity does not, or vice versa. But over the long run, per capita output, and thus the standard of living, cannot rise without sustained increases in labor productivity.

large degree on the presence of other inputs, such as capital, as well as the level of technology.

There are two ways in which labor productivity can grow: through capital deepening (a rise in the ratio of physical capital to labor input), and through technical progress (a rise in output due to the availability of new technologies). Capital deepening results from increases in net investment (additions to the stock of structures and equipment that go beyond that necessary to compensate for depreciation). Technical progress, on the other hand, allows for an increase in output per hour of labor input without the need for capital accumulation. This decomposition is important for understanding the extent to which any given change in labor productivity is driven by investment in physical capital (that is, by a rise in capital intensity) or by investment in intangible capital (such as innovation, organizational change, and research and development).

Wages and unit labor costs

The wages paid to labor are an important component of workers' income. As in the case of GDP, we distinguish between nominal and real wages. *Real wages* are obtained by deflating *nominal wages* by the appropriate price index. While wages reflect income from employment, overall income also includes transfers and other non-labor related income. In economies with substantial non-wage transfers such as subsidized food and housing, real wages alone will not be an appropriate indicator of living standards. In the long run, the rate of growth of real wages tends to be related to the rate of labor productivity growth (Box 2.2).

The unit labor cost (ULC) is defined as worker compensation (often proxied by nominal wages) per unit of output. ULC has an inverse relationship with labor productivity. Recall that labor productivity can be measured as the quantity of output produced for a given hour of labor input. If labor productivity increases by 2 percent, for example, while nominal wages remain unchanged, then ULC would decline. On the other hand, if labor productivity remains unchanged but nominal wages rise by 4 percent, then ULC would rise. Thus changes in ULC reflect the net effect of changes in wages and changes in worker productivity—ULC rises when wages (or more accurately, compensation and benefits) rise faster than labor productivity (Box 2.3). Since ULC can be thought of as productivity-adjusted compensation, it is an important indicator of an economy's competitiveness (see Chapter 3). Moreover, as labor is usually the single largest component of production costs, ULC is an important indicator of trends in production costs, share prices, and inflation: other things equal, (i) a sustained rise in ULC will cause an increase in total production costs; (ii) rising production costs will reduce profits, and if these effects spread across the economy they will be reflected in a decline in equity prices; (iii) firms confronted with rising ULC will be pressured to raise prices, which can increase inflation.

Box 2.2. Real Wages, Income Shares, and Labor Productivity Growth

Recall from the national income accounts that total output (Y) can be represented as the sum of incomes (that is, payments to all resident factors of production). Suppose, for simplicity, that the factors of production can be grouped into labor (L) and capital (K). Then the value of total output is simply equal to the sum of total wages plus total profits—if P denotes the aggregate price level, W denotes nominal wages per worker, and R denotes the nominal rental rate per unit of capital, then:

$$PY = WL + RK ,$$

or:

$$Y = \left(\frac{W}{P}\right)L + \left(\frac{R}{P}\right)K ,$$

where (W/P) is the real wage and (R/P) is the real rental rate of capital. Dividing by Y, we get:

$$1 = s_L + s_K ,$$

where $s_L = (WL)/(PY)$, that is, the share of wages in total income, and
$s_K = (RK)/(PY)$, that is, the share of profits in total income. Note that s_L can be rewritten as:

$$s_L = \frac{WL}{PY} = \frac{W/P}{Y/L} = \frac{Real\ wage}{Average\ labor\ productivity} .$$

If the share of wages in total income remains constant over time, it must be the case that real wage growth is equal to the growth rate of average labor productivity (Y/L). If real wages grow faster than average labor productivity, the share of wages in income goes up and the share of profits in income falls. Conversely, if real wages grow slower than average labor productivity, the share of wages in income goes down and the share of profits in income goes up.

In reality, s_L and s_K do exhibit changes over time in many economies. However, over very long periods (several decades), the share of wages in income appears to be roughly constant, suggesting that, over the long run, the rate of growth of real wages is approximately equal to the rate of growth of average labor productivity.

Box 2.3. Unit Labor Costs, Wages, and Labor Productivity Growth

Unit labor costs (ULC) is measured as the ratio of worker compensation to output:

$$ULC = \frac{WL}{Y}.$$

Rearranging, we get:

$$ULC = \frac{W}{Y/L} = \frac{Nominal\ wage}{Average\ labor\ productivity}.$$

Hence, ULC rises when wages rise faster than average labor productivity.

ULC is also related to the share of income in total output:

$$ULC = P\left(\frac{WL}{PY}\right) = Ps_L.$$

As noted in Box 2.2, if the share of wages in total income (s_L) rises, the share of profits in total income (s_K) must fall. Thus, an increase in ULC is commonly interpreted as decline in profitability.

2.5   Potential Output and the Output Gap

The production function and growth

The output of goods and services in an economy is determined by the factors of production, which are customarily classified into the stock of capital and labor. Capital includes machinery, buildings, infrastructure for transportation and communications, plus inventories of raw materials, semi-processed items, finished goods that have not yet been sold, and, as mentioned above, land. The volume of output depends on the degree of use of the available productive factors, as well as on how efficiently they are used. The intensity of use of capital assets can be measured by the rate of capacity utilization, which is the ratio of the fixed capital assets actually in use to the total stock of such capital. The intensity of labor use is measured by the ratio of labor actually employed to total labor force, or conversely, by the rate of unemployment.[26] The more efficiently a given set of factors is used, the higher the volume of output they produce and the more productive they are. The concept of *total factor productivity (TFP)* is used to measure this technological effect on production.

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[26] An even more accurate measure of labor utilization, if available, is total hours worked. The number of hours worked per worker may vary over the business cycle, with workers doing more overtime when demand is strong, for instance. Hours worked per worker also differ markedly across countries.

TFP is a multifactor productivity measure, calculated as the ratio of real GDP to a denominator reflecting combined inputs (such as labor and capital). In the long run, the growth of output can be attributed to growth of the capital stock and the labor force, and to TFP. If output growth has been faster than the growth in inputs, the difference is attributed to rising TFP. (See Box 2.4.).

Box 2.4 Growth Accounting, Productivity, and the Solow Residual

A common representation of the production process is the Cobb-Douglas production function.

$$Y_t = A_t L_t^\alpha K_t^{1-\alpha} ,$$

where Y is output, K is the physical capital stock, L is labor input, and A is Total Factor Productivity, TFP, which captures all other implicit factors that are relevant for the transformation of capital and labor inputs into output, such as technology, human capital, and institutions. The subscript t denotes time.

In this production function, the marginal product of labor is $\alpha Y_t/L_t$. Assuming perfect competition in the labor market—that is, assuming that labor is paid the value of its marginal product—the parameter α represents the share of labor income in national output. Similarly, $1-\alpha$ represents the share of capital income in national output.

A growth accounting framework is obtained by decomposing the growth rate of output into the growth rate of capital, the growth rate of labor input, and the growth rate of TFP (or technical change). This last term, the amount of output growth that cannot be explained by the growth of labor and capital, is also known as the *Solow residual*.

$$\frac{dY_t}{Y_t} = \frac{dA_t}{A_t} + \alpha \frac{dL_t}{L_t} + \left(1-\alpha\right)\frac{dK_t}{K_t} .$$

By rearranging the above expression, we can decompose the growth in labor productivity (that is the growth rate of output-to-labor ratio) into a capital-deepening component (the first term in square brackets on the right-hand side) and a technological change component (the second term on the right-hand side):

$$\frac{dY_t}{Y_t} - \frac{dL_t}{L_t} = \left[\left(1-\alpha\right)\left(\frac{dK_t}{K_t} - \frac{dL_t}{L_t}\right)\right] + \frac{dA_t}{A_t} .$$

In practice, labor and capital shares are reported in national accounts, and we thus may decompose the observed rate of growth into factor contributions. Specifically, output grows with the rate of growth of factors of production *times* their shares on output *plus* the contribution of TFP:

$$\hat{Y} = s_L \hat{L} + s_K \hat{K} + \hat{A}$$

The last relationship can be used for projecting medium-term output growth, conditional on our assumptions vis-à-vis the factor growth rates and unchanged factor shares.

Potential output

In a smoothly functioning dynamic market economy, the patterns of production respond continuously to changes in consumer preferences, changes in relative prices of inputs, and other shifts in the conditions affecting supplies of and demands for various goods and services. At any moment, some resources will be shifting between various activities and may be temporarily idle. Thus, there is a normal degree of slack in the utilization of productive resources. The output level corresponding to this normal degree of slack, or intensity of resource use, and consequently to a stable rate of inflation, is called *potential output*. The actual level of output (and income) can be below the potential level, if for some reason there is a high degree of unemployment of labor and underutilization of the capital stock. On the other hand, in times of very strong demand, productive factors may be employed in quantities exceeding their normal intensities, pushing total output beyond its potential level for a limited time.

The concept of potential output is basically a technical relationship between inputs and output that is analyzed and estimated using various forms of a *production function*. It specifies the *aggregate supply* of goods and services, given the nation's endowment of productive factors, as well as the prices for inputs and outputs. The production function can be written as follows:

$$Y = AF(K,L) \tag{2.14}$$

Equation (2.14) states that real output *(Y)* rises with increases in the availability of capital *(K)* and labor *(L)* and with technological and other improvements *(A)* that enable existing factor supplies to be used more efficiently.

Short-run changes in real aggregate supply often reflect changes in final output prices relative to factor prices. Most important in this context is the relationship between increases in output prices and labor costs. In the short term, the combination of a growing work force and a given stock of other factors results in a decline in marginal labor productivity (the extra output generated by additional workers). Because employers increase their work force only if the value of additional workers' marginal product exceeds their wages, real wages must decline for employers to engage additional labor. To the extent that nominal wages remain relatively fixed in the short run, real wages fall only if output prices increase. This development is reflected in an upward-sloping short run aggregate supply curve, as higher levels of employment and output are associated with higher price levels.

The level of *aggregate demand* is the level of expenditure on current production that economic agents are willing to undertake. When aggregate demand is below potential output, this means that current output and spending is below what the economy could normally sustain. In this situation there is spare capacity in the economy and the rate of inflation is likely to fall. Conversely, when aggregate demand is above potential output, the rate of inflation is likely to rise. Potential output can therefore be thought of as the level of output that is consistent with a stable rate of inflation. It is commonly assumed that deviations of

actual from potential output are caused by demand conditions, although temporary disruptions on the supply side may also be involved.

The *output gap* is defined as the difference between the level of actual output and potential output, usually expressed as a percentage of the level of potential output:

$$Output\ gap = \frac{Actual\ output - Potential\ output}{Potential\ output} \times 100 \qquad (2.15)$$

When actual output exceeds potential output, there is a positive output gap and inflation tends to rise. When actual output falls below potential output, there is a negative output gap and downward pressure on inflation. Thus, the output gap provides a measure of the degree of inflationary pressure in the economy. It is an important link between the real side of the economy—the production of goods and services—and inflation.

Estimating potential output growth and assessing the output gap

The level of potential output can be estimated using different methods that vary in sophistication. This section examines three methods to estimate potential output and the output gap.

The production function approach. Ideally, one could estimate a production function where output depends on capital and labor inputs as well as TFP and establish levels of normal intensity in factor use. In its simplest form, the production function approach relies on the two-factor Cobb-Douglas production function shown in Box 2.3:

$$Y_t = A_t L_t^\alpha K_t^{1-\alpha} \qquad (2.16)$$

Using the growth decomposition shown in Box 2.4, we can calculate the rate of growth of TFP ($\hat{A}$) if we know the growth rates of output ($\hat{Y}$), the capital stock ($\hat{K}$), and the labor force ($\hat{L}$), and we approximate the parameter α by labor's share, s_L, in national income. Potential output can then be computed by using the estimated TFP series and the normal degree of utilization of labor and capital. A major drawback of this approach is that it requires reliable data on the capital stock and labor inputs—in most non-OECD countries, such data are simply not available. Another criticism of this approach is the assumption that labor's (and capital's) share of income is constant—while such an approximation may not be too far off the mark for countries such as the United States and the United Kingdom, the same cannot be said for many other countries.

The linear regression approach. A simpler approach to forecasting potential output is to estimate the trend rate of GDP growth using historical data and assuming that the same rate will hold in the future. For this purpose, a regression equation can be fitted to find the growth rate over time, as follows:

$$\ln Y_t = \beta_0 + \beta_1 t + \varepsilon_t, \tag{2.17}$$

where Y = real GDP and t = time. The coefficient β_1 will yield the trend growth rate for the economy.

Time series techniques. A third method relies on time series techniques such as univariate filters or moving averages of past values of the real GDP time series. For example, most econometric software packages can implement the Hodrick-Prescott (HP) filter. The HP filter is probably the best-known and most widely used statistical filter to obtain a smooth non-linear representation of a time series. It is designed to filter out short-term fluctuations so that the long-term component is less "noisy." Applied to logged values of real GDP, such trend component y_t^* solves the following problem:

$$\min \sum_{t=0}^{T} \left(y_t - y_t^* \right)^2 + \lambda \sum_{t=2}^{T-1} \left[\left(y_{t+1}^* - y_t^* \right) - \left(y_t^* - y_{t-1}^* \right) \right]^2. \tag{2.18}$$

where the first term is the sum of the squared deviations of the observed value y (log of actual real output) from the underlying trend value y^* (log of trend real output). The second term is a measure of the time variation of the estimated trend component. Note that the larger the parameter λ, the larger the penalty for an unsmooth trend (represented by the second term). In other words, equation (2.18) says that the desired trend should fit the data well and also not change too much over time. Hence, a higher value for λ implies a smoother underlying potential output dynamics (and more volatile output gaps); in the extreme case where λ tends to infinity, the trend is a straight line. The standard value in the literature is λ=100 for annual data, a value popularized by the academic literature on real business cycles. However, this value is arbitrary as it does not have conceptual foundations in either economics or statistics and for this reason cannot underpin a comprehensive economic assessment of the macroeconomic outlook. Another drawback of this approach is the so-called end-sample bias, as the estimates of trend output based on the HP filter tend to be too sensitive to the latest developments in actual output.

Because of the specific limitations that characterize each methodology, whenever possible, various approaches should be exploited separately and the results later combined to create a forecast for potential output growth.[27] An important caveat is that all methodologies that rely on econometric analysis by necessity use the past growth to assess future growth. In

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[27] Some examples of applications of the above methodologies are: Benes and N'Diaye (2004), Billmeier (2004), Cerra and Saxena (2000), Faal (2005), and Scacciavillani and Swagel (1999).

economies that are experiencing rapid structural change this is unlikely to be satisfactory, and more judgmental approaches may have to be used.

Once potential GDP is obtained, the output gap can be calculated using Equation (2.15) to provide an indication of the short-term business cycle position of the economy.

2.6   Forecasting Output

Techniques for forecasting output, expenditure, and prices should be based on an explicit framework for analyzing macroeconomic developments. Such a framework specifies that output and prices are determined through the interplay of aggregate demand and aggregate supply. An aggregate demand function relates total expenditures to variables such as incomes, output, prices, interest rates, and public-sector policies. An aggregate supply function would also include output prices and input prices as explanatory variables. Ideally, a forecasting model would use projected values of the explanatory variables to solve for the equilibrium between aggregate demand and aggregate supply, yielding values for output and prices. However, such modeling is impractical in most cases and we have to rely on simpler and more intuitive methods to produce the forecasts.

To simplify the task, it is best to think of supply-side factors and demand-side factors separately. The following is a practical way to proceed:

1.   First, use all the information at your disposal to come up with your best forecast for GDP growth from the supply side. As detailed below, you can do this either by: (i) projecting output using the growth accounting approach with some reasonable assumptions about the rate of growth of individual factors; (ii) projecting output employing leading indicators, trends in factors of productions, and other time series techniques applied to aggregate GDP; or (iii) forecasting growth for each of the main economic sectors (such as agriculture, industry, and services).

2.   Next, turn to the demand side. Taking into account all the information available (including your forecast for GDP growth), come up with your best forecasts for growth in consumption, investment, exports, and imports. Some of these forecasts will be covered in the government sector and the external sector. Once all the expenditure components have been forecast, you can sum them to obtain your demand-side GDP growth forecast.

3.   Then look at the two growth estimates and try to reconcile them—remember they have to be equal, since you are looking at the same variable, GDP, from the different perspectives of supply and demand. Ask yourself which information you may have overlooked that could alter the growth projection made from the supply side or from the demand side in a way to bring the two projections closer to each other, and keep adjusting your forecasts until you obtain consistent projections.

4.   As an additional check, you may wish to consider how your final GDP projection is related to potential output and whether the gap is closing or expanding. Take into consideration that a series of automatic mechanisms (such as price and wage inflation as well as real exchange adjustments) exists that will work toward the elimination of the gap overtime.

Recall the distinction between nominal and real variables as summarized in equation (2.12). Any change in a nominal variable from one period to the next is the result of a change in its volume (quantity and quality) and a change in its price. Typically, economic theory does not provide inferences about values directly, but about volumes and prices separately. Thus, to forecast GDP for the coming year, we need a forecast of the change in volume (real GDP) and a forecast of the change in price (the GDP deflator).

Box 2.5 Some Useful Formulas

If
$$X = Y \cdot Z,$$

then
$$\frac{X_{t+1}}{X_t} = \frac{Y_{t+1}}{Y_t} \cdot \frac{Z_{t+1}}{Z_t},$$

and
$$(1 + \frac{\Delta X}{X}) = (1 + \frac{\Delta Y}{Y}) \cdot (1 + \frac{\Delta Z}{Z}),$$

or
$$\left(1 + \frac{\%\Delta X}{100}\right) = \left(1 + \frac{\%\Delta Y}{100}\right) \cdot \left(1 + \frac{\%\Delta Z}{100}\right).$$

Similarly, if
$$X = Y / Z,$$

then
$$\frac{X_{t+1}}{X_t} = \frac{Y_{t+1}}{Y_t} \bigg/ \frac{Z_{t+1}}{Z_t},$$

and
$$(1 + \frac{\Delta X}{X}) = (1 + \frac{\Delta Y}{Y}) \bigg/ (1 + \frac{\Delta Z}{Z}),$$

or
$$\left(1 + \frac{\%\Delta X}{100}\right) = \left(1 + \frac{\%\Delta Y}{100}\right) \bigg/ \left(1 + \frac{\%\Delta Z}{100}\right).$$

For example, if $RGDP$ = real GDP, and $GDPD$ = GDP deflator, then:

$$GDP_{t+1} = GDP_t \times \left(\frac{RGDP_{t+1}}{RGDP_t}\right) \times \left(\frac{GDPD_{t+1}}{GDPD_t}\right).$$

In what follows, we shall focus only on forecasting real changes. Prices and price changes are analyzed in Chapter 3.

Forecasting output: the supply side

This section proposes three approaches to forecasting short-term growth from the supply side. The first approach is to determine the shares of labor and capital, the historic rates of growth of labor and capital, and estimate the residual, that is, the rate of growth of TFP. Next, we need to make assumptions about the future developments of these variables, perhaps working with a few alternative scenarios. While the rate of growth of labor is mostly pre-determined by demographics, capital accumulation varies depending on investor

confidence. Finally, the projections of TFP need to be dovetailed with the alternative scenarios; for example, the rate of growth of TFP is likely to be lower in a country riddled by financial and political instability.

The second approach is to analyze leading economic indicators that can predict changes in economic activity—for example, changes in factory orders, building permits, inventories, stock prices, profit margins, cash flows, capacity utilization, and the number of new enterprises. No single time series fully qualifies as an ideal leading indicator, so it is important to analyze groups of indicators and look for common patterns. Sometimes, several leading indicators are put together to form a composite leading index—such an index is considered to be superior to individual series because it represents developments in a broad spectrum of the economy. Series that are included as components in a composite leading index tend to be indicators which: (i) cause fluctuations in economic activity (for example, economic policy instruments such as short-term interest rates); or (ii) express the expectations of economic agents (for example, consumer or business tendency surveys and share prices); or (iii) measure economic activity at an early stage of the production process (for example, housing starts and the output of intermediate goods) or adjust quickly to changes in economic activity (for example, overtime work). Different component series are used in different countries, owing to differences in their economies as well as data availability. Moreover, the component series for any given index may change over time.

The third approach involves forecasting production in each sector separately and obtaining the overall real GDP growth rate as the weighted average of the sectoral growth rates:

$$\frac{Y_{t+1}}{Y_t} = \sum_{i=1}^{n} \frac{Y_{i,t+1}}{Y_t} = \sum_{i=1}^{n} \frac{Y_{i,t+1}}{Y_{it}} \frac{Y_{it}}{Y_t} = \sum_{i=1}^{n} \omega_i \frac{Y_{i,t+1}}{Y_{it}},$$ (2.19)

where Y = aggregate real output, Y_i = real output of sector i, t denotes the time period, and ω_i denotes the weight of sector i. When detailed information is available on likely developments in individual sectors, projecting each sector individually and combining the separate estimates provides a more accurate projection of aggregate output. For example, if it is known that certain new hotels will begin operating in the following year, this information can be utilized in projections for the tourism sector. In this way, information about important sectors is explicitly incorporated in the projection.

Forecasting output: the demand side

Once we have obtained our forecast of aggregate output, the projection should be cross-checked against a projection based on the expenditure approach. Recall from equation (2.4) the standard expenditure components of GDP, where final consumption, C, comprises private consumption and government consumption and gross investment, I, comprises private investment and government investment. The forecast for government consumption and investment expenditure will be covered in Chapter 4. Projections for exports and imports of

goods and nonfactor services will be covered in Chapter 3. In this section, we will discuss only forecasts for private consumption and private investment. Private sector consumption (and its obverse, saving) and investment behavior have been studied extensively for a wide variety of countries, and the results of this work provide a good basis for forecasting.

Private consumption

Consumption is normally the largest and least volatile component of aggregate demand. Private consumption includes most personal expenditures of households such as food, clothing, and rent. The key factors affecting private consumption are how much people can afford to consume and how much people choose to consume now rather than later. Economic theory relates private consumption to the level of private disposable income, interest rates, and expected inflation, which affect the relative price between current and future consumption, and sometimes to other factors such as the distribution of income or its nature (permanent or transitory).

Household disposable income (YD) can be viewed from the standpoint of either its sources or its uses:

$$YD = Y - T = C_P + S_P,\tag{2.20}$$

where: Y = wages, salaries, and other household incomes; T = taxes less transfers (that is, direct personal taxes, such as the income tax, net of personal transfers, such as pension receipts and unemployment insurance benefits); C_P = private consumption; and S_P = private savings. Equation (2.20) shows that household consumption and household savings are determined simultaneously. For a given level of disposable income, once private consumption is known, household savings can be determined as a residual.

According to the simplest version of Keynesian economic theory, the relationship between private consumption and disposable income can be written as:

$$C_P = a + bYD,\tag{2.21}$$

where $a > 0$ and $0 < b < 1$. This specification of the consumption function implies that the marginal propensity to consume (dC_P/dYD) is constant and is equal to b, but the average propensity to consume (C/YD) falls as YD increases, owing to the declining relative importance of a positive constant term. One way to start, then, is to look at the ratio of private consumption to GDP in the recent past to check if it has been relatively stable or if it has followed any discernible trend that could be realistically projected into the future.

Of course, consumers are unlikely to be influenced only by their current disposable income—when people decide how much to consume and how much to save, they consider both the present and the future. The life-cycle hypothesis and permanent income hypothesis are two complementary theories based on this argument. The life-cycle hypothesis emphasizes that income follows a regular pattern over a person's lifetime and that savings allows households

to move consumption from those times in life when income is high to those times when it is low. The permanent income hypothesis emphasizes that people experience random and temporary changes in their incomes from year to year, and postulates that consumption should depend primarily on permanent income because consumers use saving and borrowing to smooth consumption in response to transitory changes in income. These theories imply that, aside from current disposable income, other variables that potentially affect consumption are expected future income, wealth, and the real interest rate:[28]

$$C_P = f\left(YD, YD^e, wealth, real\ interest\ rate, ...\right). \tag{2.22}$$

In general, when projecting consumption, the forecaster may want to take into consideration the large empirical literature that usually identifies a (i) positive correlation between consumption and current disposable income, expectations (proxied by indicators such as consumer confidence indexes and employment growth), the availability of credit (which may be influenced by prudential indicators and financial sector regulation), wealth (as proxied by indicators such as stock market performance and housing prices): and a (ii) negative correlation between consumption and real interest rates, increases in income or sales taxes, volatility, and uncertainty. These factors may be considered qualitatively or quantitatively, by means of a regression using the time series methods discussed in Chapter 1.[29]

A different approach to forecasting consumption is based on the random-walk theory. If consumers behave according to the permanent income hypothesis, they will choose their consumption based on their current expectations of their lifetime incomes, and change their consumption only when they receive news that causes them to revise their expectations about their life-time or permanent income.[30] If consumers have rational expectations—that is, if they use all available information to make optimal forecasts about the future—they will be surprised (and consequently change their expectations) only by events that are entirely unpredictable. Therefore, if the permanent income hypothesis is correct and people have rational expectations, then changes in consumption over time should be unpredictable. In other words, consumption should follow a random walk. The concept of a random walk and its implication for forecasting and estimation were discussed in Chapter 1. Basically, what this implies is that the best forecast for future consumption is current consumption.

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[28] Note that changes in the real interest rate can either raise or lower consumption. On one hand, an increase in the real interest rate will tend to lower current consumption through the substitution effect, by making saving more attractive. On the other hand, an increase in the real interest rate will tend to raise current consumption through the income effect, by making the consumer better off (assuming he or she is a saver).

[29] For some examples, see: Bulíř and Swiston (2006), Dell'Ariccia and others (2006), Hofman, Nadal De Simone, and Walsh (2005), Hunt and others (2006), López Mejía and Ortega (1998), Ludwig and Sløk (2002), and Moreno-Badia (2006).

[30] A necessary condition for the permanent income hypothesis to hold is that household can borrow against future income. This is a reasonable assumption only in countries with well-developed financial markets.

Private investment

Private investment exhibits substantial variability in most countries. Therefore, it is a good idea to start by examining the behavior of the ratio of private investment to GDP in the recent past.

Non-public investment comprises three distinct components: residential, non-residential investment by corporations, and inventories. Inventory investment is typically a very small yet volatile component of aggregate demand. In some countries, residential investment is the largest share of investment. To forecast residential investment, it is important to understand and project construction activity. Government and credit policies are usually key—one should consider developments in the amount of credit allocated to the sector, interest rates, and regulations or taxes, as well as household income and the housing deficit (that is, the demand for housing units relative to the existing stock).

For business fixed investment, theoretical models indicate that firms invest up until the marginal return on investment (the marginal product of capital) equals the cost of financing the investment (the marginal cost of capital). This implies that shocks affecting either one of these values will determine the investment behavior of enterprises. In particular, an increase in (i) real interest rates, (ii) the cost (also through an exchange rate depreciation) of capital goods and intermediate goods (e.g., oil), and (iii) the cost of other inputs of production (wages), by increasing the marginal cost of capital will tend to decrease investments. On the other hand, an increase in (i) current and expected profits, (ii) expected market-specific and aggregate demand conditions, and (iii) factor productivity or competitiveness due to a real exchange rate depreciation will raise the marginal product of capital and hence lead to more investments.

In practice, investors' expectations of future sales may well dominate their rate of return calculations. Of course, if capital is not fully utilized, it is unlikely that investors will decide to increase the capital stock unless they expect a substantial rise in demand. Investor confidence and expectations generally contain a large element of judgment that is difficult to quantify. Investors are normally risk averse, so that greater risks to their projections may translate in more cautious behavior and hence lower investment. For instance, exchange rate volatility may be an important factor to consider. High and/or volatile inflation may also discourage investment because it is symptomatic of an uncertain business environment.

It may be possible to proxy investors' expectations of future sales with past changes in actual output. The hypothesis that the desired capital stock—and therefore investment spending—tends to vary with changes in output is sometimes referred to as the "accelerator model." According to the accelerator model, net investment varies with the change in real GDP whereas depreciation is likely to be proportional to the capital stock, and is therefore proportional to real GDP (as a first approximation). Therefore, investment varies with the

change in GDP, as well as with the level of GDP. One can summarize these arguments in the expression:

$$I_P = f\left(\Delta GDP, GDP, real\ interest\ rate, inflation, exchange\ rate, ...\right). \qquad (2.23)$$

In general, one can think of private investment as being positively related to expected GDP growth, capacity utilization, and fiscal incentives, and negatively affected by real interest rates, the output gap, construction costs, the real cost of machinery and equipment, and political and economic volatility and uncertainty.[31]

In developing countries, the standard optimizing investment models (based on the user cost and marginal productivity of capital) are weakened by institutional and structural factors such as the absence of well-developed financial markets, the relatively large role of government in capital formation, distortions created by foreign exchange constraints, and other market imperfections. Furthermore, if the country is a small open economy, the relative proximity to richer foreign markets may be the driving force behind investments. In general, however, severe data constraints usually hinder attempts to apply such models; data on the capital stock, labor force, wages, and user cost of capital are often limited or nonexistent.

In many developing countries, the availability rather than the cost of finance represents the major constraint to private investment. As a result, bank credit, foreign capital inflows, and retained profits represent the major determinants of private investment in these countries. In addition, there is the possibility of financial crowding out if the government's recourse to the banking system limits credit to the private sector, and real crowding out if government investment preempts scarce supplies of domestic and imported physical resources and limits market opportunities.

Other components of aggregate demand

The other components of aggregate demand will be covered in Chapter 4 (exports and imports) and Chapter 5 (government consumption and investment).

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[31] For some examples, see: Guimaraes and Unteroberdoerster (2006), Haas and others (2006), Roache (2006), and Sancak (2002).

Box 2.6 The Accelerator Model

If data on capital stocks are limited or unreliable, a simplified accelerator model based on real GDP growth projections could be a useful practical method of forecasting private investment. The desired capital stock, K^*, is the amount of capital that equates the marginal benefit of capital to the real rental price of capital. Assuming a constant capital-to-GDP ratio:

$$K^* = \chi Y,$$

let K_{-1} denote the capital stock at the end of the last year, and suppose K_{-1} is not equal to the desired capital stock for this year, K^*. The amount of depreciation during the year is δK, where δ is the fraction of capital that depreciates each year. Gross investment, I, is equal to the change in the capital stock plus depreciation:

$$I = K - K_{-1} + \delta K.$$

If we assume that the capital stock is adjusted each year so that it is equal to the desired stock, then investment demand during the year can be written as:

$$I = \chi \Delta Y + \delta \chi Y.$$

The first term on the right hand side shows that the level of investment depends on the change of output—when output accelerates (that is, when ΔY increases), investment increases. This accelerator process seems to explain a large fraction of the movements in investment.

Let g denote the rate of real GDP growth, so that $\Delta Y = gY$. Then investment demand can be written as:

$$I = (g + \delta)\chi Y.$$

Thus, if we have a forecast of g, δ, and Y, and an estimate of χ, we can use them to forecast I.

Note that χ can be estimated from historical data on fixed capital formation or gross domestic investment and GDP using the formula:

$$\chi = \frac{I}{(g + \delta)Y}.$$

III. CHAPTER THREE: THE PRICE LEVEL, INFLATION, AND EXCHANGE RATES

Our main objective in this chapter is to present practical approaches commonly used to forecast prices, inflation, and exchange rates. In financial programming, these approaches are useful for constructing the baseline and policy scenarios. The chapter begins by introducing the basic concepts of measuring price indexes, inflation, and exchange rates tracked by economists and statisticians. This is followed by simple monetary theory, an introduction to the economics of exchange rates, and forecasting techniques. Our focus is on the macroeconomic links between prices, money, and exchange rates and on how inflation and exchange rate movements depend on the existing monetary and exchange rate regime.

You will recall that the formulation of macroeconomic projections is an iterative exercise. The forecasts of inflation and exchange rates in this chapter are necessarily preliminary. In addition to being a key macroeconomic variable, exchange rates have an important effect on external competitiveness and, through their effect on interest rates, on international capital flows. Therefore, a complete assessment of inflation and exchange rate projections is possible only following a thorough discussion of balance of payments issues in Chapter 4. When you have completed your balance of payments projections in Chapter 4, you will need to revisit your projections of prices, interest rates, and exchange rates to ensure that together they produce a coherent picture of where the economy is headed under the assumption of unchanged policies.

3.1   Measuring Price Indexes and Inflation

A price index reflects the average of the proportionate changes in the prices of a specified set of goods and services between two periods of time. Usually, a price index is assigned a value of 100 in some selected base period, and the values of the index for other periods are intended to indicate the average percentage change in prices compared with the base period. A price index, for example, for which 2010=100 whose values in January 2012 and January 2013 are 104.5 and 106.7 respectively, indicates that prices have risen by 4.5 percent between the index reference of 2010 and January 2012 and at a 2.1 percent rate between January 2012 and January 2013 ($\left[106.7/104.5-1\right]\times100=2.105$). Inflation occurs when the prices of goods and services increase over time. Deflation refers to when the prices of goods and services decline over time. Statisticians and economists have developed different specialized indexes to measure price changes in the economy. For example, the *Consumer Price Index* (CPI), measures the relative changes over time in the prices of consumption goods and services acquired or used by households. Another example would be the *Producer Price Index* (PPI) which measures the relative change over time in the prices domestic producers receive for their goods or services as they leave the production process to be sold on to the domestic and/or export markets. Another broad measure of price change is the *GDP deflator*, which measures changes in the level of prices of all new, domestically produced final goods and services in an economy. The GDP deflator measures the ratio of nominal (current-dollar) GDP to the real (or chain volume) measure of GDP. Business economists,

macroeconomic analysts, and policymakers also monitor a variety of other specialized price indexes, including labor costs, housing price indexes, and so on. For the economy as a whole, the CPI and the GDP deflator are the two most frequently used measures of the aggregate price level changes.

The consumer price index and the GDP deflator

In practice, the *consumer price index* (CPI) is most commonly defined as a measure of the relative change in the cost of a *fixed* basket of goods and services purchased by the reference population. National statistical agencies also compute different aggregations of the consumer price index to measure price change relevant for subsets of the population (e.g. urban, rural, and regional indexes) or to reflect harmonized concepts and definitions, such as the Harmonized Index of Consumer Prices (HICP) required by the EU. Countries designate an index, the so-called headline CPI, as the main index for macro-economic policy and indexation. The composition of the basket used to compile the CPI is based on expenditure data as reported by households during an income and expenditure survey. The CPI weight reference indicates the period during which the expenditure data used to develop the basket are collected.

To accommodate the broad range of users, the CPI is usually calculated at least once a month; however, there are some countries that calculate the index on a quarterly basis. Enumerators collect prices from a sample of outlets for each of the goods and services selected as being representative of household expenditure patterns. As prices change from one month to the next, so too will the total cost of the CPI basket.[32] Box 3.1 describes the formula for calculating this index.

As noted in Chapter 2, any change in a nominal variable from one period to the next is the result of a change in its volume (quantity) and a change in its price. Therefore, growth in nominal GDP reflects both volume growth—an increase in the quantity of goods and services produced in the economy—and changes in the prices (inflation or deflation) of these goods and services. The *GDP deflator* is and adjustment of the impact of changes in prices on changes in nominal GDP. Constant price series show changes in the volume of goods and services produced domestically and are often referred to as volume (or real) measures. The ratio of the current to volume price series is therefore a measure of price movements, and this forms the basis for the (implicit) GDP deflator:

$$GDP\ deflator = \frac{Nominal\ GDP}{Volume\ GDP} \times 100 = \frac{GDP\ at\ current\ prices}{Volume\ GDP} \times 100 . \qquad (3.1)$$

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[32] For a more detailed explanation of the CPI, see IMF (2004).

Unlike the CPI, the GDP deflator is not based on a fixed basket of goods and services. The basket changes to reflect consumption and investment patterns. New expenditure patterns are reflected in the GDP deflator as consumers respond to relative changes in prices. Although a comprehensive measure of inflation, the GDP deflator does not necessarily reflect the full impact of inflation on consumer welfare as it does not include imported goods and services. Like the CPI, the GDP deflator is expressed as an index (Box 3.1).

Box 3.1 Price Index Formulas for the CPI and the GDP Deflator

The CPI compares the cost of a representative basket of goods and services valued at prices during the current period with the cost of the *identical* basket of goods and services valued at prices in some price-reference period, 0. This involves weighting together aggregated prices for different categories of goods and services so that each takes an appropriate share to reflect the expenditure of the households covered by the index. The Laspeyres formulation measures current prices weighted by base quantities divided by base prices weighted by base quantities. .

$$P_{LA} = \frac{\sum_{i=1}^{N} p_i^t q_i^0}{\sum_{i=1}^{N} p_i^0 q_i^0} \times 100$$

$p_i^0 =$ *Price of item in the base period*

$p_i^t =$ *Price of item in period t*

$q_i^0 =$ *Quantity of item i sold in the base period*

In practice, the CPI is a ***Laspeyres-type*** index. A true Laspeyres index would require the basket to be that purchased in the price reference period, whereas in most CPIs the basket refers to a different period from the price reference period. The index is assigned a value of 100 in some selected base period, and the values of the index for other periods are intended to indicate the average percentage change in prices compared with the base period. For example, if the price of the basket had increased by 35 percent since the price-reference year, then the index would be 135; if the price had fallen by 5 percent since the price-reference year, the index would stand at 95.

The GDP deflator compares the value of total domestic output of goods and services produced during the current period with the same output valued at price-reference year prices. If q_i^t is the quantity of good *i* produced during the current year, we can write the GDP deflator as:

$$GDP\ deflator_t = \frac{GDP\ at\ current\ prices_t}{VolumeGDP_t} \times 100 = \frac{\sum_{i=1}^{N} p_i^t q_i^t}{\sum_{i=1}^{N} p_i^0 q_i^t} \times 100 .$$

This is known as a ***Paasche***, or ***current-weighted*** price index.

Although the GDP deflator and the CPI are commonly used measures of the aggregate price level, the two do not necessarily move together all the time. There are two main differences between the GDP deflator and the CPI:

- *The indexes cover different sets of goods and services.* The GDP deflator reflects the prices of all new, domestically produced final goods and services in an economy, whereas the CPI reflects the prices of a representative basket of goods and service purchased by consumers. The GDP deflator excludes imported goods and services, while the CPI includes imported goods and services. In addition, the GDP deflator includes the prices of investment goods, government services, and exports.

- *The two series are also constructed differently*, as outlined in Box 3.1. The CPI uses a fixed basket of goods and services, while for the GDP deflator the basket changes to reflect current consumption and investment patterns. To illustrate, consider a price increase that causes consumers to switch their expenditure patterns relative to the price-reference period.[33]

In practice, the CPI and GDP deflator usually give similar results, provided the periods being compared are not too far apart. The greater the length of time between the two periods being compared the greater is the opportunity for differential price and quantity movements and hence differences between the two indexes. A partial remedy to the biases associated with index numbers is to revise weights frequently. Chain-weighted indexes, constructed by revising the weights every year, are used by a number of countries.

Other price indexes

Beyond the CPI and the GDP deflator, other price indexes can be used to complete an assessment of inflationary developments in an economy.

The *producer price index* (PPI) tracks price trends from a producer's (supply side) perspective.[34] This contrasts with the CPI, which measures price change from the purchaser's

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[33] Commodities whose prices have increased more than the average will tend to have weights in the current period that are relatively smaller than in the price reference period, and therefore will have relatively less weight in a Paasche index than in a Laspeyres index. Other things equal, this means that a Paasche index, like the GDP deflator, will tend to produce a lower estimate of inflation than a Laspeyres index, such as the CPI, when prices are increasing and a higher estimate when prices are decreasing. A geometric mean of the Laspeyres and Paasche indexes will provide a reasonable approximation to an index that has no such substitution bias. Box 3.2 discusses the sources of bias in the CPI.

[34] A few countries still compile the *wholesale price index* (WPI), which preceded the PPI. The WPI would normally cover the price of products as they flow from the wholesaler to the retailer and is an index for measuring the relative change in prices in markets other than retail. Most countries have replaced the WPI with the PPI because of the broader activity and product coverage provided by the PPI, as well as the conceptual concordance between the PPI and the System of National Accounts. For a more detailed explanation of the PPI, see IMF (2004a).

(demand side) perspective.[35] The PPI measures the average change over time in the prices received by domestic producers for their output. Typically, the index covers the agriculture, mining and quarrying, manufacturing, and electricity, gas, and water supply. Increasingly, more and more countries are expanding coverage to include service industries as well. The PPI "basket" includes both goods and services purchased by other producers as inputs to their operations or as capital investment, as well as goods and services purchased by consumers either directly from the service producer or indirectly from a retailer; imports are not included. The PPI is calculated using a fixed base-weight formula similar to that used for the CPI. A monthly or quarterly PPI with detailed product and industry data allows short-term price inflation to be monitored through different stages of production and is thus a useful indicator of inflationary trends.

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[35] Producers' and purchasers' prices differ owing to government subsidies, sales and excise taxes, and distribution costs.

Box 3.2 Source of Bias in the CPI

There are four main potential sources of bias in the CPI:

- *Substitution bias:* Over time, some prices rise more than others. Consumers tend to buy less of the items with larger relative price increases and more of those with smaller relative price increases. Since the CPI assumes that consumers will buy the same basket of goods and services as they did in the base year, this means that items whose prices have risen most receive too much weight in the index (because consumers have substituted away from them), while those whose prices have risen least are given too little weight (because consumers have shifted their spending towards them). In other words, the CPI shows more inflation than consumers actually suffer because it does not capture the fact that they substitute cheaper items for more expensive ones.

- *New Outlet bias:* Conceptually, new outlet bias is identical to the new product bias discussed below. New outlet bias arises because of the failure to reflect either price changes in new outlets not yet sampled, or the welfare gain to consumers when new outlets appear and provides greater choice and a different level of service. A failure to maintain a fully up-to-date outlet sample can introduce bias because the new outlets will often be distinctive in their pricing or service policy.

- *Quality change:* The quality change problem involves trying to measure price changes for products which exhibit quality changes. The old item is no longer available, but a replacement or alternative one is on sale and priced by the collector. If the effect of quality change on price is, on average, either to reduce or increase the price, or the quality is improving or deteriorating but this is not reflected in a change in price, then a bias will result if the prices are compared without a quality adjustment.

- *New goods:* Over time, new goods (and services) will appear. These may be quite different from what is currently produced. A failure to bring new goods into the index with sufficient speed can lead to an upward bias if those new products later experience large price reductions that are not reflected in the index.

Import and export price indexes[36] measure the change over time in the prices of goods or services purchased from abroad by domestic residents (imports) or sold to foreign buyers by domestic residents (exports).[37] Import and export price indexes are primarily used to deflate foreign trade statistics. The import price index is also a valuable input for measuring inflation: since some inputs to domestic production, as well as consumption, are imported, movements in import prices can often be an indicator of future inflation.

Labor costs are a key predictor of inflation, because they often represent a large share of the total costs to private businesses. Measures of labor-cost inflation include the growth rates of average wages (or earnings), compensation costs, and unit labor costs (ULC). *Average wage statistics* are published in many countries. Wages do not include employer payments into funds for the benefit of workers (which in many countries account for a large proportion of total compensation), or, in certain countries, some items of direct pay, such as year-end bonuses. By contrast, *compensation cost indexes* measure changes in the cost of labor compensation, including wages, benefits, and payroll taxes. The ULC is an important measure of productivity calculated by dividing total labor compensation (including benefits) by real output. An increase in ULC will result in a reduction of profitability unless a firm can pass along higher labor costs to its customers. Many economists view increases in ULC as an important indicator of potential inflation.

Calculating the inflation rate using price indices

For policy analysis, we are more interested in the change in the price level, that is, the inflation rate, than in the price level itself. *Inflation* is a sustained and persistent increase in the general level of prices of goods and services in an economy. The increase in the average prices of all goods and services in the economy has to be distinguished from a change in the relative prices of individual goods and services. Generally, an overall increase in the price level is accompanied by a change in the structure of relative prices, but it is only the overall increase, not the relative price changes, that constitutes inflation. *Deflation* refers to a fall in the general level of prices.

The CPI is the most widely used and most easily understood measure of inflation. Since CPI data are usually collected and published on a monthly basis, the CPI inflation rate can be computed in several different ways. Each option provides a different perspective on how prices in an economy are evolving. The examples below use monthly CPI data for Brazil for

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[36] Note that import and export price indexes are not the same as import and export unit value indexes. Unit value indexes measure the change in the value of imports (exports) regardless of whether the items are homogeneous; therefore, they can be affected by changes in the mix of items as well as changes in their prices. In contrast, price indexes reflect an average of the proportionate changes in the prices of a specified set of imports (exports).

[37] The prices used in calculating export price indexes are usually quoted "free on board"(f.o.b.), that is, excluding freight, insurance, unloading, transportation, and duty while the prices used in calculating the import price index are usually quotes as "c.i.f", that is including cost, insurance, and freight.

2004 and 2005 to compute inflation rates using a variety of formulas. The data are presented in Table 3.1.

Table 3.1. Brazil: CPI, 2004 and 2005

		Seasonally Unadjusted Data		Seasonally Adjusted Data [a]	
		Monthly CPI	Quarterly CPI [b]	Monthly CPI	Quarterly CPI [b]
2004					
Q1	January	137.3		136.8	
	February	138.1	138.1	137.5	137.5
	March	138.8		138.2	
Q2	April	139.3		138.7	
	May	140.0	140.1	140.0	139.9
	June	141.0		141.2	
Q3	July	142.3		142.4	
	August	143.3	143.1	143.7	143.5
	September	143.7		144.5	
Q4	October	144.4		145.0	
	November	145.4	145.5	145.8	145.8
	December	146.6		146.7	
Average [c]		141.7	141.7	141.7	141.7
2005					
Q1	January	147.5		147.0	
	February	148.3	148.4	147.7	147.8
	March	149.3		148.6	
Q2	April	150.5		149.9	
	May	151.3	151.0	151.2	150.8
	June	151.3		151.3	
Q3	July	151.6		151.8	
	August	151.9	152.0	152.4	152.5
	September	152.5		153.2	
Q4	October	153.6		154.3	
	November	154.5	154.4	154.9	154.8
	December	155.0		155.2	
Average [c]		151.4	151.4	151.5	151.5

(a) Seasonally adjusted using X12 in EViews.
(b) Computed as the average of the three months in that quarter.
(c) Computed as the average of the 12 months in that year (for monthly data), or the average of the four quarters in that year (for quarterly data).

- *Annual average inflation* is the percentage change in the average value of the index from one year to the next:

$$\text{Average inflation in 2005} = \left(\frac{CPI_{2005}}{CPI_{2004}} - 1\right) \times 100 = \left(\frac{151.4}{141.7} - 1\right) \times 100 = 6.9$$

- The *end-of-year* or *December inflation rate* is the percentage change in the index comparing December of the current year with December of the previous year. For example, the end-of-year inflation rate for Brazil in 2005 is:

$$\text{End-of-year inflation rate in 2005} = \left(\frac{CPI_{\text{Dec 2005}}}{CPI_{\text{Dec 2004}}} - 1\right) \times 100 = \left(\frac{155.0}{146.6} - 1\right) \times 100 = 5.7$$

  In this example, end-of-year inflation (5.7 percent) is lower than the annual average inflation (6.9 percent), suggesting that Brazil's inflation was falling at end-2005.

- The *12-month change* is the percentage change in the CPI index comparing the latest month with the same month in the previous year, for example the 12-month change for August 2005 is:

$$\text{12-month change in August 2005} = \left(\frac{CPI_{\text{Aug 2005}}}{CPI_{\text{Aug 2004}}} - 1\right) \times 100 = \left(\frac{151.9}{143.3} - 1\right) \times 100 = 6.0$$

- Similarly, *the quarter-on-quarter inflation* rate refers to the percentage change in the CPI index comparing the latest quarter with the same quarter in the previous year, for example the Q3, 2005 quarter-on-quarter inflation rate is:

$$\text{Quarter-on-quarter inflation rate in Q3 2005} = \left(\frac{CPI_{\text{Q3 2005}}}{CPI_{\text{Q3 2004}}} - 1\right) \times 100 = \left(\frac{152.0}{143.1} - 1\right) \times 100 = 6.2 \,.$$

The formulas that we have looked at so far compute inflation rates over a one year period; however, we might also be interested in the rate of change in prices over a shorter period of time:

- The *monthly inflation rate* refers to the percentage change in the CPI comparing the most current month with the previous month;. For example, the monthly change for August 2005 is computed below:

$$\text{Monthly inflation rate in August 2005} = \left(\frac{CPI_{\text{Aug 2005}}}{CPI_{\text{July 2005}}} - 1\right) \times 100 = \left(\frac{151.9}{151.6} - 1\right) \times 100 = 0.2$$

- Likewise the *quarterly inflation rate* refers to the percentage change in the CPI comparing the most current quarter with the previous quarter.

- Monthly and quarterly inflation rates are often annualized so as to be more comparable with inflation rates computed on an annual basis. This can be done as follows:

Annualized monthly inflation rate in August 2005 $= \left(\left(\frac{CPI_{\text{Aug 2005}}}{CPI_{\text{July 2005}}} \right)^{12} - 1 \right) \times 100 = 2.4$

Monthly annualized inflation rates are more volatile that the 12-month changes, as illustrated in Figure 3.1(a), which plots the12-month and annualized monthly inflation rates for Brazil in 2004 and 2005. In general, there is a great deal of noise in the monthly inflation data; however, some of this volatility occurs because the data are not seasonally adjusted (see Box 3.3). Figure 3.1(b) plots the annualized monthly inflation rates computed from seasonally adjusted data as compared to the inflation rates computed from unadjusted data. The later is not successful, compared with the 12-month changes in 3.1(a), at removing seasonal volatility.

Figure 3.1 Brazil: Inflation Rates, 2004 and 2005

(a) Monthly Annualized and Month-on-12 Month Inflation Rates

(b) Seasonally Adjusted and Unadjusted Monthly Inflation Rates
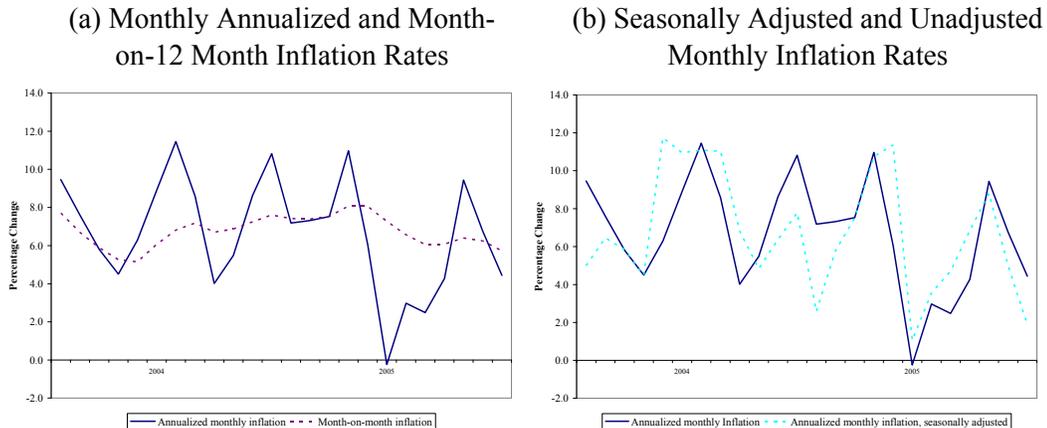
Comparing one period's CPI with another period's—for example, the previous month, the previous year, or a designated base period—provides only a crude measure of inflation (if the general level of prices has risen) or deflation (if it has fallen). These measures do not discriminate between persistent and transitory price changes; inflation arising from an increase in the price of an item with relatively volatile prices, such as energy, is not distinguished from inflation arising from increases in the prices of items for which prices tend to move steadily. For this reason, the concept of *underlying or core inflation* has been developed to isolate the long-run (or persistent) component of the measured CPI, that is, the inflation rate that reflects general inflationary pressures in the economy.

Box 3.3 Seasonal Adjustment

Seasonal adjustment removes the effects of recurring seasonal influences from many economic series, including consumer prices. Changing weather conditions, production cycles, model changeovers, holidays, and sales can cause seasonal variation in prices. For example, oranges can be purchased year-round, but prices are significantly higher in the summer months when the major sources of supply are between harvests. Seasonal movements can be large enough to mask other characteristics of the data that are of interest to analysts of current economic trends. Hence, seasonally adjusted data are usually preferred in the formulation of economic policy, because they eliminate the effects of changes that normally occur at the same time and in about the same magnitude every year.

Seasonally adjusted time series are often derived using a computer program such as X-12-ARIMA developed at the U.S. Census Bureau. The adjustment process quantifies seasonal patterns and then factors them out of the series to permit analysis of non-seasonal price movements. It is important to note that seasonal factors are estimates based on present and past experience and that future data may show a different pattern of seasonal factors.

While core inflation is an intuitively appealing concept, one should be aware that there is neither a firm theoretical basis for this concept nor a single agreed approach to measuring core inflation. Analysts have developed a number of measures of core inflation rates to better inform monetary policy. (As we saw earlier, using 12-month changes rather than monthly changes in the CPI is one way to eliminate noise but other measures try to do more.) Box 3.4 discusses various measures of core inflation.

Box 3.4 Measuring Core Inflation

There are three broad classes of core inflation measures:

- *Measures that exclude pre-identified components of the CPI:* The most common core measure excludes component price indexes, such as food and energy, from the CPI that are considered to be particularly volatile,   Food and energy prices are often excluded because they tend to be subject to large one-off supply disruptions (as opposed to aggregate demand changes) and are thus highly volatile. The *CPI excluding food and energy* has obvious limitations: in many countries, food and energy comprise very large shares in the CPI basket and this can be difficult to explain to general users.
- *Measures that exclude certain components on a period-by-period basis (according to specific statistical criteria):* A second method of calculating core inflation is to exclude what are regarded as excessively volatile changes as they occur. The *trimmed mean* removes from the CPI those components with the largest price changes (increases or decreases). The rationale is that large changes reflect relative price movements—price changes particular to an individual component— and not the overall economy-wide inflation rate. Unlike the CPI excluding food and energy, the set of components excluded from the trimmed mean changes from month to month.
- *Measures that downplay the more volatile components:* The third way of dealing with components that are felt to be too volatile is to replace the expenditure-based CPI weights with ones that are inversely proportional to each item's price volatility over a reference period. The core inflation rate is then calculated as the mean from this volatility-weighted distribution. While more volatile items are not permanently excluded, their influence on average headline inflation is muted.

For more on measures of core inflation, see Silver (2007).[IMF Staff Papers Vo. 54, No. 1: same title]

3.2   Exchange Rates

Exchange rates are among the most important prices in an open economy. Each country has a currency in which the prices of goods and services are quoted—the dollar in the United States, the yen in Japan, and the euro in the euro area countries, to name a few. Just as other prices in the economy are determined by the interaction of buyers and sellers, exchange rates are determined by the interaction of households, firms, and financial institutions that buy and sell foreign currencies to make international payments. The market in which international currency trades take place is called the *foreign exchange market*.

A *bilateral exchange rate* (simply called the exchange rate) is the price of one currency in terms of another. It can be defined in two ways: as the price of the domestic currency in terms of foreign currency or, alternatively, as the price of foreign currency in terms of domestic currency. Let E_t represent the price of one unit of domestic currency in terms of foreign currency at time t and let e_t represent the price of one unit of foreign currency in terms of domestic at time t. Then

$$E_t = \frac{1}{e_t}. \tag{3.2}$$

The choice between the two definitions is a matter of convention, as the same information is conveyed regardless of which one is employed. *E* expresses the external value of the

domestic currency in terms of some foreign currency (usually U.S. dollars). An increase in E implies an *appreciation* of the domestic currency (or *revaluation* in the case of a fixed exchange rate regime), while a decrease in E implies a *depreciation* (or *devaluation* in the case of a fixed exchange rate regime).

Exchange rate indices relative to a base period ($t = 0$) may be calculated as:

$$E_t^* = \frac{E_t}{E_0}, \quad e_t^* = \frac{e_t}{e_0}. \tag{3.3}$$

The *cross rate* refers to exchange rates between any two currencies other than the U.S. dollar, the currency in which most exchanges are usually quoted. The cross rate is computed by taking the ratio of the exchange rates against the U.S. dollar. For example, the IMF's *International Financial Statistics* database records the bilateral exchange rate for each country against the U.S. dollar: to get the euro/yen (cross) exchange rate simply divide the dollar/yen exchange rate by the dollar/euro exchange rate.

An important distinction is between *spot* and *forward nominal exchange rates*. The spot exchange rate is the rate quoted for transactions that are settled immediately or "on the spot;" this is the most commonly referred to exchange rate and the term *spot* is typically dropped. The forward exchange rate applies to contracts signed today but involving currency trades that will take place at a pre-determined future date, such as 30, 60, or 90 days from today; these contracts will be settled in the future at the forward rate agreed to today. Comparisons between today's spot exchange rate and the forward exchange rate prevailing in today's forward exchange market contain useful information about market expectations of future exchange rate movements.

The bilateral exchange rate provides information on the relative value of the domestic currency vis-à-vis the currency of a single trading partner. It is commonly desired, however, to provide assessments of the overall "strength" or "weakness" of the domestic currency vis-à-vis *all* its trading partners, taking into account the fact that trade with some is more extensive than trade with others. The nominal *effective exchange rate* is an index that measures the average change of a country's nominal exchange rate against a number of other currencies during a given period. Unlike the bilateral nominal exchange rate, the effective nominal exchange rate is an index number and not a relative price of one currency vis-à-vis another. More specifically, *the nominal effective exchange rate* (NEER) is a weighted average of various bilateral nominal exchange rates, with the weights reflecting the relative importance of the countries as trading partners.[38]

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[38] More generally, the choice of weights will depend on the economic issue being analyzed. Different weights may be appropriate, depending on whether, for example, the analysis focuses on the determination of domestic inflation, financial asset demand, or monetary policy formulation, or trade competitiveness.

$$NEER_t = 100 \times \prod_{i=1}^{N} \left(E_{it}^* \right)^{w_i}. \tag{3.4}$$

In equation (3.4), E_{it}^* is the exchange rate index for the domestic currency vis-à-vis currency i; w_i is the weight of currency i, and N is the number of currencies included in the calculation of the NEER. The sum of the weights is "normalized" to one; each individual weight w_i reflects the relative importance of currency i in the country's bilateral trade, as measured by imports, exports, or total trade. Sometimes, more sophisticated approaches are employed. The IMF's *International Financial Statistics*, for example, goes beyond bilateral trade weights to take into account indirect competition between trading partners in third countries.[39] In practice, it is common to work with a limited number of currencies that represent a large percentage of total trade and to ignore non-convertible currencies and currencies of countries with very high inflation.

Another important distinction is between the nominal exchange rate and the *real exchange rate*. Whereas the nominal exchange rate is the price of one currency in terms of another, the real exchange rate (R) is a measure of the relative price (or cost) of one country's goods and services relative to those of another, when both are expressed in the same currency. The real exchange rate can be expressed as

$$R = \frac{EP}{P^f} = \frac{P}{P^f / E}, \tag{3.5}$$

where E is the nominal exchange rate – recall that this was previously defined in terms of foreign currency per unit of domestic currency; P is the domestic price level; and P^f is the foreign price level. Movements in the real exchange rate are indicative of shifts in the relative cost of different national output baskets, which may result in changes in the demand of these baskets. Section 3.5 discusses interpretations of real exchange rates and their determinants.

The real exchange rate can be computed either on a bilateral or on a multilateral basis. The *real effective exchange rate* (REER) index measures the extent to which the purchasing power of a particular currency has changed over time relative to a group of other countries, rather than just one country. The REER is calculated by deflating each component of the NEER index by the associated measure of relative price or cost movements:

$$REER_t = 100 \times \prod_{i=1}^{N} \left(\frac{E_{it}^*}{P_{it} / P_t} \right)^{\omega_i}. \tag{3.6}$$

In equation (3.6), E_{it}^* is the exchange rate index for the domestic currency vis-à-vis the currency of country i; $\left(P_{it} / P_t \right)$ is the ratio of the price index of country i in period t to the price index of the home country in period t (with the same base year as that used to calculate

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[39] For further details on various weighting schemes, see Turner and Van't dack (1993).

E_{it}^{*}); ω_{i} is the (normalized) weight of country i, and N is the number of countries included in the calculation.[40]

Many of the issues regarding the construction of the nominal effective exchange rate also apply here, with the additional issue of which deflator to use. Any of the price indices discussed in Section 3.1 can be used to construct a REER index; however, it is likely that the different deflators will result in different measurements of the evolution of the REER. In general, the most appropriate deflator to use will depend on the question at hand—Chapter 4 will discuss using the REER as a measure of international competitiveness.

3.3   Analyzing Inflation

What determines the inflation rate? We can think about answering this question from two perspectives—either in terms of why some countries have inflation rates that are higher or lower than other countries or what causes the inflation rate to change from one period to the next for a given country. In this section, we review some of the theories that have been developed to answer this question.

The quantity theory of money

According to the *quantity theory of money* the price level in an economy is determined by the money supply (and thus the inflation rate is determined by the money supply growth rate). As Milton Friedman has famously stated "inflation is always and everywhere a monetary phenomenon." The quantity theory of money is built from the quantity equation, also referred to as the equation of exchange, given below:

$$MV=PY, \tag{3.7}$$

where M is the quantity of money, V is the velocity of circulation of money, P is the price level, and Y is real GDP. Assuming that velocity is constant, and defining k=1/V, we obtain the quantity theory of money which posits a proportionality between real money and real income, given in equation (3.8).

$$\frac{M}{P} = kY \tag{3.8}$$

With constant velocity, any changes in the quantity of money (M) are matched by a proportional change in nominal GDP (PY). Under the additional assumption of *money neutrality*, money (a nominal variable) has no effect on the real level of output, and the

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[40] For further details on the construction of effective exchange rate indexes in the IMF, see Zanello and Desruelle (1997) and Bayoumi, Lee, and Jayanthi (2005).

quantity of money determines the price level. If the central bank maintains a stable money supply then the price level will be stable. To explain the inflation rate, we can re-write equation (3.8) in percentage changes, and re-arrange to obtain equation (3.9) where we continue to assume that velocity is constant, that is, $\Delta k = 0$. This equation states that the growth rate of money is the sum of the inflation rate and the real growth rate of the economy. Again, under money neutrality, the growth rate of real output is determined by other factors, implying that the inflation rate ($\Delta P / P$) is determined by the growth rate in the money supply ($\Delta M / M$).

$$\left(1+\frac{\Delta P}{P}\right)=\left(1+\frac{\Delta M}{M}\right)-\left(1+\frac{\Delta Y}{Y}\right). \tag{3.9}$$

The quantity theory of money gives us a very simple way to predict inflation and keep it under control: monitor and control what happens to monetary aggregates. The usefulness of this theory as an explanation of inflation depends on the validity of two assumptions upon which it is built–unchanged velocity and money neutrality. Are these assumptions sufficiently realistic?

The assumption of money neutrality is usually considered valid *in the long run*, as the long-run growth rate of the economy is determined by real variables such as technological progress and the growth in factors of production, not by monetary variables. In addition, changes in velocity tend to be relatively small in the long run. Accordingly, a large body of empirical evidence supports the quantity theory of money in the long run. Figure 3.2 plots the decadal averages of inflation and money growth rates for a wide sample of countries where the high correlation between money growth and the inflation rate can be clearly seen.

Figure 3.2 Correlation between Money and Inflation
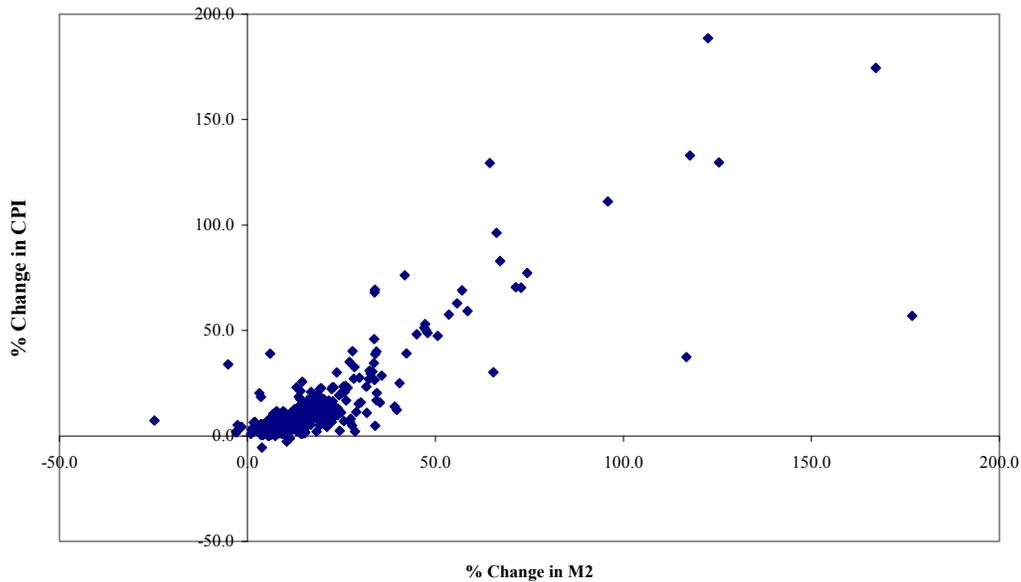
Source: Author's calculations. Data are the decadal (10-year) average growth rate in M2 and the 10 year average inflation rate from 1950 through 2000. Countries with inflation rates or money growth rates in excess of 200 percent are excluded. Data are from IMF *International Financial Statistics* and the sample includes all IMF member countries for which both data points were available for a total of 480 observations.

The quantity theory works well also when changes in monetary aggregates are very large relative to other disturbances in the economy, as is the case in periods of large monetary expansions. For examples, in periods of extremely large inflations (hyperinflation), the money supply and prices move closely together.

Outside these extreme circumstances, there is less agreement about money neutrality in the short run. If we were to look at a plot of money growth and inflation using quarterly or even annual data, we would not observe a high correlation. Many economists would argue that this is because changes in the money supply have an impact on real economic variables in the short run, so that, for example, a monetary expansion may increase output rather than prices if the economy is operating below its potential level. In addition, in the short run we observe large changes in velocity, which have proven difficult to predict, so that the assumption of unchanged velocity is contradicted by the data. As a result, the quantity theory of money, specifically, and the growth rate of the money supply, more generally, do not provide good explanations of the inflation rate in the short run.

The Phillips curve

Phillips curve models explain the inflation rate in the short run, or over the course of the business cycle, as being determined by three main variables—economic activity in the economy, the expected inflation rate and supply shocks. Economy activity is measured either by the unemployment rate or the output gap (defined as the deviation of the current level of output from its full employment or potential level). The *short-run Phillips curve* relationship, given in equation (3.10), says that short-term movements in inflation are determined by the output gap. When output is above potential and domestic demand is high relative to the supply capacity of the economy, firms can increase their profits by increasing prices, without concern for losing sales to competitors. Also, workers demand higher wages, knowing that firms will be able to pass on the cost increase to customers through higher prices. This results in an increasing rate of inflation. On the other hand, when there is a negative output gap (or a high unemployment rate), there is downward pressure on prices (and wage demands are lower), and the inflation-rate tends fall.[41]

$$\Delta P_t = \beta GAP_{t-1}. \qquad (3.10)$$

More sophisticated Phillips curve models also include expected future inflation as a determinant of current inflation (expectations-augmented Phillips curve). To explain why this is the case, consider workers writing multi-year wage contracts with their employers. If they think future inflation is going to be higher, they will demand higher wages than otherwise, and this will translate into additional price pressures. Equation (3.11) provides an example of an expectations-augmented Philips curve:

$$\Delta P_t = \Delta P_t^e + \beta GAP_{t-1}, \qquad (3.11)$$

where ΔP_t is the inflation rate, ΔP_t^e is the expected inflation rate, GAP_t is a measure of excess demand in the economy (either the output gap or the unemployment rate).[42] The parameter β measures how responsive inflation is to excess demand in the economy, and will have a positive sign when the output gap measure is used and a negative sign when the unemployment rate is used.

There are many different formulations of the Phillips curve model and alternative techniques for estimating these models.[43] In particular, there are differing assumptions about how

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[41] Recall from Chapter 2, the equilibrium unemployment rate is often referred to as the non-accelerating inflation rate of unemployment or NAIRU. The Phillips curve equation is the origin of that terminology.

[42] In some empirical specifications, dummy variables are included to capture specific shocks to the inflation rate, such as changes in indirect taxation or oil prices.

[43] For examples, see Stock and Watson (1999). For country applications, see Bokil and Schimmelpfennig (2005) and Callen and Chang (1999).

inflation expectations are formed. One frequent assumption is that agents are backward looking, that is, the expected inflation rate is determined entirely by past inflation rates. The simplest version of a backward-looking Phillips curve assumes that the expected inflation rate is equal to the lagged inflation rate. With this assumption, econometricians estimate the following equation of inflation (3.12):

$$\Delta P_t = \Delta P_{t-1} + \beta GAP_t + \varepsilon_t,$$ (3.12)

where ε_t is a random disturbance. Other formulations of the backward looking Phillips curve include several lags of the inflation rate, where the coefficients are restricted to sum to one.[44] Recent work on the Phillips curve emphasizes forward-looking expectations, and it is increasingly common to include both backward and forward-looking elements of inflation expectations when formulating the model.

The Phillips curve model can also be extended to the open economy case by assuming that the CPI inflation rate is a weighted average of the inflation rates for domestically produced goods and for imported goods.[45] The inflation rate for domestically produced goods is assumed to be determined by a standard Phillips curve relationship as described above, and imported goods inflation is determined both by the change in the real exchange rate and the expected inflation rate, yielding equation (3.13):

$$\Delta P_t = \Delta P_t^e + \beta GAP_t - \gamma(r_t - r_{t-1}) + \varepsilon_t,$$ (3.13)

where r_t is the log real exchange rate. Real appreciations lead to a lower import price inflation rate and, as a result, lower CPI inflation.

The mark-up model

The *mark-up model* assumes that firms set prices as the sum of the costs of all production inputs and a fixed mark-up, which covers fixed costs and profits. Equation (3.14) is an example of an empirical model of inflation based on the mark-up theory. The price level (P_t) is set equal to a mark-up on the unit labor cost (ULC_t) and the price of imported goods (PM_t):

$$\ln P_t = \mu + \gamma \ln ULC_t + \lambda \ln PM_t + \xi_t,$$ (3.14)

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[44] The restriction that the coefficients on the lagged inflation rates sum to one ensures that the long-run Phillips curve is vertical, that is, in the long run or steady state (defined by an unchanging inflation rate and no shocks), the level of output is at potential (or the unemployment rate is at the natural rate or NAIRU).

[45] See Ball (1998) for a derivation of an open economy Phillips curve.

where μ is the mark-up, γ is the labor share in output, λ is the share of imported goods in output, and ξ_t is a random shock. If we consider this to be the long-run relationship between the price level and the prices of inputs, then recall from Chapter 1 that we can write the following error-correction model:

$$\Delta \ln P_t = \alpha + \beta \left(\ln P_{t-1} - \mu - \gamma \ln ULC_{t-1} - \lambda \ln PM_{t-1} \right) + \varphi \Delta \ln ULC_t + \delta \Delta \ln PM_t + \varepsilon_t . \quad (3.15)$$

The coefficients in this model can be interpreted as follows: γ and λ are the long-run elasticities of the price level with respect to changes in unit labor cost and the price of imported goods. φ and δ are the short-run or impact elasticities; these measure the contemporaneous impact on the price level of changes in either unit labor costs or import prices.

This model can be further generalized by allowing the mark-up to be larger in periods of positive output gap (when demand is strong and firms have more pricing power) and lower in periods of negative output gap (when demand is weak and firms have little pricing power). In this new model, equation (3.15) also includes the output gap as an explanatory variable. This modified mark-up model now includes a Phillips curve model, in addition to input cost variables.[46]

3.4   Analyzing the Exchange Rate

Exchange rate regimes

We have defined the exchange rate as the price of one unit of domestic currency in terms of the foreign currency. This price is determined in the foreign exchange market, but in many cases governments do not simply let market forces operate, but have specific policies to maintain a certain level or path for the exchange rate of their currency. The *exchange rate regime* of each country describes this policy. The costs and benefits of alternative exchange rate regimes are discussed in Chapter 12.

To maintain the desired level of the exchange rate, monetary authorities either intervene directly on the foreign exchange market buying or selling foreign currency, or they engineer changes in domestic interest rates, which make financial assets denominated in domestic currency more or less attractive relative to foreign assets, and thus change the demand for domestic currency. These issues are discussed further in Chapter 6.

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[46] For country applications, see Bowdler and Jansen (2004), De Brouwer and Ericsson (1998), Lissovolik (2003), and Sekine (2001).

The most basic distinction among exchange rate regimes is between a fixed regime, in which the monetary authorities commit to exchange the currency at a given parity, and a fully flexible regime, in which the exchange rate is determined by the market. In reality, there are many different varieties of fixed and flexible exchange rate regimes. The IMF classifies exchange rate arrangements into the following groups, on the basis of their degree of flexibility and the existence of formal or informal commitments to exchange rate paths:[47]

- *Exchange arrangements with no separate legal tender:* The currency of another country circulates as the sole legal tender (formal dollarization), or the country belongs to a monetary or currency union in which the same legal tender is shared by the members of the union. Adopting such regimes implies the complete surrender of the monetary authorities' independent control over domestic monetary policy.

- *Currency board arrangements:* A monetary regime based on an explicit legislative commitment to exchange domestic currency for a specified foreign currency at a fixed exchange rate, combined with restrictions on the issuing authority to ensure the fulfillment of its legal obligation. This implies that domestic currency will be issued only against foreign exchange and that any increases in the liabilities of the domestic monetary authority are fully backed by increases in holdings of foreign assets. These arrangements eliminate traditional central bank functions, such as monetary control and lender-of-last-resort, and leave little scope for discretionary monetary policy.[48]

- *Other conventional fixed peg arrangements:* The country formally or de facto pegs its currency at a fixed rate to another currency or a basket of currencies, where the basket is formed from the currencies of major trading or financial partners and weights reflect the geographical distribution of trade, services, or capital flows.[49] There is no commitment to keep the parity irrevocably. The exchange rate may fluctuate within narrow margins of less than ±1 percent around a central rate—or the maximum and minimum value of the exchange rate may remain within a narrow margin of 2 percent. The monetary authority stands ready to maintain the fixed parity through direct intervention (that is, via sale/purchase of foreign exchange in the market) or indirect intervention (for example, via aggressive use of interest rate policy, imposition of foreign exchange regulations, exercise of moral suasion that constrains foreign exchange activity, or through intervention by other public institutions). Flexibility of monetary policy, though limited, is greater than in the case of exchange arrangements with no separate legal tender and currency boards because traditional

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[47] This section draws on the Appendix to the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions.* The IMF classifies countries' exchange rate regimes based on members' actual, de facto, arrangements as identified by IMF staff, which may differ from their officially announced arrangements. Note that other classifications exist in the literature which may not correspond closely to the IMF classification. See, for example, Rogoff and Reinhart (2004).

[48] Some flexibility may still be afforded, depending on how strict the banking rules of the currency board arrangement are.

[49] The currency composites can also be standardized, as in the case of the special drawing right (SDR).

central banking functions are still possible, and the monetary authority can adjust the level of the exchange rate, although relatively infrequently.

- *Pegged exchange rates within horizontal bands:* The value of the currency fluctuates by at least ±1 percent around a fixed central rate and the margin between the maximum and minimum value of the exchange rate exceeds 2 percent. There is a limited degree of monetary policy discretion, depending on the band width.

- *Crawling pegs:* The currency fluctuates within a narrow margin of 2 percent around a central flat rate that is adjusted periodically. The periodic adjustments may be either in small amounts at a fixed rate or in response to changes in selective quantitative indicators, such as past inflation differentials vis-à-vis major trading partners or differentials between the inflation target and expected inflation in major trading partners. The rate of crawl can be set to generate inflation-adjusted changes in the exchange rate (backward looking), or set at a preannounced fixed rate, or set on the basis of the projected target inflation differentials (forward looking). Maintaining a crawling peg imposes constraints on monetary policy in a manner similar to a fixed peg system.

- *Exchange rates within crawling bands:* The currency fluctuates around a crawling central rate with a margin between the maximum and minimum value of the exchange rate that exceeds 2 percent. The degree of exchange rate flexibility is a function of the band width. Bands may be either symmetric around a crawling central parity or widen gradually with an asymmetric choice of the crawl of upper and lower bands. In some cases the authorities may simply announce the upper and lower bounds with no preannounced central rate. The commitment to maintain the exchange rate within the band imposes constraints on monetary policy, with the degree of policy independence being a function of the band width.

- *Managed floating with no predetermined path for the exchange rate:* The monetary authority does not announce a central rate or upper and lower bounds for the exchange rate but attempts to influence the level or trend of the exchange rate in response to objectives for or concerns about other macroeconomic variables. Indicators for managing the rate are broadly judgmental (for example, balance of payments position, international reserves, parallel market developments), and adjustments may not be automatic. Intervention may be direct or indirect.

- *Independently floating:* The exchange rate is market determined, with any official foreign exchange market intervention aimed at moderating the rate of change and preventing undue fluctuations in the exchange rate, rather than at establishing a level for it.

Purchasing power parity

A useful benchmark in assessing exchange rate and inflation developments is *purchasing power parity* (PPP). PPP states that the nominal exchange rate between any two currencies reflects the relative purchasing power of the two currencies, as indicated by national price levels:

$$E = \frac{P^f}{P},$$

$$(3.16)$$

where E is the nominal exchange rate (in terms of foreign currency per unit of domestic currency), P is the domestic aggregate price level, and P^f is the foreign aggregate price level. Assuming the domestic consumption basket is similar to the foreign consumption basket, then PPP means that one unit of the domestic currency has the same purchasing power at home as it has abroad. If, on the other hand, the exchange rate is below the level implied by the PPP, the purchasing power of the domestic currency is less abroad than at home.

In practice, there are many reasons why the purchasing power of a currency varies across countries, leading to deviations from PPP: similar goods may be sold at different prices in different countries (even after they are translated in the same currency); differences in preferences among consumers across countries may result in different consumption baskets; the methodology used to construct price indices may differ. If all these reasons do not change over time, then *relative PPP* may hold even if PPP does not, so that changes in the exchange rate are equal to the difference between foreign and domestic inflation.

$$\%\Delta E \approx \%\Delta P^f - \%\Delta P.$$

$$(3.17)$$

Empirical studies show that PPP (either absolute or relative) does not hold in the short run. However, relative PPP tends to hold in the medium to long run, because there are economic forces that tend to eliminate differences in the purchasing power of currencies across different countries. Relative PPP is therefore an important relationship to keep in mind when analyzing inflation and the exchange rate in the medium and long term.

The real exchange rate

In section 3.2, we introduced the concept of the *real exchange rate* (*R*) which we defined as a measure of the prices of the home country's goods and services relative to the prices of a foreign country's goods and services, given by equation (3.5) re-written here for convenience.

$$R = \frac{EP}{P^f} = \frac{P}{P^f / E},$$ (3.18)

where *E* is the nominal exchange rate (in terms of foreign currency per unit of domestic currency), *P* is the domestic aggregate price level, and P^f is the foreign aggregate price level.

If PPP holds, the real exchange rate is always one by definition. If absolute PPP fails to hold, but *relative* PPP holds, then changes in the real exchange rate are always zero. So we can think of movements in the real exchange rate as measuring changes in the relative purchasing power of the domestic currency at home and abroad. A rise in the real exchange rate—a *real appreciation*—reflects an increase in the domestic currency price of domestic goods (*P*) relative to that of foreign goods (P^f/E).[50] A real appreciation increases the amount of foreign goods that can be purchased in exchange for one unit of home goods. Equivalently, it implies an increase in the purchasing power of a unit of domestic currency abroad relative to its purchasing power at home. The real exchange rate appreciates when the nominal exchange rate appreciates, and/or when the domestic price level rises by more than the foreign price level (that is, when domestic inflation is higher than foreign inflation).

Intuitively, as a real exchange rate appreciation tends to make domestic goods more expensive relative to foreign goods, it makes it more difficult for domestic producers to sell their goods abroad and more attractive for foreign producers to sell their goods at home. This explains why the real exchange rate is frequently used as a measure of *international competitiveness* of a country, as we will see more specifically in the next chapter.

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[50] As with the bilateral nominal exchange rate, the bilateral real exchange rate can also be defined as the inverse of the ratio shown in equation (3.4), that is, the prices of a foreign country's goods and services relative to the prices of the home country's goods and services, expressed in the same currency. In that case, an increase in the real exchange rate would denote a real depreciation.

3.5 Forecasting Inflation

Forecasting CPI inflation

What are the types of information that will form the basis for a good forecast of the CPI inflation rate? Equivalently, we can ask what determines the inflation rate, and our answers will provide a structure for the analysis of information on developments that might influence the evolution of prices. Section 3.3 discussed the determinants of the inflation rate and made an important distinction between what determines the inflation rate in the short run and in the long run. We discussed that although the growth rate of money and the inflation are highly correlated in the long run, other variables such as the output gap, the expected inflation rate or input costs (including the price of imported goods) play a key role in the short run, that is, over our forecast horizon. The discussion in this section provides suggestions for formulating a judgmental forecast of the inflation rate, and for estimating and forecasting with the Phillips curve and mark-up models discussed in the previous section.

A key feature of inflation is that it is a highly *persistent* phenomenon, which means that the inflation rate in the current period is highly correlated with the inflation rate in the previous period. This feature of the inflation rate is found in many countries, across many types of monetary policy regimes, and at various stages of development. The degree of persistence tends to increase with the amount of *indexation* in the economy and how accommodative the stance of monetary policy is (Box 3.5). For countries with highly persistent inflation, a forecast for inflation that is equal to the current inflation rate is an excellent starting point for a judgmental forecast and, indeed, may even be a good forecast.[51] Here the current period inflation rate could refer to either the annual average or to the end-of-period inflation rate. When there are large differences between these two measures that are not attributable to seasonal factors or other one-off shocks, the end-of period inflation rate will be the better measure to use as a starting point.

As an alternative to using the previous period's inflation rate as a forecast, *the core inflation rate* in the previous period (using any of the measures mentioned in Box 3.4), the *expected inflation rate* (from surveys or bond price differentials), or the *target inflation rate* in an inflation targeting regime or stabilization program could be used as a starting point for judgmental forecasting.

With this as our starting point, we can look at developments in the economy that would result in a change in the inflation rate: aggregate demand, the exchange rate, inflation expectations, changes in the prices of inputs, and other developments. We can incorporate this information

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[51] This was referred to as the naïve forecasting method in Chapter 1. A more sophisticated approach could be to utilize the Box-Jenkins methodology to build a univariate model of the inflation rate to use in forecasting (Box and Jenkins, 1970).

by making either judgmental adjustments to our initial forecast or with a Phillips curve or mark-up model for the inflation rate that are either econometrically estimated or calibrated using coefficient estimates from empirical studies on similar countries. In an open economy, the process for forecasting inflation and the exchange rate are intertwined and these two forecasts should be made together—section 3.6 provides suggestions on how to do this—for now we focus on how developments other than the exchange rate influence our inflation forecast.

Box 3.5 Indexation

Indexation, a technique to adjust payments using a price index, arises in a variety of macroeconomic environments. In the presence of inflation, most economies feature some type of indexation of contracts and/or government payments. These practices sometimes arise spontaneously in the market, and sometimes are promoted by the government itself.

Wage indexation is a wage adjustment rule that ties the growth rate of nominal wages to the movement of a price index such as the CPI. Such rules remove the need for the frequent renegotiation of wages as they are designed to protect real wages from erosion due to inflation. When wages are perfectly indexed, the real wage is fixed.

Financial indexation adjusts the value of the nominal payment in question according to a price index. Financial indexation can originate in contracts between private parties or in the denomination of public debt. Either way, financial indexation allows the creation of a financial instrument that is practically riskless in terms of inflation.

Exchange rate indexation occurs under a particular exchange rate regime called the *crawling or adjustable peg*. This exchange rate regime involves a preannounced exchange rate (path) that varies according to the difference between domestic and foreign inflation. Often, the exchange rate adjustment rule is constructed using domestic inflation in the preceding month, which is why this regime can be considered an indexation practice.

Other things equal, the higher is domestic demand, the greater the upward pressure on prices: this is the key feature of the Phillips curve relationship outlined in the previous section. In Chapter 2, we discussed how to develop our forecast for real GDP growth from the supply side and from the demand side. Any increase in aggregate demand in excess of potential output growth will likely result in a higher inflation rate.

Data on *inflation expectations*, when available, have become an increasingly important ingredient in assessments of price developments. In many countries, there are regular surveys to poll the general public or groups of people—such as the business sector, financial market participants, trade unions, or private households—on their view of the inflation rate over the next quarter or 12 months. In countries where there are inflation-indexed bonds, it is possible to extract a measure of inflation expectations from the data on the price of these bonds.[52]

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[52] See, for example, Scholtes (2002).

These data can be used either to inform judgment or, if a sufficiently long time series is available, in empirical work using the Phillips curve. Such data can be useful especially in times of rapid change—during a crisis or during a stabilization program—to provide an indication of how credible the public believes monetary policymakers are in their commitment to fight inflation.

Developments in the *prices of inputs* can also assist in forming a forecast of the inflation rate—the markup model that was discussed earlier is especially useful here. As mentioned, since labor is an important input in the production of many goods and services, it is useful to have information on wage developments in the economy, for example, the average industrial wage or ULC. In countries where an index of wages is not available but where public sector wages lead private sector developments, then information on public sector wages agreements may be useful. As far as possible, wage developments should be analyzed in the context of recent productivity developments: in general, wage growth in excess of recent inflation that cannot be explained by high productivity growth will contribute to a higher inflation rate (or lower profits). As explained in Chapter 2, changes in ULC reflect the net effect of changes in wages and changes in worker productivity, which is why this indicator is frequently used for forecasting inflation.

There are other developments that should also be considered when forecasting inflation, for example, changes in indirect taxes and changes in administered prices. Such changes have an immediate direct impact on the inflation rate; in the case of changes in *administered prices*, this effect will depend on the size of the price change and the relative share of the goods and services with administered prices in the CPI basket (Box 3.6). There can also be a second round, indirect effect through the impact on inflation expectations, wages and, increases in the price of goods which are not taxed or whose prices are not administered but now face higher demand.

Box 3.6 Administered Prices

An *administered price* can be defined as a price dictated by an entity other than market forces. It is most common that an administered price refers to a price set by a government, but it may also be set by a private company with sufficient control over the market that it can set prices. Administered price schemes typically set a minimum guaranteed support price or a target price for a commodity, which is maintained by associated policy measures, such as quantitative restrictions on production and imports; taxes, levies, and tariffs on imports; export subsidies; and public stockholding. *Regulated prices* are those administered prices that are monitored and controlled by government policy, which restricts the extent to which these prices may vary. Common examples of goods with administered/regulated prices include fuel, utilities, medical services, and transport.

Forecasting the change in the GDP deflator

Once we have a forecast for the CPI inflation rate, we can use this as the basis for a forecast of the GDP deflator. We can forecast the GDP deflator on either an aggregated or disaggregated basis.

The aggregated approach involves examining the historical relationship between the CPI inflation rate and the GDP deflator inflation rate, and forecasting the GDP deflator assuming a continuation of the same relationship. For example, we could examine historical correlations, or use a linear regression model or cointegration model for the GDP deflator that includes the CPI and import price inflation rates.

According to the disaggregated approach, the GDP deflator can be viewed as a weighted average of the price changes of the components of GDP. Therefore we can forecast the GDP deflator by individually forecasting the price and volume changes of the components of GDP, summing the relevant components to obtain nominal GDP and real GDP, and then computing the GDP deflator as the ratio of nominal GDP to real GDP.

We can approach this either from the supply side (using the data on GDP by production approach) or from the demand side (using the data on GDP by expenditure approach). From the supply side, the GDP deflator is a weighted average of agricultural, industrial, and service price changes. However, this approach is rarely used because the deflator from the supply side is an implicit price index of value-added (output minus intermediate consumption).

From the demand side, the GDP deflator can be thought of as a composite of the average price of the different expenditure components, as illustrated in Figure 3.2. Economic theory serves as a guide to models that are helpful to form forecasts of the real expenditure components (private consumption, private investment, and exports and imports). Chapter 2 provides some guidance on forecasting real private consumption and real private investment; Chapter 4, on forecasting real imports and exports; and Chapter 5, on forecasting public consumption and investment. The following are some suggestions for forecasting each of these deflators:

- It might be useful to separate consumption expenditure into private and public consumption and forecast the price changes for these components separately. The change in the *private consumption deflator* could be forecast as the same as the change in the CPI. To the extent that information is available, the change in the *public consumption deflator* could be forecast as a weighted average of changes in the CPI and in public sector wages, with the weights determined by the portion of public expenditure on wages and salaries.

- The change in the *investment deflator* can be approximated by a weighted average of the change in domestic prices (as measured by the CPI, the PPI, a construction cost index, or the WPI) and the change in import prices. The weight would depend on the

share of imported goods and services in investment demand. We do not always have data directly on this weight; however, data on imported capital goods in overall imports, domestic production of capital equipment, the size of the construction industry, foreign direct investment, and local knowledge can assist in forming a good judgmental estimate. In general, the share of imported goods in investment tends to be greater in smaller economies, and high levels of FDI are often associated with higher shares of imported goods.

- To forecast the *deflator for export and imports*, we need forecasts for the international price indices of exports and imports, as discussed earlier in this chapter. Sources of these forecasts are discussed in Chapter 4.

To compute the GDP deflator, combine the forecasts for the price deflators with the forecasts for the levels of the expenditure components, following the structure in Figure 3.3, and as discussed in further detail in Chapter 7. Using this approach ensures that the forecasts for both real and nominal GDP are consistent with the forecasts for the government and external sectors.

Figure 3.3 The GDP Deflator and Its Components
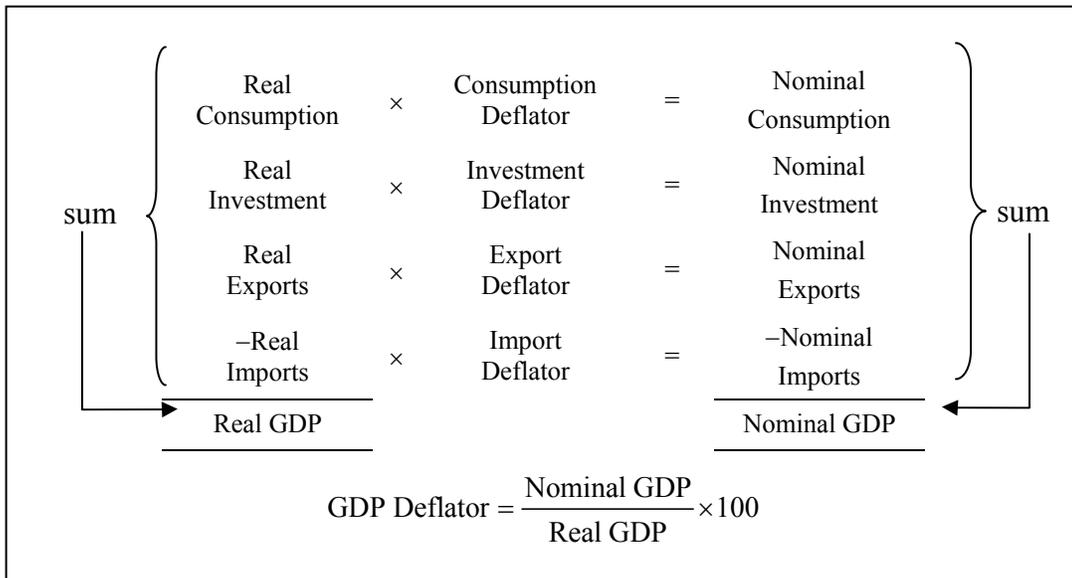
3.6   Forecasting the Exchange Rate

This section provides some guidelines for forecasting the nominal and real exchange rate for the baseline scenario. However, it must be said at the outset that the exchange rate is one of the more difficult macroeconomic variables to forecast accurately and this should be borne in mind as we go through the discussion on forecasting these variables. The forecasts for the nominal and real exchange rates must be consistent with each other and with the forecast for the inflation rate (at home and abroad). For simplicity, we will work with the assumption that there is only one trading partner or that all trade is carried out in one major currency, such as the U.S. dollar or the euro. The real exchange rate, nominal exchange rate, domestic inflation, and inflation in the corresponding foreign country are linked in the following way:

$$1 + \frac{\Delta R}{R} = \frac{\left(1 + \frac{\Delta E}{E}\right)\left(1 + \frac{\Delta P}{P}\right)}{\left(1 + \frac{\Delta P^f}{P^f}\right)},$$

$$or \tag{3.19}$$

$$\frac{\Delta R}{R} \approx \frac{\Delta E}{E} + \frac{\Delta P}{P} - \frac{\Delta P^f}{P^f},$$

where $\Delta R/R$ is the forecast for the percentage change in the real exchange rate; $\Delta E/E$ is the forecast for the percentage change in the period average nominal exchange rate (in U.S. dollars or euros per unit of domestic currency); $\Delta P/P$ is the period average forecast for domestic inflation; and $\Delta P^f/P^f$ is the period average forecast for the inflation rate in the United States or the euro area. Forecasts for inflation in the United States or other countries can be obtained from external sources such as the IMF and the OECD; see Chapter 5 for more on this.

Thus, given the forecast for the average domestic inflation rate that was developed earlier (in Section 4), we can either forecast the nominal exchange rate and use the equation above to obtain a forecast for the real exchange rate, or first forecast the real exchange rate and then derive the nominal exchange rate forecast. If the inflation forecast does not include the contemporaneous nominal exchange rate as an explanatory variable (either directly or indirectly though import prices), then this is straightforward. However, if the model used to forecast inflation includes contemporaneous changes in the nominal exchange rate (or import prices in domestic currency) then it will be necessary to solve simultaneously the inflation equation and the relative PPP equation for the inflation and exchange rate forecast.

Whether we choose to begin with a forecast of the real exchange rate or the nominal exchange rate depends in part on the exchange rate regime—which is assumed unchanged in a baseline scenario—and in part on which variable can be forecast with a greater degree of confidence.

In the case of a fixed exchange rate regime or a tightly managed floating regime, it is usually sensible to forecast the nominal exchange rate as unchanged, and then compute a forecast for the real exchange rate. In the case of a tightly managed exchange rate, we can set the forecast for the nominal exchange rate equal to the December average exchange rate, for example. Note that when the domestic inflation rate exceeds the inflation rate in the main trading partner, then an unchanged nominal exchange rate assumption could imply a very large real appreciation in the baseline scenario, which could raise questions about the sustainability of the exchange rate regime.

In the case of a crawling peg or band with a preannounced rate of crawl, we would simply forecast the nominal exchange rate to change by the preannounced rate of crawl.
In the case of a floating exchange rate regime, the behavior of the exchange rate will depend heavily on developments in the country's external accounts, which are discussed in the next chapter. A useful starting point may be to assume that the nominal exchange rate is unchanged from the previous period, or that it is determined by relative PPP (i.e., the change in the exchange rate is equal to the inflation differential). This preliminary forecast can be used to prepare a preliminary round of forecasts of the external accounts. Once these are available, the consistency of the initial exchange rate forecast needs to be considered, and a second round of forecast may be necessary. We will return on this subject at the end of the next chapter.

Once we have a forecast for the percentage change in the average nominal exchange rate ($\Delta E_t/E_t$), we may also be interested in a forecast for the average exchange rate itself (E_t) and in the end-of-period exchange rate (E_t^{EOP}). The forecasted average exchange rate is simply:

$$E_t = E_{t-1} \times \left(1 + \frac{\Delta E_t}{E_t}\right). \tag{3.20}$$

Assuming a linear trend, the forecast for the end-of-period exchange rate can be computed using the formula:

$$E_t = \frac{E_{t-1}^{EOP} + E_t^{EOP}}{2},$$

(3.21)

which can be rearranged as

$$E_t^{EOP} = 2E_t - E_{t-1}^{EOP}.$$

(3.22)

The percentage change in the end-of-period exchange rate is:

$$\frac{\Delta E_t^{EOP}}{E_t^{EOP}} = \left(\frac{E_t^{EOP}}{E_{t-1}^{EOP}} - 1 \right).$$

(3.23)

IV. CHAPTER FOUR: THE EXTERNAL SECTOR

4.1 Introduction

Trade with the rest of the world allows citizens of an economy to access a broader range of goods, services, factors of production, and financial assets. In addition, international trade allows worldwide production to be organized more efficiently: international division of labor allows countries to specialize in the production of those goods and services in which they have comparative cost advantages. Third, international trade has an important intertemporal dimension. In open economies domestic consumption and investment no longer have to equal domestic production. Spending in excess of domestic production can be financed by accumulating external liabilities, while, conversely, an excess of production over spending results in the accumulation of external assets.

A country's external (international) accounts record the transactions of its residents with foreign residents and track the evolution of their external assets and liabilities. Developments in a country's external accounts are linked to movements in exchange rates, interest rates, and asset prices, to the depletion or accumulation of official reserves and, sometimes, to acute economic crises. It is natural, therefore, that these accounts occupy center stage in policy discussions involving national policymakers, international capital market participants, and international financial institutions. Since its inception, one of the IMF's principal functions has been to help its member countries compile accurate and comprehensive international accounts. The IMF has also long offered its members advice and financial assistance when they faced imbalances in their international payments.

This chapter provides an overview of the structure of external accounts, their economic significance, and ways to forecast them.

4.2   The External Accounts

The international accounts for a country summarize the economic relationships between residents of that country and nonresidents. They consist of the *balance of payments* (BOP), the *international investment position* (IIP), and the *other changes in financial assets and liabilities accounts*.[53]

The BOP records transactions in goods, services, and assets between the country's residents and foreign residents during a calendar year. For the purposes of bookkeeping, the country's *residents* are its households, nonfinancial and financial businesses, its government, monetary

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[53] The methodology for constructing the BOP and other changes in financial assets and liabilities accounts, and for measuring a country's external position is set out in the sixth edition of the *Balance of Payments and International Investment Position Manual* (*BPM6*).

authorities, and their agencies. Foreign residents (nonresidents) are persons and businesses resident in other countries, foreign governments and monetary authorities, and international financial institutions.[54] Transactions covered in the BOP include the sale or purchase of currently produced goods and services and the purchase or sale of existing physical and financial assets. The BOP records transactions in terms of a major international currency, such as the U.S. dollar, and at market exchange rates prevailing on the transaction date. BOP accounts are compiled according to the *accrual* method of accounting, which recognizes transactions when the economic exchange takes place, regardless of when payment is made and cash changes hands.

The BOP accounts for a country are constructed using the *vertical double entry accounting system*: every transaction gives rise to two entries with equal values and opposite signs, a credit (+) and a debit (-). In the current and capital accounts, transactions data are shown as gross credit or gross debit entries. A credit denotes entries that give rise to receipts from foreign residents, i.e., exports of goods and services, primary income receivable, secondary income, capital transfers, and disposals of non-produced nonfinancial assets. Items that require payment by residents to foreign residents are recorded as debits. These cover entries for imports of goods and services, primary income payable, secondary income, capital transfers, and acquisitions of non-produced nonfinancial assets.

In the case of transactions in financial assets and liabilities, the terms "net acquisition of assets" and "net incurrence of liabilities" are used (beginning in *BPM6*). A positive change indicates an increase in assets or liabilities and a negative change indicates a decrease in assets or liabilities. The interpretation of increase or decrease under the credit or debit notion, however, depends on whether the increase or decrease refers to assets or liabilities (a debit for an asset is an increase; a debit for a liability is a decrease). A positive sign for the financial account balance indicates a net increase in assets and/or a net decrease in liabilities, while a negative sign indicates a net increase in liabilities and/or a net decrease in assets. Although the debit and credit presentation is not emphasized for the financial account transactions, it is important to recognize and maintain accounting identities. With double entry bookkeeping, the sum of all credits should be identical to the sum of all debits, and the overall total should equal zero. In this accounting sense, the BOP is always in balance.

A second set of accounts, the IIP, complements the BOP accounts by providing a summary statement of the country's stock of external financial assets and liabilities at a point in time. The country's *net international investment position* is the difference between a country's external financial assets and liabilities and is a summary measure of its external financial

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[54] The concept of residency in the BOP is based on the transactor's center of predominant economic interest, not on the transactor's nationality. Individuals living in a country are generally considered residents if they have resided there for at least 12 months. An enterprise is resident in an economic territory when the enterprise is engaged in a significant amount of production of goods or services from a location in the territory. It is generally required that production take place or is planned to take place over a period of a year or more.

wealth.[55] Even though both debt and equity assets and liabilities are included in the IIP, the country is sometimes referred to as a net creditor if its foreign assets exceed its foreign liabilities and as a net debtor otherwise.

The other changes in financial assets and liabilities account is the third set of accounts. It is a statement that shows other flows, such as valuation changes, that reconciles the BOP and the IIP for a specific period, by showing changes due to economic events other than transactions between residents and nonresidents.

Data on BOP flows, the IIP and other changes in financial assets and liabilities constitute the complete set of international accounts for an economy. Because data on stocks are often used to estimate income receipts, consistent classifications of the income component of the current account, the financial account of the BOP and the IIP are essential for reconciling stocks and flows and for performing a meaningful analysis of yields and rates of return on external investments.

4.3   The Balance of Payments

The three accounts in the BOP are the *current account,* the *capital account, and the financial account*. Exports and imports of currently produced goods and services, and flows of primary and secondary incomes between residents and nonresidents are recorded in the current account. The capital account records capital transfers receivable and payable between residents and nonresidents; and the acquisition and disposal of non-produced, nonfinancial assets between residents and nonresidents. The financial account records transactions that involve financial assets and liabilities and that take place between residents and nonresidents.

The current account

The *current account* comprises exports and imports of currently produced goods, services, and income flows to and from foreign residents (see Table 4.1).

Transactions classified under *goods* relate to the movement of merchandise that involve a change of ownership. Exports of goods are normally calculated *free on board* (*f.o.b.*), i.e., excluding the cost of freight and insurance. The imports of goods should also be calculated *f.o.b*. If the cost of transportation and insurance (cost, insurance, freight, or *c.i.f.*) is included, an adjustment should be made to bring the recording of imports to an *f.o.b.* basis.

The *trade balance* is the difference between exports and imports of goods. From an analytical point of view, it is somewhat arbitrary to distinguish goods from services. For example, a unit of foreign exchange earned by a freight company strengthens the BOP to the same extent as

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[55] The IIP is a subset of the national balance sheet. The net IIP plus the value of nonfinancial assets equals the net worth of the economy, which is the balancing item of the national balance sheet.

the foreign exchange earned by exporters. Nonetheless, the trade balance is useful in practice, since it is often a timely indicator of trends in the current account balance. The customs authorities often provide data on trade in goods long before information on trade in services becomes available.

Services refer mainly to the transport and insurance of goods, transport fares paid by travelers, tourist services (including hotels, restaurants, and health-related services), telecommunication, computer and information services, construction, government purchases (in connection with embassies, for example), and other items. Goods for processing are also recorded as a service in cases where the manufacturing is undertaken by an entity that does not own the goods and that is paid a fee by the owner.[56]

Primary Income may be derived from labor (*compensation of employees*, or wages paid to employees living in neighboring countries but considered as residents of their home country), the renting of natural resources, and from financial assets or liabilities. Investment income (net) represents receipts and payments of interest on financial assets and liabilities, dividends on corporate stocks and reinvested earnings. For indebted countries, interest payments on foreign debt often constitute the largest income sub-item. The important credit items are interest earned on reserve assets and, for creditor countries, interest received on loans to foreigners.

Secondary Income (formerly current transfers) include cash transfers and gifts in kind (such as food and medicines), including funds sent by workers residing abroad to families back home. Other current transfers, such as current taxes on income and wealth, social contributions and benefits, and contributions paid by member governments to international organizations,[57] are also included.

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[56] The service is termed "*manufacturing services on physical inputs owned by others*" in *BPM6*.
[57] Contributions that give rise to equity are acquisitions of shares or other equity and are not included.

The *current account balance* (CAB) is one of the most useful indicators of an external imbalance. It is the difference between credits and debits of goods, services, primary income, and secondary income. If a country's current account is in surplus, then its residents are accumulating foreign assets and the net IIP is rising; if a country's current account is in deficit, then its residents are issuing liabilities that are purchased by nonresidents and its net IIP is declining.

Table 4.1 Classifications of the BOP

Current Account	Capital and Financial Account
Goods	**Capital account**
	Capital transfers
Services	**Acquisition/disposal of non-produced,**
Manufacturing	**nonfinancial assets**
Maintenance and repair	
Transport	**Financial account**
Travel	**Direct investment, net**
Government services	**Portfolio investment, net**
Other services	**Financial Derivatives and ESOs (net)**
	Other investment, net
Primary Income	**Net Errors and Omissions**
Compensation of employees	**Reserve and Related Items***
Investment income	**Reserve assets (ΔRES)**
Other primary income	**Credit and loans from the IMF**
	Exceptional financing
Secondary Income	

*Based on the analytic presentation used in the IMF's statistical publications. Exceptional financing refers to transactions undertaken by the authorities to finance BOP needs, including such items as external borrowing, accumulation and payments of arrears, and debt forgiveness (see Box 4.3).

The capital account

The capital account records *capital transfers* and the *acquisition or disposal of non-produced, nonfinancial assets*.

Capital transfers are unilateral transfers from nonresidents that generate appreciable changes in the stock of the country's financial or real assets.[58] Capital transfers may be in cash (investment grants to build roads, schools, or hospitals) or in kind (debt forgiveness), and are sometimes disaggregated into general government, or official transfers, and private transfers.

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[58] Unilateral transfers do not generate future liabilities to recipients. Capital transfers are generally large and infrequent.

Investment grants normally obligate the recipient (either the general government or the private sector) to use the funds for fixed capital formation—in many cases, investment grants are tied to specific investment projects.

Debt forgiveness is the voluntary cancellation by an official creditor of all or part of a debt specified by a contractual arrangement. It is recorded as a capital transfer (general government) under the capital account.

The category *acquisition or disposal of non-produced, nonfinancial assets* records transactions involving non-produced, nonfinancial assets, such as land and subsoil resources, or non-produced intangible assets, such as patents, copyrights, trademarks, and franchises, and leases or other transferable contracts.[59]

The financial account

The financial account records exchanges of financial assets and liabilities between residents and nonresidents. The assets and liabilities listed in the financial account are distinguished by the following characteristics: (i) *the nature of the investment*, i.e., whether it is direct or portfolio investment and whether it is debt or equity; (ii) *the original maturity* of the asset or liability being exchanged, i.e., whether it is long or short term; and (iii) *the identity of the issuer/holder*, i.e., whether it is a private or public sector entity. On this basis, the following functional categories can be distinguished in the financial account:

Direct investment flows arises when an investor resident in one economy makes an investment that gives control or a significant degree of influence on the management of an enterprise that is resident in another economy. *Inward* direct investment occurs when a foreign investor purchases a domestic financial or nonfinancial firm, sometimes referred to a *brownfield* investment, or when it uses its funds to set up a new firm in the country, sometimes referred to as a *greenfield* investment. *Outward* direct investment is the acquisition by a domestic investor of a controlling interest, or significant degree of influence on the in a foreign company or the use of its funds to create a subsidiary in a foreign country. The reinvestment of retained earnings in a foreign firm that is controlled by a domestic firm is another example of outward direct investment.[60] *Portfolio investment* includes purchases of tradable equity and investment fund shares, and debt securities that do not give the purchaser

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[59] The BOP treats acquisitions or sales by nonresidents of land or subsoil assets as a transaction between two resident units. The nonresident unit acquires an equity stake on a *notional* resident one (and the physical asset remains in the territory of the country). The only exception is land purchased or sold by foreign embassies and international organizations, where the transaction involves a shift of land from the territory of one country to that of the other (*BPM6*, Chapter 13, pp. 13,.10).

[60] The acquisition by a foreign investor of a significant stake in an existing domestic company (typically 10 percent or more of voting power) is also considered a direct investment inflow. However, purchases or sales of equity not involving a controlling interest in a company are not considered direct investment and are recorded under portfolio flows.

substantial control rights, such as management. Portfolio investment covers the purchases by, or sales to, nonresidents of stocks, bonds, money market debt instruments, and tradable financial derivatives, such as currency and interest rate swaps. Portfolio investment is distinguished by the maturity of the asset or liability being exchanged.

Other investment comprises trade credits and advances, loans, insurance, pension, and standardized guarantee schemes, and other financial transactions involving nontradable instruments. Trade credits are generally short term in nature. On the other hand, the term of loans can vary. Some short-term bank loans were at the root of maturity mismatches that played an important role in financial crises in emerging markets in the 1990s. In *BPM6*, SDR allocations are recognized as liabilities, under other investment (see Box 4.1).

Reserve asset flows refer to changes in the country's holdings of official monetary reserves. Official reserves (or *reserves* in short) are external assets that are readily available to, and controlled by, the monetary authorities and take three forms: foreign currency, deposits, and securities usually, though not exclusively, in the form of US dollars and short-term US Treasury securities; monetary gold; and Special Drawing Rights (SDRs) and the country's reserve position in the IMF. Transactions with the IMF affect both reserve assets and reserve liabilities (see Box 4.1).

Reserve assets are used to finance imbalances generated elsewhere in the BOP. For example, a country that is running a current account surplus is acquiring foreign financial assets, such as higher balance on its deposits at overseas banks, bonds, or equity. The "import" by domestic residents (households, firms, banks, government, and central bank) of foreign assets is a financial outflow that is shown as a debit in the financial account. In many situations, central banks intervene in foreign exchange markets by buying or selling official reserve assets. Central bank foreign exchange intervention aims to affect exchange rates and other macroeconomic conditions in the country.

In practice, the BOP accounts may not balance exactly. Imbalances arise because estimates of various components of the BOP are derived from different sources and because some items are over- or under-recorded or not recorded at all. Therefore, all BOP accounts contain a residual item called *net errors and omissions*, which is equal to the sum of all the other entries, with the sign reversed. Because this line is recorded net, credit errors offset debit errors—that is, an underestimation of exports may be partly offset by an underestimation of imports. Therefore, the size of the net residual cannot be taken as an indicator of the relative accuracy of the BOP statement. Nonetheless, large, persistent, and volatile net residuals impede the interpretation and analysis of a country's BOP.

Box 4.1 How IMF Transactions Affect the BOP

Four main types of transactions with the IMF can directly affect a country's BOP accounts:

- *Use of IMF resources.* When a country purchases foreign currency from the IMF (for instance through a standby arrangement), it increases its financial assets (the foreign exchange received) but at the same time it incurs a financial liability (its obligation vis-à-vis the IMF). Thus, use of IMF credit is recorded in the financial account, as an increase in a liability under "other investment, loans, credits and loans with the IMF", and its counterpart is shown as an increase in "reserve assets."

- *Changes in special drawing rights (SDRs).* SDRs are international reserve assets created by the IMF to supplement countries' existing assets. If SDRs are used to acquire foreign exchange, to settle financial imbalances, or to extend loans, the transactions are recorded in the BOP under reserve asset flows. According to BPM6, new allocations of SDRs are recorded as the incurrence of a liability of the recipient under SDRs in other investment, with a corresponding entry under SDRs in reserve assets.

- *Changing a "reserve tranche position" in the IMF.* This arises from (i) the payment of part of a member's quota in reserve assets, and (ii) the IMF's net use of the member's currency. Changes in a country's reserve position in the IMF, which include a member's creditor position under any arrangement to lend to the IMF, are assets from the country's perspective. Such shifts are recorded as changes in reserve assets in the Financial Account.

- *Lending to the IMF and lending to IMF Managed Trusts* have becoming increasingly important following actions by the IMF in 2009 to substantially increase its lending resources. The *International Reserves and Foreign Currency Liquidity: Guidelines for a Data Template* (2013) provides in Appendix VII, statistical guidelines for recording transactions and positions related to these lending facilities.

4.4   The International Investment Position

The IIP account is compiled at the end of the calendar quarter or year and it constitutes the balance sheet of the country's external financial assets and liabilities. Changes in the IIP from one period to the next reflect changes in the country's stocks of foreign assets and liabilities from the end of the previous period. These changes are the result either of external financial transactions during the period as recorded in the BOP or of valuation changes from exchange rate and asset price movements. Roughly speaking, a country that sells more goods and services from nonresidents than it buys from them is acquiring foreign financial assets that raise its external wealth. This is reflected in a more positive or less negative net IIP. A country that buys more goods and services from nonresidents than it sells to them will, on the other hand, see its net IIP decline. Either way, changes in countries' relative net IIP positions are of keen interest to policymakers. A country that exports fewer goods and services to the rest of the world than it imports cannot sustain this forever. At some point, it will be forced to halt the deterioration of its net IIP position as the willingness of foreign residents to acquire

domestic assets is limited, presaging sustained changes in exchange rates or interest rates. In recent years, the number of countries for which IIP data have become available has expanded through the efforts of the IMF and national compilers.

4.5   Analyzing the External Position

Determinants of the current account balance

The *current account balance* (*CAB*) is the difference between receipts and payments in the current account of the BOP. Recall from Chapter 2 that this balance also reflects the gap between income and spending (or absorption) in the economy, or

$$GNDI - A = CAB, \tag{4.1}$$

where *GNDI* is the country's gross national disposable income, and A is domestic absorption, defined as economy-wide spending by households, business and the government on domestic and foreign made goods and services, or $A \equiv C+I+G$. A country whose domestic absorption exceeds gross national disposable income must be importing the difference from the rest of the world. Also, recall from Chapter 2 that the current account balance is equal to the economy's saving-investment gap:

$$CAB \equiv S - I . \tag{4.2}$$

Like consumption, national saving and investment can be further broken down by sector into government (public) and nongovernmental (private).

Consider a country that is running a current account surplus (*CAB* > 0). This country is a net saver vis-à-vis the rest of the world as it uses up for domestic consumption or investment less than the national income currently available to it and makes the surplus available to foreign residents. The country's provision of net financing to the rest of the world leads to a reduction in its foreign liabilities or buildup in its foreign assets (possibly, official reserves). Thus, the current account surplus is matched by a deficit in the capital and financial accounts of the BOP, and the country's net international investment position improves. Conversely, in a country that runs a current account deficit (*CAB* < 0), economy-wide consumption and investment exceed gross national income. This country is financing its net acquisition of resources from the rest of the world by liquidating part of its foreign assets (including—possibly—official reserves), or increasing its foreign liabilities. This country is running a surplus in the capital and financial account of the BOP, and it is experiencing a deterioration in its IIP.

More formally, define as *FI* net capital inflow into the economy (excluding the monetary authorities), and as Δ*RES* the accumulation of official reserves of the monetary authorities. Then the balance of payments identity implies:

$$CAB + FI - \Delta RES = 0, \tag{4.3}$$

where an increase in official reserves enters equation (4.3) with a negative sign because it represents "imports" by the monetary authorities of additional reserve assets. Equation (4.3) can be thought of as the budget constraint for the entire economy. Specifically, a current account deficit can be maintained only as long as capital inflows persist and/or net official international reserves decline. Large and persistent current account deficits and increasing net international indebtedness raise questions about the ability of a country to sustain its external position. In Chapter 10 below we will present a methodology to assess external sustainability.

Why do countries run current account deficits or surpluses? There are many reasons. For instance, foreign savings can be an important *source of development finance* for lower income countries. These countries may have many profitable domestic investment projects but lack sufficient savings to finance them. In this situation, as equation (4.2) indicates, the country can expand domestic investment beyond the resources available from domestic savers by making use of foreign savings—that is, by running a current account deficit.[61]

A current account deficit may also be an optimal response to a *temporary negative external shock*, for example a short-lived drop in export prices or poor weather that results in poor harvests of export crops. In these cases, the country can avoid an undesirable sharp temporary drop in domestic absorption by drawing on foreign savings or reducing its stock of foreign assets.[62]

Long-term structural changes, such as those related to *population aging* or the *depletion of natural resources* may also result in current account imbalances. A country with an aging population, for example, might decide to accumulate foreign assets to provide its citizens with retirement income in the future. Such a country would run a current account surplus temporarily. Countries whose economies depend heavily on exhaustible natural resources may also usefully accumulate foreign assets to maintain living standards in the future, when the natural resources will be depleted.

Current account deficits can also result from *short-run macroeconomic imbalances*, such as excessive domestic demand pressures that lead to overheating, i.e., a situation in which actual output exceeds potential output and inflationary pressures are building up (see Chapter 2). In an open economy, excessive domestic demand pressures translate into higher imports with no corresponding increase in exports, causing a deterioration in the current account. In addition, prices of goods that cannot be imported, such as many services, will tend to increase, leading to inflationary pressures. In these situations, policies to correct the current account imbalance

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[61] Because capital is often scarce in developing countries, the return on capital should be high in these countries, and they should be importers of capital, through direct foreign investment or other types of inflows. However, lack of infrastructure, poor institutions, political and macroeconomic instability, and other factors may work to reduce the return to investment in these countries.

[62] See Obstfeld and Rogoff (1996, Chapters 1 and 2).

are desirable (see Chapter 11 below). When excessive domestic demand is caused by a fiscal expansion, the so-called twin deficits may emerge (a budget deficit accompanied by a current account deficit).

The current account balance and the real exchange rate

The current account position of a country is closely linked to the level of the *real exchange rate*. In Chapter 3, the real exchange rate was defined as the price of the domestic consumption basket relative to the foreign consumption basket, when expressed in the same currency, i.e.,

$$R = \frac{EP}{P^f} = \frac{P}{P^f / E},$$
(4.4)

where P is the domestic consumer price index, P^f is the foreign consumer price index, and E is the nominal exchange rate (units of foreign currency per unit of domestic currency). An increase in R (a real exchange rate appreciation) indicates that the domestic consumption basket has become more expensive relative to the foreign consumption basket. Since domestically produced goods tend to dominate the domestic consumption basket while goods produced abroad tend to dominate the foreign consumption basket, a real exchange rate appreciation also means that domestically produced goods have become more expensive than goods produced abroad. The converse is true in case of a real exchange rate depreciation.

Because labor is the largest cost component in most productive sectors, labor costs are an important determinant of domestic inflation, and it is often convenient to assess relative competitiveness by using a concept of the *real exchange rate based on unit labor costs* (ULCs) rather than the consumer price index. The ULC is defined as the labor cost that has to be paid on average to produce one unit of output in the country. The ULC-based real exchange rate is defined as

$$R^{ULC} = \frac{E * ULC}{ULC^f},$$
(4.5)

where ULC is the unit labor cost in the domestic country (usually measured for the manufactured sector), ULC^f is unit labor cost in the foreign country, and E is the nominal exchange rate (units of foreign currency per unit of domestic currency). Because most countries have several trading partners, in practice these indices are computed on a trade-weighted basis, with each trading partner assigned a weight based on its importance to the country's trade. Table 4.1 provides some estimates of the evolution of U.S. dollar labor costs during the period 1975–2005 for a number of countries around the world.

Table 4.2 Selected Countries: Hourly Compensation Costs in U.S. dollars, 1975-2005 [*]

	1975	1980	1985	1990	1995	2000	2002	2003	2004	2005
Americas										
United States	6.2	9.6	12.7	14.8	17.2	19.7	21.3	22.2	22.8	23.7
Brazil	na	na	na	na	na	3.5	2.6	2.7	3.2	4.1
Canada	6.1	8.9	11.2	16.3	16.5	16.5	16.7	19.5	21.8	23.8
Mexico	1.5	2.2	1.6	1.6	1.7	2.1	2.5	2.4	2.4	2.6
Asia and Oceania										
Australia	5.6	8.4	8.2	13.1	15.4	14.4	15.4	19.8	23.4	24.9
Hong Kong SAR	0.8	1.5	1.7	3.2	4.8	5.5	5.7	5.5	5.5	5.7
Israel	2.0	3.4	3.7	7.7	9.4	11.4	11.0	11.6	12.0	12.4
Japan	3.0	5.5	6.3	12.6	23.5	21.9	18.6	20.3	21.8	21.8
Korea, Republic of	0.3	1.0	1.2	3.7	7.3	8.2	8.8	9.7	11.1	13.6
New Zealand	3.3	5.4	4.6	8.5	10.4	8.4	9.1	11.7	13.7	15.0
Singapore	0.8	1.5	2.5	3.7	7.6	7.2	6.7	7.2	7.4	7.7
Sri Lanka	0.3	0.2	0.3	0.4	0.5	0.5	0.5	0.5	0.5	na
Taiwan	0.4	1.0	1.5	3.9	6.0	6.2	5.6	5.7	6.0	6.4
Europe										
Austria	4.5	8.9	7.6	17.9	25.3	19.1	20.7	25.5	28.5	29.4
Belgium	5.8	11.7	8.2	17.9	25.7	20.1	21.8	26.6	30.0	30.8
Czech Republic	na	na	na	na	2.6	2.8	3.8	4.7	5.5	6.1
Denmark	6.2	10.8	8.1	18.4	25.3	21.9	24.3	30.2	34.5	35.5
Finland	4.6	8.3	8.2	21.2	24.3	19.4	21.8	27.1	30.7	31.9
France	4.5	8.9	7.5	15.4	19.3	15.5	17.1	21.1	23.9	24.6
Germany	na	na	na	na	30.1	22.7	24.2	29.6	32.5	33.0
Greece	1.7	3.7	3.7	6.8	9.1	na	na	na	na	na
Hungary	na	na	na	na	2.7	2.8	3.9	4.8	5.6	6.1
Ireland	3.1	6.0	6.0	11.8	13.8	12.7	15.3	19.1	21.9	22.8
Italy	4.6	8.1	7.6	17.3	15.7	13.8	14.8	18.1	20.5	21.1
Luxembourg	6.2	11.5	7.5	16.0	23.6	17.5	18.7	23.1	26.6	27.7
Netherlands	6.6	12.1	8.7	18.0	24.0	19.3	22.1	27.5	30.8	31.8
Norway	6.9	11.8	10.5	21.8	24.8	22.6	27.9	32.7	36.4	39.1
Poland	na	na	na	na	na	2.8	3.3	3.5	3.9	4.5
Portugal	1.5	2.0	1.5	3.6	5.1	4.5	5.1	6.2	7.0	7.3
Spain	2.5	5.9	4.6	11.3	12.7	10.7	12.0	15.0	17.1	17.8
Sweden	7.1	12.4	9.6	20.8	21.7	20.2	20.2	25.2	28.4	28.7
Switzerland	6.0	11.0	9.6	20.6	28.9	21.0	23.8	27.8	30.2	30.5
United Kingdom	3.4	7.5	6.2	12.6	13.8	16.8	18.4	21.3	24.8	25.7
Trade-weighted measures										
All foreign economies	3.8	6.5	6.6	11.8	15.0	13.7	13.9	16.2	18.0	18.9
OECD	4.1	7.0	7.1	12.6	15.9	14.6	14.9	17.5	19.4	20.4
Europe	4.9	9.5	7.7	16.8	21.2	17.8	19.5	23.7	26.6	27.3
European Union-15 1/	4.8	9.4	7.6	16.6	21.1	17.9	19.5	23.8	26.8	27.5
Asian NIEs 2/	0.5	1.2	1.6	3.7	6.6	7.1	7.0	7.5	8.2	9.3

Source: U.S. Department of Labor, Bureau of Labor Statistics, November 2006; www.bls.gov.

1/ European Union-15 refers to European Union member countries prior to the expansion of the European Union to 25 countries on May 1, 2004.

2/ The Asian NIEs are Hong Kong SAR, the Republic of Korea, Singapore and Taiwan.

How do changes in the real exchange rate affect the current account balance? Consider a real exchange rate appreciation: as foreign goods become cheaper, domestic consumers and investors reduce their demand of domestic goods and increase their demand of foreign goods, while foreign consumers and investors do the opposite. So, exports decline and imports increase in volume terms, worsening the trade balance and the current account. There is also a value effect, however. Because of the real appreciation, the value of imports measured in terms of domestic goods falls, which tends to improve the trade balance and the current account. If exports and imports respond strongly to relative price changes (have high *price elasticities*), then the volume effect tends to dominate, and *a real exchange rate appreciation leads to a deterioration in the current account*. [63]

Long-run elasticities are typically larger than short-run elasticities because it takes time to switch production and consumption patterns. Thus, following a real exchange rate appreciation the current account may improve initially, as the value effect dominates the volume effect, but then deteriorate later on. Conversely, a depreciation of the real exchange rate, which makes domestic goods cheaper relative to foreign goods, tends to improve the current account, especially in the medium to long run when elasticities are larger. This pattern is called the *J-curve effect*.

Thus, if its real exchange rate is too high, a country may lose external competitiveness and experience a current account deficit and a gradual deterioration in its net international investment position. Conversely, countries where the real exchange rate is too low may be too competitive, record large current account surpluses, and accumulate net foreign assets at a rapid pace. Since in the world as a whole each surplus has to be matched by a deficit, both large current account deficits and surpluses may be disruptive of international monetary and financial stability.

Real exchange rate movements may reflect current and expected changes in countries' *fundamentals affecting competitiveness*—such as technology, institutions, and infrastructure, as well as capital scarcity. They can also occur as a result of *short-term fluctuations in the nominal exchange* rate if these fluctuations are not transmitted to domestic prices in full, or if the transmission is slow. The extent to which changes in nominal exchange rate affect domestic prices is often referred to as the pass-through coefficient. If the pass-through coefficient is large, a nominal exchange rate depreciation (a decline in E) leads to an offsetting increase in the domestic price index, with little or no effect on the real exchange rate. In this case, the exchange rate depreciation is a *purely nominal phenomenon*, with no

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[63] An elasticity is the percentage change in quantity traded resulting from a one percent change in price. For convenience, elasticities are always defined to be positive numbers. In the case at hand, the current account balance improves if the sum of the price elasticity of exports (defined as the percentage increase in the quantity exported when the export price increases by 1 percent) and the price elasticity of imports (defined as the percentage decline in import quantity as a result of a 1 percent increase in the import price) exceeds one. This condition is called the *Marshall-Lerner condition.*

effect on relative prices or relative competitiveness. In large advanced economies pass-through coefficients are generally small, while in open developing countries they tend to be larger.

The real exchange rate can vary substantially also in countries where the nominal exchange rate is fixed or heavily managed, if the difference between domestic inflation varies over time. A common example is that of a country that pegs its currency to that of a low-inflation country in an attempt to bring down its rate of inflation. If domestic inflation converges to foreign inflation only gradually over time, during the transition the real exchange rate may become quite overvalued, undermining the competitiveness of domestic producers and worsening the current account. We will discuss the choice of exchange rate regime and monetary policy further in Section III below.

Sometimes, changes in the real exchange rate reflect changes in the price of goods and services that are traded internationally *(tradable goods)* relative to the price of goods and services that are not traded internationally *(nontradable goods)*.[64] To see why this is the case, decompose the consumer price indexes in the home country and the foreign country into geometric averages of tradable and non-tradable good prices as follows:

$$P = \left(P^N\right)^{\alpha} \left(P^T\right)^{1-\alpha}$$
$$P^f = \left(P^{Nf}\right)^{\alpha^f} \left(P^{Tf}\right)^{1-\alpha^f}$$

(4.6)

where the α's are weights between zero and one. Then, after taking logarithms, the real exchange rate can be expressed as:

$$\ln R = \ln\left(\frac{EP^T}{P^{Tf}}\right) + \alpha \ln\left(\frac{P^N}{P^T}\right) - \alpha^f \ln\left(\frac{P^{Nf}}{P^{Tf}}\right).$$

(4.7)

Thus, the real exchange rate can be decomposed into three components:

- the relative price of tradables (EP^T/P^{Tf});
- the relative price of nontradables in terms of tradables in the home country (P^N/P^T);
- the relative price of nontradables in terms of tradables in the foreign country (P^{Nf}/P^{Tf}).

If international competition equalizes the price of tradable goods across countries, then the first term on the right hand side is equal to zero. If, in addition, the relative price of nontradables in the foreign country does not vary much, then movements in the real exchange rate mainly reflect movements in the domestic relative price of nontradable goods.

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[64] This relative price is sometimes referred to as the *internal terms of trade*. Examples of goods not traded internationally include services such as medical care, automobile repairs, or housing services.

An increase in the relative price of nontradable goods (a real appreciation) causes domestic firms to switch production from the tradable to the nontradable sector, and the domestic tradable sector becomes smaller. Accordingly, prolonged periods of real exchange rate overvaluation can hurt the development of the traded sector.

International comparisons show that nontradable goods and services tend to be relatively cheap compared to tradables in low-income countries and relatively expensive in high-income countries (*the Penn effect*). As countries develop, productivity in the traded sector grows faster than in the nontradable sector, resulting in falling relative prices for tradable goods (*the Balassa-Samuelson effect)*. According to this hypothesis, countries that grow rapidly and are catching up to more advanced countries should have an appreciating real exchange rate. However, appreciating relative prices of nontradable goods and services may also signal excessive domestic demand, as discussed above. In practice, determining whether a real exchange rate appreciation reflects long-term equilibrium trends (such as the Balassa-Samuelson effect) or short-term macroeconomic imbalances is very difficult, and it requires a comprehensive assessment of the state of the economy.

4.6   Analyzing International Financial Flows

In the previous sections, we have discussed the forces that influence the current account of the balance of payments. Now we turn to the financial account. With increased international capital mobility, financial flows have grown in size, have become more complex, and are playing an increasingly important role in determining balance of payments developments.

International financial flows take place through different financial instruments (equities, bonds, bank loans) and among different categories of agents (the government, private financial firms, private nonfinancial corporations, central banks). The factors that explain these flows vary depending on the type of flow. Here we discuss only some of the major forces at play. Further considerations are left to the section on forecasting the financial account.

Foreign direct investment flows (FDI) respond to long-term differences in the productivity of capital across countries. Countries where the return on capital is high, be it because capital is relatively scarce, technology is better, or infrastructure is superior, tend to be recipient of direct foreign investment. Foreign investors often also take into account political risk and the quality of the country governance in deciding where to locate their operations. Because FDI requires considerable planning time, these flows are usually governed by long-term considerations and are less volatile than other flows.
Portfolio flows, such as investments in equity, bonds (corporate or government), and other securities, are influenced by relative rates of return in various countries, transactions costs, expected exchange rate changes, and by risk premia associated with the various financial instruments. Portfolio investment moves to countries where expected rates of return are

higher or the exchange rate is expected to appreciate, if the difference is enough to compensate for transaction costs and the risk premium.

More formally, suppose a U.S. resident is considering investing in two different securities, a U.S. government bond which pays its return in dollars and a Brazilian government bond payable in Brazilian reais. Both bonds are assumed to mature in one year. To decide where to invest, the U.S. investor must compare the interest rate paid by each of the securities. Furthermore, if she invests in the Brazilian bond the U.S. investor will have to convert the reais into U.S. dollars when the bond matures, so she must account for changes in the exchange rate over the life of the investment by forming an estimate of the future exchange rate. Such an investor will be indifferent between the two assets when expected rates of return are equal, or

$$
i^{\$} = i^{R\$} + \frac{E\left[S_{t+1}^{\$/R\$}\right] - S_t^{\$/R\$}}{S_t^{\$/R\$}} , \tag{4.8}
$$

where $i^{\$}$ is the interest rate in U.S. dollars, $i^{R\$}$ is the interest rate in Brazilian reais, S_t is the current value of the exchange rate (expressed in dollars per reais), and $E[S_{t+1}]$ is the expected value of the exchange rate next period. This relationship is known as the *interest rate parity condition*. If equation (4.8) does not hold because, for example, the interest rate on the U.S. bond is less the expected return on the Brazilian bond, then capital will flow from the U.S. to Brazil. This will cause the real to appreciate relative to the U.S. dollar, making it more expensive for the American investor to acquire Brazilian assets. This process stops once expected rates of return across the two markets are equalized.

The reasoning behind the interest parity condition, while it clarifies key elements affecting the portfolio choice of international investors, neglects one important difference between the U.S. and Brazilian investment: from the point of view of the U.S. investor, the U.S. investment is safe, while the Brazilian investment is risky, because there is uncertainty about the future value of the exchange rate.[65] Typically, U.S. investors need to be compensated for taking exchange rate risk through a risk premium. In addition, the asset (in this case the government bond) may also be subject to nonpayment (or default) risk. The risk premium on the Brazilian deposit would have to compensate the U.S. investor for default risk as well.[66] In this case, letting ρ denote the risk premium, the interest parity condition becomes

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[65] If there is a forward market for the Brazilian currency, i.e., a market in which the U.S. investor can sell today the reais that she expects to earn next period, then foreign exchange risk can be avoided by selling the returns forward. For investors using forward markets, the relevant interest parity condition is the so-called *covered* interest parity condition, which is the same as equation (4.8), except that the expectation of the future exchange rate term on the right-hand-side of the equation is replaced by the one-period ahead forward exchange rate. Alternatively, international investors can avoid exchange rate risk by demanding foreign currency-denominated assets.

[66] More precisely, the risk premium would reflect the difference in the default risk on the two investments.

$$i^{\$} = i^{R\$} + \frac{E\left[S_{t+1}^{\$/R\$}\right] - S_{t}^{\$/R\$}}{S_{t}^{\$/R\$}} - \rho \,. \tag{4.9}$$

The risk premium in this case is subtracted from the expected return on the Brazilian bond to restore interest rate parity.

Based on equation (4.9), we would expect periods of low interest rates in advanced countries to be accompanied by large financial flows towards emerging markets, as investors search for riskier but better-paying financial assets.[67] This is indeed a well-documented empirical regularity. Conversely, a generalized tightening of monetary policy resulting in higher interest rates in advanced countries often leads to a reduction in portfolio flows to emerging markets, consistent with the theory behind equation (4.9).

Country-specific factors that may affect the volume of capital inflows include: an improvement in sovereign creditworthiness (lower credit risk); an improvement in productivity (a higher real rate of return); the implementation of a successful macroeconomic stabilization program; and institutional reforms such as improvements in corporate governance, the development of derivative markets, and a relaxation of capital controls (which is likely to influence not only the level but also the composition of capital inflows), and a change in the level of international reserve holdings. Capital outflows may be prompted by the repayment of debt in tranquil periods or by capital flight during crisis episodes.

In the short term, the volume and volatility of international capital flows to a particular country may also be affected by *spillovers* from developments in neighboring countries (for instance, exchange rate pressures or a currency crisis in a trading partner), which may lead to a reassessment of investors' risk perceptions. Losses on investments in other countries may also cause leveraged investors to sell off sound securities to meet margin calls, resulting in a reversal of capital inflows.

4.7   International Capital Flows and External Vulnerability

In the past, periods of rapid increase in international financial integration have been accompanied by a number of currency crises (Box 4.2), and monitoring and addressing external vulnerabilities is an important part of macroeconomic policymaking.

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[67] Positions that take advantage of interest rate differentials by borrowing in the low yielding currency and lending in the high-yielding currency in this fashion are called *carry trades*.

Box 4.2 International Financial Crises in Historical Perspective

An earlier era of international financial integration that had begun in the 1870s ended with the outbreak of World War I in 1914. Efforts to reestablish order in the international monetary and financial system following the end of the war ultimately proved unsuccessful. The 1920s and 1930s were characterized by financial and economic turmoil around the world.

With most countries adopting extensive capital controls, international capital flows remained limited in the years following World War II. In the 1970s, however, high commodity prices and low real interest rates prompted many developing countries governments to borrow heavily from international banks eager to recycle so called "petrodollars" from oil-exporting countries. Much of the loaned money went to finance government expenditures rather than productive investment in export sectors. When the world economy ground to a halt in the early 1980s, commodity prices fell, world real interest rates shot up, and many developing countries became unable to pay, threatening the solvency of the largest banks in the world. The road out of the *debt crisis* of the 1980s was difficult and long: developing countries had to undertake painful current account adjustment that was accompanied by debt rescheduling and eventually debt reduction. This process lasted the best part of the decade and while it was unfolding private financial flows declined spectacularly.

In the 1990s, with the debt crisis finally sorted out, capital flows to emerging market restarted in earnest. This time more foreign capital was directed toward the private sector, and a larger share of the flows took the form of international equity and bonds rather than bank loans. Despite the new pattern of capital flows, a new round of financial crises occurred, beginning with Mexico in December 1994, followed by the Asian crises in mid-1997, and by Russia and Brazil in 1998. The new wave of crises once again raised the issue of the vulnerability of an open and integrated international financial system.

Following Argentina's default on its external debt in 2001, the early 2000s were characterized by relative stability in international financial markets. The "subprime" crisis in the US in 2007–2008 marked the beginning of the first global financial crisis of the 21st century, also called the "Great Recession". The current global financial crisis affected most severely certain highly indebted advanced economies in Europe, but growth in emerging and developing countries also slowed down. Sovereign defaults have so far been avoided through IMF lending and, in the case of Greece, private sector voluntary restructuring initiatives. As a result of these policy responses and a rebound in investor sentiments, international private capital flows have currently resumed but remain volatile.

A *currency crisis* occurs when the domestic currency depreciates sharply. Often, but not always, crises happen in countries with a pegged exchange rate, in which the parity is no longer judged credible by market participants. Expecting a devaluation, foreign exchange traders start selling local currency quickly (a speculative attack), forcing the central bank to sell reserves. Unless confidence is restored before reserves run out, a devaluation follows.

An increase in political risk, concerns about the solvency of the domestic banking system or large corporations, or a government fiscal crisis can cause a currency crisis. External vulnerabilities may also build up when periods marked by economic deregulation, the removal of cross-border restrictions on capital flows, financial innovation, and increased

competition are followed by sharp credit booms, economic overheating, and asset price inflation. Subsequent unfavorable macroeconomic developments, such as economic downturns, declines in incomes, changes in expectations over policy continuity, and a collapse in asset prices may generate a balance of payments crisis and threaten the stability of the financial system. The Nordic banking crisis, the Mexican crisis of 1994, and the Asian crisis of 1997 are examples of how the combination of fixed exchange rate systems and the removal of cross-border restrictions on international capital flows can contribute to currency crises.

Currency crises can occur with a floating exchange rate, if investment in local assets suddenly becomes less attractive to foreign investors, causing foreign portfolio inflows to dry up and resulting in a sharp depreciation of the currency (sudden stop). For example, in 2002 Brazil was faced with a sudden stop when market participants became worried about the continuity of government policy during the upcoming national election. Though the government did not actively intervene in support of the exchange rate, continued capital flight and exchange rate depreciation raised concerns over whether the existing stock of reserves was sufficient to meet principal and interest payments on external debt.

Occasionally, a sudden stop in capital flows may result from disruptions in the supply side of the market, which force global investors, such as multinational banks, to rebalance their portfolios in favor of lower expected risk. After experiencing large losses in one emerging market, reductions in risk tolerance may cause these investors to sell-off other positions in a similar asset class. Through this mechanism of *financial contagion*, problems in one emerging economy can be transmitted to others, even if these economies are not directly related by trade links and other economic conditions.

Sudden stops force countries to undergo a sharp and costly adjustment in the current account. This adjustment is typically accomplished through a compression in the country's imports that causes a large reduction in investment and consumption. A substantial currency depreciation and higher interest rates often accompany sudden stops and help bring about the current account adjustment (see Chapters 11 and 15). The countries affected by the Asian countries of 1997–98, for example, were able to restore growth through strong export demand as a result of the realignment of the real exchange rate and competitive export position.

Predicting the level and direction of capital flows in general, and determining the likelihood and exact timing of a sudden stop is very difficult. Foreign investors base their decision of whether to continue investing in a country on a variety of information, including underlying macroeconomic fundamentals, views and expectations of future economic prospects, expected return differentials across countries, the level of perceived risk, and beliefs on what other investors might do. Some suggested methods to estimate the level and direction of capital flows are discussed in more detail in subsequent sections.

4.8   Indicators of External Vulnerability

In countries that maintain restrictions on private international financial flows or have limited access to world capital markets, current account deficits are financed mainly through changes in gross foreign reserves. Movements in reserves are also the main tool to support a fixed exchange rate regime. In such countries, a traditional indicator of external vulnerability compares the country's stock of international reserves to its monthly import bill. A general rule of thumb is that reserves should be equal to at least three months of imports of goods and services.

In countries with access to world capital markets, on the other hand, current account imbalances can be financed not only through changes in official reserves, but also through foreign borrowing, portfolio inflows, or direct foreign investment. In these countries, current account imbalances reflect not only an excess of imports over exports, but also payments related to interest on foreign debt or repatriation of dividends. In addition, amortization of outstanding loans or bonds or divestments by foreign investors can place pressure on the BOP. For these countries, the ratio of reserves to imports is a poor indicator of external vulnerability, and is hence usually complemented by other indicators.

Table 4.3 provides an example of external vulnerability indicators used by IMF staff in surveillance work. Besides summarizing basic BOP information and reporting the traditional ratio of reserves to imports, the table contains several notable indicators:

- The *ratio of broad money to reserves* indicates the extent to which the demand for converting highly liquid domestic financial assets into foreign currency can be met through reserves. For countries with fixed exchange rates that are vulnerable to currency crises, this ratio may be a useful indicator of the ability of the central bank to withstand a speculative attack.

- The *ratio of short-term debt to reserves* measures the ability of reserves to cover amortization payments on external debt coming due within the next year. It is useful for assessing the likelihood that a country might have to default or reschedule its debt in the near future.[68]

- *The recent behavior of the exchange rate* is also an indicator of confidence in the domestic currency and the health of the country's external position, as are *ratings assigned by international credit rating agencies* to foreign-currency-denominated government debt.

- *The interest rate spread*, or the differential between interest rates paid by the government (or highly rated private domestic borrowers) and a suitable reference rate,

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[68] Short-term debt ideally should include both debt issued with an original maturity of less than one year and debt issued with longer maturity but coming due within the next year.

is also a signal of the perceived creditworthiness of the country. Commonly used reference rates are interest rates on U.S. treasury paper or, for emerging markets, average interest rate paid by countries included in the J. P. Morgan emerging market bond index (EMBI).

If the country issues international bonds that are actively traded in secondary markets, the prices of those bonds are also an indicator of the perceived creditworthiness of that country. An advantage of this indicator is that it is available at high frequency (often on a daily basis), and not just on those dates at which the country actually issues securities. *Movements in secondary market bond prices* (or spreads, computed as the difference between the interest rate implied by the price and a risk-free interest rate) provide a useful yardstick to measure how investors' view of the country's creditworthiness evolves over time, and how it reacts to domestic developments, such as policy changes or macroeconomic shocks. Sudden, sharp increases in spreads typically signal a loss of confidence by foreign investors, and may precede or accompany a currency crisis or a sudden stop.

Credit default swap (CDS) spreads have an advantage over bond prices and spreads since they are a specific indicator of credit risk. Credit default swaps are a means by which one party pays a premium in exchange for the second party compensating the first party in the event of a default on the underlying bond. Increases in CDS spreads indicate the market's perception that credit risk has risen. Credit derivatives are a relatively pure play on credit risk and are therefore considered to reflect more up-to-date credit risk information than bond spreads if the credit derivatives market is relatively liquid.[69]

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[69] CDS spreads can be used to extract estimates of the market expectations about probabilities of default or recovery rates. Studies that have applied these techniques (e.g., Argentina in the run-up to the government's default) suggest that CDS spreads and the embedded default probabilities were more responsive to the deterioration in credit quality than credit ratings.

Table 4.3 Poland: Indicators of External Vulnerability, 2000–05

(In percent of GDP, unless otherwise indicated)

	2000	2001	2002	2003	2004	2005 Projection
Current account balance	-6.0	-2.9	-2.6	-2.2	-1.5	-1.3
Capital and financial account balance	6.2	1.7	3.7	1.7	0.6	1.5
o/w: Inward portfolio investment (debt securities etc.)	2.1	0.6	1.6	1.8	4.5	4.2
Other investment (loans, trade credits etc.)	0.7	0.4	0.2	-0.3	-1.2	-0.9
Inward foreign direct investment	5.6	3.1	2.2	2.0	2.5	2.4
Net foreign assets (NFA) of commercial banks (in billions of US$)	31.8	33.3	33.8	35.8	46.3	...
Official reserves (in billions US$)	27.5	26.6	29.8	34.2	36.8	40.8
Official reserves in months of imports of goods	6.8	6.5	6.6	6.1	5.1	4.4
Broad money to reserves (Ratio)	2.5	3.0	2.6	2.6	2.7	...
Ratio of short-term external debt to reserves (in percent)[1]	34.8	41.9	46.6	59.7	63.2	62.4
Total external debt (in billions of US$)	69.5	72.0	84.9	105.9	126.7	134.2
Ratio of short-term external debt to total external debt (in percent)	13.7	15.5	16.4	19.3	18.4	...
Exchange rate (per US$, period average)	4.3	4.1	4.1	3.9	3.7	3.3
Financial Market Indicators Foreign currency debt rating						
Standard and Poor's[2]	BBB+	BBB+	BBB+	BBB+	BBB+	BBB+
Moody's[3]	Baa1	Baa1	A2	A2	A2	A2
JP Morgan's EMBI index (spread in basis points)	241	195	185	76	69	57

Source: Republic of Poland: 2005 Article IV consultation – Staff Report, IMF Country Report No. 5/263.

[1] By original maturity.

[2] In Standard & Poor's rating system BBB+ is investment grade.

[3] In Moody's rating system Baa is investment grade whereas Ba is below.

Countries having trouble financing payments imbalances through external borrowing or through sales of reserves or other foreign assets may have to resort to so-called exceptional financing operations (Box 4.3). Through these operations, a borrower and its creditors acknowledge that the debt cannot be repaid as promised and agree to alter the terms of the original contracts, reducing the interest or principal due or extending the maturity of the debt.

Box 4.3 Exceptional Financing

Exceptional financing arrangements include the following:

- The *rescheduling of existing debt*, which involves replacing an existing contract with one that postpones debt service payments. The main BOP items affected by rescheduling are interest payments (shown in the current account) and amortization payments (shown in the financial account). Debt restructuring may cover arrears on interest or principal as well as scheduled interest and principal payments.

- *Arrears on debt servicing*, which can be either interest or amortization payments that are past due. Interest arrears are treated as if they have been paid for with a short-term loan; that is, as a scheduled interest payment is recorded as an income debit in the current account, it is offset by a credit in the financial account under short-term liabilities.

- *Debt forgiveness* or the voluntary cancellation by an official creditor of all or part of a debt specified by a contractual arrangement. It is recorded as an official transfer under the capital account.

- *Debt-bond swaps* involve the exchange, usually at a discount, of an existing debt instrument (such as a loan) for another form of debt instrument (such as a bond). *Debt-equity swaps* involve the exchange, usually at a discount, of bank claims (or other debt instruments) for nonresident equity investment in the country. Swaps of obligations falling due in the reporting period or in arrears are recorded below the line as credit entries under exceptional financing; corresponding debit entries under the appropriate debt instrument are made above the line.

4.9 Forecasting the Balance of Payments

General considerations

In this section and the next, we outline some basic procedures that utilize measures of domestic and global activity to produce forecasts of BOP items. For countries integrated in world capital markets, forecasting financial flows is especially important, as these flows may be substantially larger and more volatile than trade flows. Yet, as stressed in the preceding section, these flows can be particularly difficult to predict.

Because the balance of payments is an accounting identity, forecasts of the current account balance must be consistent with predictions about the balance of the capital and financial account. One approach, particularly useful in countries where there are large international private financial transactions, is to produce two independent set of forecasts for the two accounts and then reconcile them afterwards. For instance, if the capital and financial account surplus is large relative to the current account deficit, then it may be an indication that the initial forecast for imports (and, with it, the forecast for domestic expenditure and

output) needs to be revised upwards, as the expansionary effect of foreign capital inflows was not adequately taken into account. Conversely, if the surplus in the capital and financial account is small relative to the current account deficit, imports, expenditure, and output might need to be revised downwards.

For countries with limited access to world financial markets, an alternative approach may be to project the current account first, and then evaluate whether the current account imbalance (if any) can plausibly be financed.

In principle, BOP forecasts will be more accurate the more detailed information is available about developments in individual sectors. For example, the factors that determine oil imports may be significantly different from those influencing imports of other goods and services; this may require disaggregating the forecast of oil imports from that of non-oil commodities. Likewise, exports of primary products may reflect weather at home and demand abroad, whereas exports of manufactured goods may be uncorrelated with rainfall but may reflect demand at home. In this case, it will be useful to disaggregate the forecast of primary commodity exports from that of other exports. But while disaggregation can increase accuracy, it also requires more time, data, and research. Thus, one should balance the benefits and costs of disaggregation in deciding whether to use broader or narrower concepts as forecasting variables.

For most BOP current account entries that record economic transactions in currently produced goods, services, and income, any change in *value* from one period to the next is the result of a change in *volume* and a change in *price*. Economic theory does not provide inferences about values directly, but about volumes and prices separately. Thus, to forecast exports (and imports) for a coming year, we need a forecast of the change in volume and a forecast of the change in price. The following identity is worth keeping in mind:

$$Value_{t+1} = Value_t \times \left(1 + \frac{Proportional\ change}{in\ volume}\right) \times \left(1 + \frac{Proportional\ change}{in\ price}\right). \qquad (4.10)$$

In the following sections, we will concentrate on forecasting volume changes. To obtain a forecast in nominal terms (in U.S. dollars), the volume forecast will have to be combined with a forecast of the relevant (U.S. dollar) price.

Forecasting global economic conditions

The economic transactions recorded in the BOP reflect the interplay of forces in the domestic and global economy. Accordingly, before forecasting BOP variables it is useful to form a view about *economic developments in the rest of the world* and, especially in the country's main trading partners and sources of financial flow. Future developments in world output growth, inflation, commodity prices, and international interest rates are also a useful input to balance of payments projections.

A number of international organizations, including the IMF and the OECD, regularly forecast macroeconomic conditions in the world economy as they monitor developments in their member countries. Indicators of output and prices in individual economies are averaged, using the export or import shares of the home economy as weights, to produce measures of expected global developments that reflect the prospects of the country in question (Box 4.4).

Box 4.4 Global Assumptions (GAS) and Global Economic Environment (GEE) Data from the IMF's World Economic Outlook (WEO)

IMF economists rely on the WEO's GAS and GEE tables for their country projections. The GAS table contains assumptions for exchange rates (industrial country currencies), international interest rates (LIBORs), the oil price (Average Petroleum Spot Price, APSP), projections for nonfuel commodity prices, and the export unit value for manufactures of the industrial countries. IMF economists' projections are expected to be consistent with these assumptions and projections.

GEE data are country-specific key economic indicators. For each country, weighted averages of data in trading partners countries—output, demand, imports, prices, and costs—are calculated by combining data for each of its trading partners with corresponding fixed-year weights that are proportional to the country's geographical distribution of exports (or origin of imports, as the case may be). The weight assigned to each trading partner reflects the average merchandise trade in the latest three years as reported by the IMF's Direction of Trade Statistics (DOTS).

Given a reasonably stable geographic pattern of a country's foreign trade, composites of foreign demand and inflation calculated in this fashion tend to be more meaningful for purposes of analyzing effects on the country from economic developments outside its borders than composites based on GDP or worldwide trade weights. For example: Canada, whose foreign trade is highly concentrated on the United States, will tend to be relatively less affected by a major recession in Germany than a country such as Austria, whose export share to Germany is substantial. Foreign output and demand measured by GDP or imports may be particularly useful information for projecting the exports of any given country. Similarly, the composites of partner country export prices may serve to guide the projections of a country's import prices.

Data on non-fuel commodity prices, maintained by the IMF Research Department's Commodities Unit, are used in the GEE tables to provide, for each country, an average of non-fuel commodity prices, weighted by its export as well as import composition of average non-fuel commodity trade. The GEE tables also include a set of "component-based" trade deflators. These pre-calculated average foreign trade prices are based on countries' recent composition of trade in manufactures, oil, and non-fuel commodities using world price indicators (also shown in the GEE tables). The indicators, which at most can be counted upon to approximate recorded trade prices or unit values, may nevertheless be of value for countries lacking reliable statistics on trade unit values, or for economists in their formulation of projections.

Forecasting the current account

In this section, we provide some practical steps in making projection of the various detailed items of the current account. Once forecasts for individual components are produced, they can be combined to obtain forecasts for the trade balance and the current account balance. An important consistency check is then to evaluate whether *the forecasts with these balances are consistent with the overall macroeconomic situation*, and, particularly, with forecasts of

aggregate domestic demand and nominal and real exchange rate changes. For instance, a large domestic demand expansion that is not accompanied by a real exchange rate depreciation should lead to a deterioration in the trade balance and the current account. Conversely, a real exchange rate appreciation that is not accompanied by a contraction in domestic demand should lead to a worsening of the current account. A temporary shock, such as a temporary worsening of the terms of trade, may cause a temporary deterioration of the current account, as the effects of the shock on domestic consumption and investment are smoothed out through the decumulation of foreign assets.

To forecast *merchandise exports and imports*, we will describe two approaches: the regression approach, which involves econometric estimation of export or import functions; and the elasticity approach.

Consider the regression approach as applied to forecasting exports first. Taking prices in export markets as given, we can base our forecast of the volume of exports, denoted X, on an export supply relation such as:

$$X = f \text{ (Export Capacity, External Competitiveness, Excess Demand, etc.).} \quad (4.11)$$

Equation (4.11) lists the factors affecting the volume of merchandise exports, which is usually measured as an index number. Exports depend on the country's capacity to produce goods and services for sale abroad, on its external competitiveness, and on its domestic demand conditions. To implement this relation empirically, we need proxies for the concepts listed on the right-hand side of equation (4.11). Real GDP is a possible proxy for export capacity, although more disaggregated information might be needed from economic officials regarding the state of different industries important for the country's exports, whether there has been sufficient investment to maintain and expand capacity in mines, oil, the tourism sector, and so forth.

If a reasonable, stable export supply function can be estimated, we can use it to forecast exports based on our forecasts of GDP, potential output, the exchange rate, and domestic prices that were made earlier (see Chapters 2 and 3), and a forecast of foreign prices obtained externally.

It is also common to estimate an export demand equation of the following general form:

$$X = f\left(Y^f, RER, \ldots\right), \quad (4.12)$$

where Y^f denotes income in trading partner countries and *RER* denotes the real exchange rate, as a proxy for price competitiveness. One can think of exports as positively related to foreign demand and competitiveness. In addition, exports are normally negatively affected by macroeconomic volatility and uncertainty. Changes in the trade policy regime, including tariffs and quotas, can also have a major influence on trade flows. And in many economies, it is also important to consider nonprice aspects of competitiveness such as quality, timely

delivery, and packaging, particularly when exporters are attempting to break into new markets.

To employ the relation proposed above for forecasting purposes, it will be necessary to describe explicitly its functional form and then estimate econometrically its parameters.[70] For many countries long time series of reliable data are not available. Hence, it is often necessary to rely on less sophisticated forecasting techniques.

The second method for forecasting exports (the elasticity approach) makes use of elasticity estimates obtained from existing studies. Consider the export demand function shown in equation (4.12). Let ε_P^X denote the relative price elasticity of the country's exports and ε_{Yf}^X denote the trading partners' income elasticity of demand for the country's exports. By definition:

$$\varepsilon_P^X = \frac{\Delta X / X}{\Delta RER / RER},$$ (4.13)

and

$$\varepsilon_{Yf}^X = \frac{\Delta X / X}{\Delta Y^f / Y^f}.$$ (4.14)

That is, ε_P^X is the percentage change in export demand in response to a one percent change in relative prices (proxied here by the real exchange rate), and ε_{Yf}^X is the percentage change in export demand in response to a one percent change in the trading partners' real income.[71] Empirical studies on income and price elasticities of exports are quite numerous in the literature and may be useful as benchmark in assessing the reliability of specific estimates for the country and period under consideration. Most studies find the price and income elasticities very low in the short run and higher in the long run. (Box 4.5 and 4.6)

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[70] See Senhadji and Montenegro (1999) for a derivation of a tractable export demand equation that can be estimated. For examples of econometric estimations of export demand and supply functions, see Cerra and Saxena (2002), Giorgianni and Milesi-Ferretti (1997), and Cheng (2004).
[71] The most relevant notion of income would be disposable income (or GNDI) of the trading partners. If this is not available, it can be proxied by GDP or by GDP net of exports, as suggested by Senhadji and Montenegro (1999). As for relative prices, ideally we should use the ratio of the export price of the home country to the domestic price of each trading partner, as well as the export price of the home country relative to the export price of each potential competitor. In practice, however, it is common to use the ratio of the home country's export unit price vis-à-vis a readily available index of the world export unit price, or simply the real effective exchange rate, as noted in the text.

Box 4.5 Estimates of Price and Income Elasticities of Export Demand

Senhadji and Montenegro (1999) estimate price and income elasticities of export demand for 53 industrial and developing countries. They find that exports do significantly react to both movements in the activity variable and the relative price, though slowly:

- The average price elasticity is close to zero in the short run but reaches about one in the long run. (It takes six years for the average price elasticity to achieve 90 percent of its long-run level.)

- A similar pattern holds for income elasticities in that exports react relatively slowly to changes in trading partners' income. The short-run income elasticities are on average less than 0.5, while the long-run income elasticities are on average close to 1.5.

In general, developing countries seem to have lower price elasticities than industrial countries, although Asian countries have significantly higher price elasticities than both industrial and developing countries. Among the developing countries, Asian countries have the highest income elasticities, while African countries face the lowest income elasticities of export demand.

Box 4.6 Estimates of Price and Income Elasticities of Import Demand

Senhadji (1998) estimates price and income elasticities of export demand for 77 industrial and developing countries. He finds that, like exports, imports react relatively slowly to movements in relative prices and in the activity variable:

- The average price elasticity is close to zero in the short run but reaches about one in the long run.

- A similar pattern holds for income elasticities. The short-run income elasticities are on average around 0.5, while the longer-run income elasticities are on average close to 1.5.

In general, industrial countries tend to have significantly higher income elasticities and lower price elasticities than developing countries.

Once we obtain estimated price and income elasticities, we can use them to forecast export volume growth using the following relation:

$$\frac{\Delta X}{X} = \varepsilon_P^X \left(\frac{\Delta RER}{RER} \right) + \varepsilon_{Yf}^X \left(\frac{\Delta Y^f}{Y^f} \right), \tag{4.15}$$

where

$$1 + \frac{\Delta RER}{RER} = \frac{\left(1 + \frac{\Delta P}{P} \right)}{\left(1 + \frac{\Delta e}{e} \right) \left(1 + \frac{\Delta P^f}{P^f} \right)}. \tag{4.16}$$

As in the case of exports, imports can be forecast using a regression approach or an elasticity approach.

Under the regression approach, a demand equation for imports can be specified as:

$$M = f\left(Y, RER, ...\right),\tag{4.17}$$

where M denotes the volume of merchandise imports (usually measured as an index number), Y denotes domestic income (proxied by GNDI, GDP, or some other measure of domestic activity), and RER denotes the real exchange rate.[72] In addition, imports may be negatively related to domestic tariffs and volatility or uncertainty in the domestic economy.

Using the import demand function shown in equation (4.17), and denoting with ε_P^M the relative price elasticity of the country's imports, then by definition:

$$\varepsilon_P^M = \frac{\Delta M / M}{\Delta RER / RER},\tag{4.18}$$

and

$$\varepsilon_Y^M = \frac{\Delta M / M}{\Delta Y / Y}.\tag{4.19}$$

That is, ε_P^M is the percentage change in import demand in response to a one percent change in relative prices (proxied here by the real exchange rate), and ε_Y^M is the percentage change in import demand in response to a one percent change in real income.[73]
Once we obtain estimated price and income elasticities (see Box 4.6), we can use them to forecast import volume growth using the following relation:

$$\frac{\Delta M}{M} = \varepsilon_P^M\left(\frac{\Delta RER}{RER}\right) + \varepsilon_Y^M\left(\frac{\Delta Y}{Y}\right).\tag{4.20}$$

These methodologies produce forecasts for merchandise exports and imports, which are often the largest components of the trade balance. The next step is to obtain forecasts of *service transactions*. The major items in these category often include transportation and travel

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[72] See Senhadji (1998) for an example of how to derive and estimate a structural import demand function. For examples of econometric estimations of import demand functions, see Giorgianni and Milesi-Ferretti (1997) and Cheng (2004).

[73] Again, the most relevant notion of income would be disposable income (or GNDI). If this is not available, it can be proxied by GDP or by GDP net of exports, as suggested by Senhadji (1998). As for relative prices, we can use the ratio of the import deflator (adjusted by the exchange rate) to the GDP deflator, or simply the real effective exchange rate, as noted in the text.

(credits reflecting tourist receipts and debits reflecting spending abroad by residents), insurance, financial, and consultancy services. If specific information about trends in these sectors is not available, a possible strategy is to assume they are a constant proportion of the value of merchandise exports and imports, the reason being that freight payments and receipts will tend to vary with the amount of merchandise trade.

Travel services, as recorded in the BOP, are conventionally defined to include food and lodging and other tourist expenditures incurred after the traveler arrives in a foreign country. Thus, not surprisingly, methods for forecasting travel credits and debits resemble those used for forecasting merchandise exports and imports.[74]

The current account also includes *labor income and financial income flows*. For countries with a large external debt, interest payments due on external debt often constitute the largest debit item in this category. Interest payments (ID) can be forecast by taking the implicit interest rate from the latest year available (i_t) and applying it to the average debt stock for the forecast year, that is, the debt stock at the end of the previous year (D_{t-1}) plus half of the debt-creating flows in the forecast year (B_t, based on projections in the financial account):[75]

$$ID_t = -i_t \left[D_{t-1} + \left(B_t / 2 \right) \right].$$ (4.21)

The important credit items in this category are interest earned on foreign exchange reserves and, for creditor countries, interest and dividends earned on foreign assets. To forecast interest earned on foreign reserves, it is necessary to know the stock of foreign reserves in the economy and the rate of interest. In most cases, the applicable interest rate is easy to find out, or you can use an international interest rate such as the London Interbank Offer Rate (LIBOR). Estimating the future level of the foreign reserves, however, is more complicated. The average stock of foreign reserves is calculated from the stock at the beginning of the forecast period (which is the same as the stock at the end of the preceding year) and at the end of the forecast period (which we do not know). The stock at the end of the forecast period is the stock at the beginning of that period plus half the projected change in reserves. Thus, if interest earned on foreign reserves is the main component, income credits (IC) can be approximated by:

$$IC_t = v_r \left[RES_{t-1} + \left(\Delta RES_t / 2 \right) \right],$$ (4.22)

where v denotes the interest rate and RES denotes the stock of foreign reserves. Remember that a negative ΔRES denotes an increase in net assets while a positive ΔRES denotes a reduction in net assets. The problem is that we do not yet know the projected change in reserves (which is related to the overall balance). Therefore, it is best to leave this item aside for the moment and proceed to forecast the remaining items in the BOP. Once that is done,

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[74] For an econometric application, see Lewis and others (2005)

[75] If D denotes (end period) debt stock and B denotes financing (borrowing), then $B_t = D_t - D_{t-1}$. The average debt stock in the forecast period t is $\left(D_{t-1} + D_t \right)/2$, which is equal to $D_{t-1} + \left(B_t / 2 \right)$.

you can return to calculate a consistent solution for income credits and the change in reserves.

Recall from equation (4.3) that, by definition:

$$CAB_t + FI_t = \Delta RES_t \tag{4.23}$$

At the same time, we have

$$CAB_t = BGS_t + (IC_t + ID_t) + TRf_t, \tag{4.24}$$

where *BGS* denotes the balance on goods and services and *TRf* denotes net current transfers.[76] Knowing *RES*, and having forecasted *FI*, *BGS*, *TRf*, *ID*, and *v* separately, we can substitute equation (4.22) and equation (4.24) into equation (4.23) to get *IC* and ΔRES.

The last component of the current account is *current transfers*. Private current transfers are usually dominated by workers' remittances, which depend on the number of workers living abroad permanently and incentives for transferring funds, particularly expectations concerning interest rates, the exchange rate, and the taxation of such income.[77] Government current transfers are largely dependent on decisions made by donor countries and therefore may be less predictable.

If the value of current transfers does not vary much from year to year, the forecast can be based on the assumption that future flows will tend to equal an average of the recorded values of recent years. ("Typical" years should be used in computing the average, not drought years marked by large receipts of temporary humanitarian aid, for example.) If transfers are growing or declining, a trend may be substituted for the assumption of no change. Alternatively, net current transfers may be assumed to be correlated with income in industrial countries (for example, if most of the country's workers abroad live in Europe, then we might be able to link this variable to European GDP growth).

Forecasting the capital and financial account

With the growing importance of cross-border financial flows, forecasting the capital and financial account has become more important in recent decades. Yet this task is made difficult by the substantial volatility exhibited by certain short-term portfolio flows and bank loans. Although the effects of such global and country-specific factors are difficult to quantify, an awareness of which factors have changed can help create an informed judgment. Based on the interest rate parity conditions described above, changes in global and country-

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[76] Remember that income debits are recorded with a negative sign, so we sum income credits and debits to get net income.

[77] For BOP recording purposes, remittances from workers living abroad for more than 12 months (classified under "current transfers") are distinguished from labor income earned by workers living abroad temporarily for less than 12 months (classified under "compensation of employees").

specific factors affect both the expected rate of return on assets and the level of risk in financial markets. The combination of these changes with the desires of international investors to set their portfolios based on risk-adjusted returns will determine whether net inflows or outflows of capital take place.

Direct foreign investment is typically less variable than the other financial flows recorded in the capital and financial account. If the share of (net, inward, or outward) direct investment to GDP has historically remained stable, then an average of this ratio over recent, normal periods provides a simple method of forecasting such flows. If we have knowledge of policy changes, we can use these to adjust our forecast. Relevant factors to consider include:
(i) prospects for macroeconomic stability, exchange rate stability, and growth; (ii) anticipated changes in corporate taxation (tax incentives), trade and customs regimes (trade policies and regional agreements); (iii) anticipated developments in financial infrastructure and financing availability; (iv) prospects for corporate governance, political stability, a stable regulatory framework, and favorable legal framework (contract enforcement, dispute settlement, property rights); and (v) anticipated changes in privatization policies.

Portfolio investment includes both debt and equity securities. It may also be helpful to analyze trends in stocks and flows by sector. In particular, the general government sector and the non-government sector (which can be split between banks and enterprises) can be forecast separately since they have separate determinants.

Government flows are typically determined by budgetary needs. Information about plans for financing the budget deficit may be available from the budget or the government debt management arm. The net financial flows of the government as recorded in the BOP should be identical to the external financing found in the budget (adjusting for the exchange rate, since the budget is presented in local currency terms).

While, as indicated earlier, portfolio flows and loans from non-resident banks to resident corporations or banks are difficult to forecast, they are influenced by cyclical and structural factors in relation to interest rate parity under imperfect asset substitutability.[78] Cyclical factors include changes in global liquidity as well as the cyclical position of the country in question.

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[78] See Gordon and Gupta (2003, 2004) for an econometric application.

- A *low interest environment* and monetary easing may propel investors in advanced countries to search for higher yields in other markets. For example, during 2000–06, when major industrial country central banks were pursuing policies to lower interest rates and increase liquidity, many investors increased their portfolio allocations to emerging market debt and equities to earn the higher yields available on these securities. Conversely, monetary tightening in mature markets may be expected to lead to a withdrawal of liquidity in the emerging market asset class and a corresponding increase in yields.

- While changes in global liquidity may affect all emerging markets in a similar manner, the policy stance and cyclical position of individual countries contribute to the ability of public and private sector entities to access external markets. For example, if a country enacts a broad set of domestic macroeconomic policies that are viewed as credible and are expected to improve economic fundamentals, this could result in an increase in expected returns, which will cause an increase in foreign capital inflows and a reduction in risk premia on the country's assets.

- Many emerging market countries have undertaken *structural reforms* to improve the development of their domestic capital markets. These reforms include a broadening of available instruments, improvements in laws to permit asset securitization, reforms in bankruptcy proceedings, and the creation of derivative markets. Successful domestic capital market development may be associated with higher capital inflows that reflect higher foreign investor participation and a broadening of the investor base.

Computing rollover rates is one useful approach to understand recent trends in portfolio investment and generate a forecast for future portfolio flows. The *rollover rate* is a comparison between the amount of debt amortizations due and new debt issued during a given time period; it is normally computed as the ratio of disbursements to amortizations, expressed in percent. If debt disbursements are greater than or equal to amortizations, this would indicate that the market is comfortable financing the existing level of the country's BOP needs. If amortizations consistently exceed debt disbursements, this could indicate that available market financing is insufficient to meet financing needs, although it could also indicate that the country has a reduced need for external finance.

For example, consider the following hypothetical data on bond issuance by Country X from 2000 to 2003:

	2000	2001	2002	2003
Bonds (net)	-261	3,137	6,110	-76
Disbursements	2,706	5,015	7,507	1,631
Repayments	-2,967	-1,878	-1,397	-1,707
Rollover Rate	*91%*	*267%*	*537%*	*96%*

The rollover rate was in excess of 100 percent on average during the four-year period in question, indicating that market access was sufficient to cover existing financing needs. Now, consider the following hypothetical series on loans to Country Y during 2000:

	2000:Q1	2000:Q2	2000:Q3	2000:Q4
Loans (net)	135	-701	-453	-768
Disbursements	507	193	208	226
Repayments	372	894	661	994
Rollover Rate	*136%*	*22%*	*32%*	*23%*

The rollover rate on loans dropped significantly during 2000: Q2 and remained low for three consecutive quarters. This trend could signal a loss of market confidence and building capital account vulnerabilities. Therefore, understanding of rollover rates across instruments and sectors could be useful in making projections about levels of external market access. Starting with knowledge of the level of amortizations and creating projections of the rollover rate is often conceptually easier than attempting to estimate the level of available market financing.

Trade credits are often less sensitive to fluctuations in market access. This is because trade credits typically have short maturity structure and are relatively secure because of the backing provided by trade. The behavior of trade credits, therefore, is often similar to developments in the trade balance. A useful approach to forecasting trade credits is to apply the same assumptions on trade growth to growth in trade credits. A similar method would be to apply a ratio of trade credits to trade and forecast this ratio into the future.

Interbank credit lines are mainly short-term revolving lines of credit. The interbank market is important for banks because it helps them better manage their liquidity needs. The interbank market often contains unsecured exposures of significant size between banks, although, in some cases, it also involves securitized transactions of lower risk. Like trade credits, interbank credit lines have historically been less sensitive to fluctuations in market access. In recent years, however, this sensitivity has increased, as banks and cross-border supervisors attempt to limit risk exposure during financial crises. Contagion during financial crises can often spread through the interbank market, as problems in the domestic banking sector spill over onto the balance sheets of foreign banks. The interbank market access of many banks may consequently be restricted or eliminated during periods of building vulnerabilities. Developments in the interbank market may also contribute to the build up of riskier positions. For example, when the differential between domestic and foreign interest rates is large, and moral hazard in the domestic financial sector is known to be pervasive (for instance, if bank regulators fail to enforce hedging rules or intermediation is carried out by non-regulated financial institutions), then over borrowing in foreign currency may result. Such positions entail duration risk (long-term investment financed with short-term liabilities) and exchange rate risk (borrowing in foreign currency).

V. Chapter Five: The Public Sector

5.1 Fiscal Sector

Fiscal developments and policies play a central role in determining overall economic developments. Fiscal policy directly affects an economy's use of aggregate resources and level of aggregate demand. Together with monetary and exchange rate policies, it also influences the balance of payments, the debt levels, and the rates of inflation and economic growth. Policies that deal with taxation, public spending, and borrowing affect the behavior of producers and consumers and influence the distribution of income and wealth in the economy. Frequently, large macroeconomic imbalances, both internal and external, can be traced to a fiscal imbalance that policy has failed to correct.

In order to assess the overall fiscal performance of an economy in the context of stabilization and structural reform, it is essential to have a firm grasp of the basic principles of fiscal accounting and analysis. The IMF's Manual on Government Finance Statistics (GFS) provides an internationally accepted framework for presenting data on a government's fiscal operations. This framework is designed to facilitate the analysis of government transactions with respect to revenue, expense, capital accumulation, and financing.

Coverage of the public sector

The building blocks of the public sector comprise central government, subnational governments, social security funds, and public corporations.

- Central government refers to the activities of a country's central authority. Transactions at this level should not only reflect the legal budget of the central government but also fiscal actions of any extra budgetary funds or autonomous agencies relevant to central government policies or under the central authorities' effective control.

- Subnational governments comprise the budgetary and extra budgetary activities of decentralized governments operating only in parts of the country, such as regional, state, and local governments.

- Social security funds form either their own subsector or part of the level of government at which they operate.[79]

- Consolidating central and subnational governments forms the general government.

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[79] In IMF publications, social security funds are normally classified with the level of government at which they operate. If a social security scheme includes a pension scheme and it is autonomous, it would be treated as part of the financial public sector.

- Public corporations comprise financial public corporations (FPCs, including the central bank) and nonfinancial public corporations (NFPCs). Consolidating NFPCs with the general government produces the nonfinancial public sector, and adding FPCs produces the consolidated public sector.

Fiscal policy can be carried out by different levels of government and through a range of institutions. Normally, fiscal policy is implemented by entities wholly devoted to the economic functions of government, such as central, state and local governments. But public corporations (both financial and nonfinancial) can also carry out fiscal policy (i.e., have an impact on public finances), typically without being explicitly budgeted. For example, central banks may extend subsidized loans and nonfinancial corporations may not operate at market prices or may provide social services. Such activities (known as quasi-fiscal operations) can have a fiscal impact comparable to that of more traditional government activities, though they are often difficult to measure (Box 5.1).[80] As a rule, fiscal policy should be assessed for policy purposes based on general government plus public corporations, whether financial or nonfinancial, that pose a significant fiscal risk (potential cost to the public finances), based on data that are reasonably reliable and quickly available. If some levels of government (for example, local governments) are constrained to run balanced budgets, it may be possible to abstract from them for some analytic purposes.

Measuring and recording government operations

We can measure and record government operations either on a cash basis or on an accrual basis. Under the cash basis, receipts and payments are documented as of the time of monetary settlement, that is, when cash is received or disbursed. Under the accrual basis, transactions are recorded at the time economic value is created, transformed, exchanged, transferred, or extinguished. For example, when goods or a fixed asset are acquired, the transaction is recorded when economic ownership changes hands, not when the actual payment is made.

Thus, a difference will arise between the cash and accrual measures when the timing of the economic event and actual payments differ. This is particularly important when there are payments arrears. Arrears reflect a government's inability to meet its expenditure commitments—often interest payments—on time. Thus, the accrual deficit will reflect the government's full interest obligations while the cash deficit will reflect actual interest payments. A government with a cash deficit that is smaller than the accrual deficit is typically behind on its interest payments and other payment obligations.

The IMF's *GFS Manual 2001* (*GFSM 2001*) is an integrated statistical system of stocks and flows that reconciles the opening and closing balance sheet positions in terms of intertwining transactions and other economic flows. It is tailored to provide the necessary information needed for a detailed economic analysis and for a transparent presentation of government

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[80] See Mackenzie and Stella (1996).

financial performance, e.g., detailed data on government assets and liabilities, and economic flows that affect the government's balance sheet. Although the system is accrual based and reconciled with other international data systems such as the national accounts (*2008 SNA*), it also presents the Statement of Sources and Uses of Cash and meets the requirements of its predecessor from 1986 (*GFSM 1986*). The *GFSM 2001* classification framework is used for both accrual and cash data. At the end of 2012, a large majority of the IMF's Staff Reports presents their fiscal data in accordance with *GFSM 2001* classification framework. [81] In the remainder of this chapter the focus will be on *GFSM 2001* system and the case studies analyzed during the workshops will use the 2001 GFS framework.

Box 5.1 Quasi-Fiscal Operations

In some countries, central banks and other public financial and nonfinancial institutions are involved in activities that give rise to financial transactions affecting the effective size of the fiscal deficit. Some of the main types of quasi-fiscal operations are:

- exchange rate subsidies administered through the exchange system;
- subsidized lending to government, public corporations, or private entities;
- unfunded or contingent liabilities such as exchange rate guarantees;
- support for the exchange rate through central bank interventions in the presence of strong market expectations of a devaluation; and
- borrowing by the central bank at high interest rates from the public in an effort to sterilize excessive foreign exchange receipts and prevent rapid money growth.
- borrowing by nonfinancial public corporations with government guarantees to fund operations that are noncommercial.

Where these quasi-fiscal operations are significant, their costs need to be included in any comprehensive measure of the public sector deficit, for several reasons. In many countries, central bank and other public sector bank losses are so large that they contribute to financial instability. Their existence also means that the conventional measures of government's fiscal balance are misleading indicators of the role of fiscal operations in the economy. The taxes and subsidies associated with quasi-fiscal operations may have distortionary effects on resource allocation.

Although it is clear that the central bank and the public financial corporations are parts of the public sector, it might be necessary when drawing up a fear picture of the general or central government finances to identify their quasi-fiscal operations although they are not always easy to quantify precisely. To the extent possible, quasi-fiscal activities should be transformed into normal budgetary operations, that is, quasi-fiscal taxes and subsidies should be replaced with explicit taxes and subsidies. The long-term objective should be to address the root causes of quasi-fiscal operations, such as lending activities that are essentially substitutes for explicit subsidies that otherwise would be in the budget and the lack of a unified exchange system. The legal authority of the central bank may need to be revised to limit the extent to which it can carry out quasi-fiscal operations. Such structural reforms are essential to minimize and eventually eliminate the need for quasi-fiscal operations.

Principal components of government operations (*GFSM 2001* framework)

Government transactions are classified into broad categories under "revenue" and

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[81] For more information on *GFSM 2001*, see www.imf.org/external/pubs/ft/gfs/manual/index.htm.

"expenditure," which is further broken up into "expense" and "net investment in nonfinancial assets". Table 5.1 provides a general description of the Statement of Government Operations in accordance with *GFSM 2001*.

As a general principle, revenue and expenditure are shown on a gross basis, so that the statistics reflect the full magnitude and impact of the government's revenue-raising operations and the disposition of revenue. Thus, school fees are not counted as an offsetting item to the cost of providing education, nor are the costs of collecting taxes deducted from tax revenue as "negative revenue." The main exception to this rule are transactions in financial assets and liabilities such as lending for policy purposes and borrowing; in this case, the rapid financial flows from and to the government make the net lending or the net borrowing the only meaningful item. Similarly, the net investment in nonfinancial assets shows the gross acquisition less the disposal of nonfinancial assets.

Table 5.1 Statement of Government Operations

Debit: *Credit:*

Expenditure	Revenue
Expense	**Taxes**
Compensation of employees	Taxes on income, profits and capital gains
Use of goods and services	Taxes on payroll and workforce
[Consumption of fixed capital (+)]	Taxes on property
Interest	Taxes on goods and services
Subsidies	Taxes on international trade and transactions
Grants	Other taxes
Social benefits	Social contributions
Other expense	Grants
Net investment in nonfinancial assets **	Other revenue
Acquisition of nonfinancial assets	Property income
Disposal of nonfinancial assets (-)	Sales of goods and services
[Consumption of fixed capital (-)]	Other revenue, n.e.c.

(Revenue) – (Expense) = Net** Operating Balance

(Revenue) – (Expenditure) = Net Lending (+) Net Borrowing (–)

Outflows: *Inflows:*

Net acquisition of financial assets	Net incurrence of liabilities
Domestic (by instruments)	**Domestic** (by instruments)
Monetary gold and SDRs	Special Drawing Rights (SDRs)
Currency and deposits	Currency and deposits
Debt securities	Debt securities
Loans	Loans
Equity and investment fund shares	Equity and investment fund shares
Insurance, pension and guarantee schemes	Insurance, pension and guarantee schemes
Financial derivatives and emp. stock options	Financial derivatives and emp. stock options
Other accounts receivable	Other accounts payable
External (by instruments as above)	**External** (by instruments as above)

*** Gross, if consumption of fixed capital is not available.**

Revenue

Unlike an enterprise, the government generally does not receive the majority of its income (called revenue) from the sale of goods and services. Instead, the government provides many goods and services to the public for free and derives most of its income from scheduled and compulsory contributions. Thus, the receipt of government revenue does not oblige the government to deliver a specific service to customers or to repay the money it receives. [82] This general principle applies to all revenue, with some exceptions.

Revenue in the form of taxes is often the main item here. Taxes are compulsory and unrequited receipts collected by the government for public purposes. Taxes are typically broken down according to the type of activity on which taxes are imposed, for example, taxes on income and profits, taxes on property, taxes on goods and services, and taxes on international trade and transactions. Tax revenue excludes compulsory social contributions since these contributions secure entitlement to social benefits, i.e., they are not unrequited.

Social contributions are actual or imputed revenue receivable either from employers on behalf of their employees or from employees, self-employed, or non-employed persons on their own behalf. These contributions secure entitlement to social benefits payable to the contributors, their dependents, or their survivor when certain risks arise. The contributions are usually compulsory, but may also be voluntary.

Grants are transfers receivable from other resident or nonresident governments or international institutions. *GFSM 2001* classifies grant transactions as revenue because they increase the government's net worth. Grants can reduce the deficit, but they should not be grouped with deficit-financing items. Nevertheless, for the purposes of analyzing and planning the budget, one must remember that grants differ fundamentally from other types of revenue. Because grants are often neither predictable nor sustainable, planning expenditure on the assumption that grants will be available runs the risk of serious budgetary miscalculations. In assessing the fiscal stance, therefore, the net lending/net borrowing balance of the fiscal account is often reported both with and without grants (see Section 5.2). Moreover, if grants are large, the foreign currency inflow can lead to an exchange rate appreciation, with potentially damaging effects on exports. The macroeconomic effects of aid inflows vary depending on whether the aid is saved (added to reserves), spent on imports, or spent on domestic goods and services.[83]

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[82] Note that loans received by the government are not considered revenue. Since the loans must be repaid, they are a liability for government, and the counterparty has a financial claim on government.

[83] See, Isard, Peter, and others, 2006, "The Macroeconomic Management of Foreign Aid: Opportunities and Pitfalls" (Washington, D.C.: International Monetary Fund).

Other revenue includes property income, such as rent from government property, interest income and dividends or withdrawals from public corporations, including the central bank. Also included in other revenue are sales of goods and services, fines, transfers not elsewhere classified, and miscellaneous other revenue.

Total expenditure

Expenditure is typically broken down by economic classification, that is, into expense and net investment in nonfinancial assets.[84]

Expense is the operating expenditure of the government and consists of current expenditures and capital transfers. It is sometimes called recurrent expenditure, because generally occurs year after year. Expense, as recorded in the fiscal accounts, differs from government consumption as recorded in the national accounts. Government consumption comprises compensation of employees and the use of goods and services; it excludes all other expenses such as subsidies, interest payments and other transfers,[85] which are considered as ultimately redistributing private sector income.

Acquisition of nonfinancial assets refers to, for example, purchases of land, buildings, and physical capital equipment intended to be used for more than one year. Acquisition of nonfinancial assets can also include projects that take longer than one year to implement. The concept of gross fixed capital formation in the national accounts is a component of the acquisition of nonfinancial assets. The latter also includes acquisitions of assets other than fixed assets.

Financing

The net lending/net borrowing balance is the difference between total revenue and total expenditure. If this balance is negative, we say there is a fiscal deficit or net borrowing. The government covers this deficit through financing operations. Financing operations serve the same purpose as revenue, in the sense that they help to finance the outlays of the government. But financing is also very different from revenue: financing involves financial assets and liabilities, or financial claims. A financing operation usually creates a debt liability that the government will eventually have to repay (repayment of government debt, also called amortization).[86] But, the financing of the deficit can be in the form of a disposal of financial assets, such as using government's available cash deposits. Therefore, all transactions in financial assets and liabilities are referred to as financing transactions. Financing is discussed in Section 3 of this chapter.

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[84] Note that the net investment in nonfinancial assets includes the disposal of nonfinancial assets as a negative item.

[85] The transfers are here referring to grants, social benefits, and other expense, which includes capital transfers.

[86] Also, the government pays yearly interest on the government's debt. This interest, which is a recurrent charge as long as the debt exists, is recorded under expense.

Net acquisition of financial assets

The government may keep various types of financial assets as deposits, debt securities, outstanding loans, equity in public corporations, and other claims, such as taxes receivable. The financial asset account record these government assets and all transactions involving the acquisition or disposal of financial assets are treated as financial transactions. The government may, of course, undertake lending to achieve some policy objectives. Examples include subsidized loans to farmers, students, or small businesses. But, if government by lending is not expecting a return of interest and principal but rather wants to promote certain policy goals, such as the use of fertilizer by farmers, the lending could be regarded as an expense. The net acquisition of financial assets is called "net" because the repayments are netted against gross acquisition of the assets.

Net incurrence of liabilities

As discussed above, the government may need to finance part of its outlays by borrowing from other sectors of the economy, for example, in the form of loans, trade credits, or the issuance of debt securities, etc. The incurrence of a liability refers to transactions that increase liabilities. Transactions that decrease liabilities are variously titled repayments, reductions, withdrawals, redemptions, liquidations, or extinguishments. The net incurrence of liabilities is called "net" because the repayments, reductions, etc. are netted against gross incurrence of the liabilities.

5.2 Fiscal Indicators[87]

The fiscal position should be assessed both in terms of flow indicators, such as the operating balance, net lending/net borrowing balance, and stock indicators, such as the amount of outstanding government debt or other balance sheet data.

Flow indicators

The *net lending/net borrowing balance* or the *fiscal balance* is the most common fiscal indicator. As mentioned earlier, it is the difference between total revenue and total expenditure or the difference between the net acquisition of financial assets and the net incurrence of liabilities. When expenditure exceeds revenue, the balance is negative (net borrowing), and we call this a deficit; if the balance is positive, we call it a surplus (net lending).[88] This balance may therefore be viewed as an indicator of the financial impact of

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[87] This section draws heavily on Daniel and others (2006).

[88] Similarly, from the financing side, when the net incurrence of liabilities exceeds the net acquisition of financial assets, the balance is negative (net borrowing). When the net acquisition of financial assets exceeds the net incurrence of liabilities, the balance is positive (net borrowing),

government activity on the rest of the economy and the rest of the world.[89] Analysts measure the fiscal balance and study its evolution over the years to analyze the impact on the economy. They may also compare a country's deficit with those of other countries. Because of the size of government operations in the economy, any imbalance could have considerable consequences for the rest of the economy. There is typically more discussion about deficits than about surpluses, because a deficit is considered more of a problem than a surplus.

Of course, a government needs to cover its deficit somehow, because it cannot spend more than it receives in revenue without some form of financing. For that reason, the deficit is considered as "net borrowing". We should distinguish between the public sector net borrowing, which covers all operations of the whole public sector, and the net borrowing of the general government or of other units of government such as the central government or local governments.

In a growing economy or one with considerable inflation, it does not make sense to express the budget deficit in current domestic currency units because over time a deficit that remains the same in current domestic currency units becomes less important relative to the size of the economy. Also, deficits in domestic currency units are not comparable with those of other countries. For these reasons, we normally express the budget deficit as a percentage of GDP.

An *adjusted fiscal balance* is the net lending/net borrowing balance adjusted by excluding such items as grants or revenue from certain activities (for example, the oil sector), or certain lumpy expenditure items.

- As noted earlier, grants differ from other types of revenue in that they are typically outside of government control and are not predictable or sustainable. Thus when grants are significant, the net lending/net borrowing balance is often reported both with and without grants. The fiscal balance excluding grants also indicates the extent of grant dependency.

- Like grants, oil revenue is highly volatile and unpredictable; it is also nonrenewable, and consuming it reduces government wealth. Countries that are heavily dependent on oil (or other nonrenewable resources) should also consider the non-oil fiscal balance, ideally as a ratio to non-oil GDP.

- Externally financed project spending may be excluded as it is outside the government's control, typically has a large import component and generally a limited impact on domestic supply, and is automatically financed (although if it is financed by lending, it will increase debt). Excluding external grants, externally financed

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[89] Net lending (+) / net borrowing (−) is a summary measure indicating the extent to which government is either putting financial resources at the disposal of other sectors in the economy or abroad or utilizing the financial resources generated by other sectors in the economy, or from abroad.

project spending and external interest payments results in the *domestic fiscal balance* (with specific definitions varying across countries).

- The *primary net lending/net borrowing balance* is defined as total noninterest revenue minus total noninterest (primary) expenditure, i.e., net lending / net borrowing excluding net interest expense.[90] It measures the effects of current discretionary budgetary policy or fiscal "effort."[91] This measure indicates how the recent fiscal actions of the government affect the government's net debt, therefore it is a critical variable for debt sustainability analysis. The debt-stabilizing primary balance is the primary balance necessary to keep the debt-to-GDP ratio stable.

- The *inflation adjusted balance* is the net lending/net borrowing balance adjusted by eliminating from expenditure the inflation-induced portion of interest payments.[92] It aims to assess the change in the real stock of public debt. This deficit concept is particularly important in countries with high inflation and a large public debt, because it measures the extent to which fiscal policy in a given year affects the real stock of public debt.

The *net operating balance* is the difference between total revenue and total expense.[93] The net operating balance is a summary measure of the sustainability of government operations because it shows the net effect on net worth of government as a result of its transactions (operations). The component of the change in government's net worth that is due to transactions can be attributed directly to government policies since governments have direct control over the decisions that led to recording these transactions. This balance is comparable to the national accounts concept of saving plus net capital transfers receivable. Targeting the operating balance could help safeguard investment in times of fiscal consolidation. Investment leaves the net worth of the government unaffected and promotes intergenerational equity. But, focusing exclusively on the operating balance is risky for several reasons. Investment spending adds to aggregate demand, and leads to greater expense in medium term (for example, building schools today (investment) leads to hiring teachers and purchasing books for the new schools). Debt can become unsustainable if public investment projects do not yield pecuniary returns to cover interest payments—either because the projects are not of

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[90] For the analysis of gross debt sustainability, total revenue minus total noninterest expenditure is used, i.e., net lending / net borrowing excluding interest expense.

[91] The underlying idea of the primary balance is that interest payments cannot be changed in the short term, because the outstanding debt cannot be changed in the current period. By excluding net interest payable, we can measure to what extent the government has changed the level of discretionary spending in an attempt to improve the fiscal situation. It therefore indicates the effort the government is making to resolve its fiscal problems in the areas where it has the power to make a difference.

[92] Inflation reduces the real value of the outstanding nominal stock of public debt. To compensate the holders of the debt for this loss, the nominal interest rate in high inflation countries is often very high. This compensation represents a return *of* capital and not a return *on* capital. In other words, a part of the government's interest payment on its debt is actually amortization (repayment of principal) and should be omitted from the interest payments above the line. The operational deficit does just that.

[93] The gross operating balance is the difference between total revenue and total expense excluding consumption of fixed capital (the GFS version of depreciation).

high quality or because the social returns are difficult to monetize. Moreover, other uses of public funds—notably reducing tax rates or investment in human capital and operations and maintenance—may have a higher social or economic rate of return than public investment; excluding public investment from fiscal targets would create a bias against these choices and may also discriminate against private sector involvement in infrastructure.

The *cyclically adjusted balance* seeks to measure the underlying fiscal position—that is, the net lending/net borrowing corrected for purely cyclical fluctuations of output on the budget.[94] It is obtained by removing the cyclical component of the budget from the nominal fiscal balance. For example, this measure removes the impact of automatic stabilizers, such as unemployment benefits, which temporarily increase during a recession. The cyclical component, in turn, depends on two factors: the size of the output gap, and the output elasticity of the budget (which is determined by the extent individual budgetary items react to fluctuations in output, as well as by the size of the budget). Budgetary targets are seldom framed in cyclically adjusted terms. This reflects in part the relative complexity of the techniques used to estimate output gaps and budgetary elasticities. But while there are a number of difficulties regarding the computation of cyclically adjusted balances, a variety of measures can be undertaken to address them, and cyclically adjusted balances can play a useful role as a reference for policy design and implementation.[95] The *fiscal impulse* is the change in the cyclically adjusted balance. It measures the discretionary fiscal stance.

The *augmented fiscal balance* is the net lending/net borrowing balance including exceptional outlays such as the fiscal costs of bank recapitalization or enterprise restructuring not otherwise captured in expenditure. Such outlays need financing and may have a significant aggregate demand impact.

The concept *gross financing needs and sources* helps focus on liquidity issues. The "needs" comprise the fiscal deficit and any other transactions that require financing plus amortization. "Sources" are the means of meeting financing needs—e.g., from bank borrowing, bond issuance, external borrowing, and privatization. Financing needs requiring a level of borrowing much greater than the normal access of the government to financial markets and banks could foreshadow liquidity problems.

Indicators of stock positions

Fiscal policy analysis has traditionally focused on flow variables, such as the net lending/net borrowing balance and the operating balances. But flows create changes in stocks, and stocks

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[94] Although the terms "cyclically adjusted balance" and "structural balance" are often used interchangeably, the structural balance refers to the fiscal balance adjusted for deviations from benchmark levels of all economic variables with a significant fiscal impact, not just output.

[95] These measures include taking into account changes in the composition of output when estimating the output gap, as well as relying on estimates of built-in elasticities, excluding the impact of discretionary measures.

are increasingly seen as important yardsticks for gauging fiscal policy in their own right as well as the changes in stocks do over time. Reconciling flows and stocks also serves as a consistency check on the quality of fiscal data.

The starting point is the government (or broader public sector) balance sheet at a given moment. It comprises on one side government assets, both financial (such as government deposits) and nonfinancial (such as buildings and roads), and on the other, government liabilities (such as government debt), and net worth (the difference between all assets and liabilities). For illustration, see the government's integrated balance sheet in Box 5.2.

Liabilities, the bulk of which typically comprises debt,[96] are a commonly used stock variable because data for these are readily available. Large or growing liabilities (typically measured against a scalar, such as GDP or revenue) may indicate future debt-servicing problems.

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[96] **Gross debt** consists of all liabilities that are debt instruments. A debt instrument is defined as a financial claim that requires payment(s) of interest and/or principal by the debtor to the creditor at a date, or dates, in the future. The following instruments are debt instruments: (1) special drawing rights (SDRs), (2) currency and deposits, (3) debt securities, (4) loans, (5) insurance, pension, and standardized guarantee schemes, and (6) Other accounts payable. Liabilities that are not debt instruments are equity and investment fund shares and financial derivatives and employee stock options. Debt liabilities and financial assets may be dealt with in an integrated manner, focusing on net debt. For example, debt may have been incurred to fund financial assets that will generate income to meet liabilities. **Net debt** is calculated as gross debt minus financial assets corresponding to debt instruments. The difference between net financial worth and net debt lies therefore in the definitions of liabilities and debt (and corresponding financial assets) as well as the way in which each is calculated: net financial worth is equal to total financial assets minus total liabilities. Net debt is total debt liabilities minus financial assets corresponding to debt instruments.

Box 5.2 GFSM 2001

GFSM 2001 is an integrated system which links flows and stocks, and also incorporates accrual and cash reporting and comprehensive balance sheets. The relationships that underpin the GFSM 2001 analytical framework are summarized in three accrual-based statements—relating to transactions, other economic flows, and the balance sheet—along with a cash-based statement:

- The *Statement of Government Operations* distinguishes between revenue and expense transactions, transactions in nonfinancial assets, and transactions in financial assets and liabilities. Revenue covers all transactions that increase net worth and expense covers all transactions that decrease net worth. Transactions in nonfinancial assets, financial assets and liabilities are not included in revenue or expense. The difference between revenue and expense is the net operating balance. Subtracting the net investment in nonfinancial assets from the net operating balance yields net lending/net borrowing, which, in turn, is equal to the net acquisition of financial assets less the net incurrence of liabilities.

- The *Statement of Other Economic Flows* presents information on changes in net worth that arise from flows other than transactions, as described above. Examples are revaluations of external loans due to exchange rate changes and debt write-offs.

- The *Balance Sheet* shows the government's net worth at the end of a fiscal year, which is equal to the stock of nonfinancial assets plus net financial worth (that is, the difference between financial assets and liabilities). The change in net worth during a year is the sum of changes due to revenue and expense transactions, valuation adjustments, and to other flows we call "other changes in the volume of assets and liabilities".

- The *Statement of Sources and Uses of Cash* shows cash flows associated with revenue and expense transactions and transactions in nonfinancial assets, and their net impact in terms of the cash surplus/deficit. Adding the cash flow from transactions in financial assets other than cash and liabilities to the cash surplus/deficit gives the net change in the stock of cash.

Statement of Government Operations

Opening balance sheet	Revenue, *less* Expense, *equals*		Closing balance sheet
Opening net worth, equals	Operating balance, *plus*	Change in net worth from OEFlows	Closing net worth, *equals*
Opening nonfinancial assets, *plus*	Net investment in non-financial assets, *equals*	Other economic flows in nonfinancial assets	Closing nonfinancial assets, *plus*
Opening net financial worth, *equals*	Net lending/ borrowing, equals	Change in net financial worth from OEFlows	Closing net financial worth, *equals*
Opening financial assets, *less*	Transactions in financial assets, *less*	Other economic flows in financial assets	Closing financial assets, *less*
Opening liabilities	Transactions in liabilities	Other economic flows in liabilities	Closing balance

Government Integrated Balance Sheet

Net financial worth recognizes that liabilities are matched by financial assets, and thus looking just at liabilities may misrepresent the government's financial position.[97] But financial assets can only be used to meet liabilities coming due if they are liquid. For example, government equity in public corporations may not be easily sold, and, in some extreme cases, withdrawing government deposits from public banks may precipitate their collapse. Any netting or offsetting of claims/liabilities within the public sector against each other may mask mismatches, such as the central government's inability to service its debt to the social security fund.

Moreover, thinking in terms of stock positions, as opposed to flows, focuses attention on valuation changes. For example, an exchange rate depreciation can quickly increase the cost of refinancing foreign-currency denominated debt, and more generally the stock of debt. For an illustration, see Box 5.3. In addition, the depreciation will likely lead to an increase in real interest rates, as the authorities aim to curtail capital outflows. As real interest rates rise, the value of government bonds held by banks and others will fall, potentially leading to large capital losses.

Net worth goes further and recognizes that liabilities may also be matched, not just by financial assets, but also by nonfinancial assets. This is the most demanding stock variable to measure as it involves valuing all nonfinancial assets owned by government.

The balance sheet can miss potentially critical aspects of the government's financial position and should be supplemented with additional information. For example:

- Contingent liabilities such as loan guarantees are frequently contracted for fiscal policy purposes, have important economic effects, and can threaten fiscal sustainability. The nominal amount, and the nature, of such liabilities should be published, as should, if possible, an estimate of their expected cost. Where guarantees are significant, it would be prudent for budgets to limit their amount and include provisions for their expected cost. Contingent liabilities are discussed further in Chapter 10.

- Public-private partnerships (PPPs), are essentially leasing arrangements where the private sector provides initial finance and the state retains ownership and bears certain future costs. While PPPs can elicit additional financing for investment and may

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[97] The composition of liabilities can also be an important source of vulnerability. For example, when government debt is short term, indexed to short-term interest rates, or foreign exchange-denominated/linked, pressures in the money and foreign exchange markets can rapidly translate into debt-servicing problems. The "balance sheet approach," which looks at links between the balance sheets of the various sectors of the economy, can help identify vulnerabilities and potential pressures stemming from balance sheets (See Allen, and others, 2002.)

increase efficiency, they may also (possibly deliberately) conceal fiscal activity and expose governments to greater (often hidden) costs than direct procurement of public works. To improve their transparency and assessment, information on PPPs should be included in budget documents and end-year financial reports.

Box 5.3 The Uruguay Banking Crisis 2002 – The Public Sector Balance Sheet 1/

In percent of GDP:	2001				2002				
	Opening balance 2/	Trans-actions	Other economic flows 2/	Closing Opening balance 3/	Trans-actions	Holding gains and losses 2/	Other volume changes 2/	Re-sidual 2/	Closing balance 3/
Net worth and its changes:	**-17.9**	**0.2**	**-7.0**	**-24,4**	**-5,0**	**-36.3**	**-5.1**	**1.2**	**-68.2**
Nonfinancial assets	23.2	3.8	...	26.6	2.6	...	...	...	...
Net financial Worth:	**-41.1**	**-3.6**	**-7.0**	**-51.0**	**-7.6**	**-36.3**	**-5.1**	**1.2**	**-96.0**
Financial assets 4/	16.0	2.3	2.8	20.8	11.2	-0.5	5.3	-1.5	34.1
Domestic + Foreign	16.0	2.3	2.8	20.8	11.2	-0.5	5.3	-1.5	34.1
Currency and deposits	14.7	1.9	2.9	19.2	3.5	-0.5	5.3	-1.7	24.7
Securites other than shares	1.3	0.4	-0.1	1.6	-1.4	0.0	0.0	2.8	2.9
Loans	...	...	...	...	9.1	...	...	-2.6	6.5
Liabilities 4/	57.1	5.9	9.8	71.8	18.9	35.8	10.4	-2.7	130.1
Domestic + External	57.1	5.9	0.0	71.8	18.9	35.8	10.4	-2.7	130.1
Currency and deposits	16.4	1.2	2.9	20.3	5.1	-5.5	1.8	-2.5	18.1
Securities other than shares	27.4	3.3	4.8	35.1	-0.7	27.2	0.1	0.1	59.8
Loans	13.3	1.3	2.0	16.4	14.5	14.1	8.6	-0.4	52.3
Memorandum items:									
Net worth (in percent of GDP)	-17.9			-24.4					-68.2
Net financial worth (% of GDP)	-41.1			-51.0					-96.0
Change in Net worth (%)	-1.2			-6.5					-43.8
Change in Net financial worth	-4.3			-9.9					-45.0
Liabilities/Assets ratio	1.46			1.52					2.10
Liabilities/Financial Assets ratio	3.57			3.45					3.81

Source: IMF Country Report No. 04/172 and STA staff estimates

1/ The Public Sector includes the Central Government, Extrabudgetary Funds, Social Security Funds, Local Governments, Nonfinancial Public Enterprises, and the Central Bank.

2/ Other economic flows record holding gains and losses and other changes in the volume of assets and liabilities.

3/ Data from IMF Country Report No. 03/247 August 2003, Table 15. Uruguay: Public Debt, plus own estimates of monetary liabilities of the BCU based on official data.

4/ The breakdown in domestic and external was not available for this case study, but it is reported by the Uruguayan authorities.

The example of Uruguay in the years culiminating in the 2002 banking crisis illustrates the impact of balance sheet operations and valuation changes on the government's financial position.

- The February 2003 staff report included two measures of the fiscal deficit: the deficit without one-time costs of bank restructuring, which was 4.6 percent of GDP, and the augumented balance including all bank restructuring as expenditure, which was 21.4 percent of GDP. The first indicator understated the fiscal impact of government interventions in the crisis, and second overstated it.

- The *GFSM 2001* deficit is 7.6 percent of GDP (the change in net financial worth due to government transactions), including 3 percent of GDP in unrequited capital transfers to banks.

- Also, the government used international reserves, IMF supprt, and development bank loans to on-lend to other failing banks – in the amount of 9 percent of GDP. While this support would not in itself have reduced net worth (assuming the bank would pay it back), the depreciation of the peso caused significant holding losses for government, which it was unable to pass on to the domestic banks. Other economic flows of 8.6 percent of GDP reflect assumption of mortgage bank debts.

- Thus, public sector net worth declined by about 44 percent of 2002 GDP with another 9 percent value at risk given the uncertainty about whether banks would pay back their loans).

5.3   Financing the Fiscal Deficit (net lending/net borrowing)

The macroeconomic impact of the government deficit depends, in part, on the way the deficit is financed.[98] There are basically four ways of financing a fiscal deficit: (i) borrowing abroad (external sector); (ii) borrowing from the central bank; (iii) borrowing from the domestic financial sector (such as commercial banks[99] and other types of financial corporations, e.g., money market funds, pension funds, insurance corporations, etc.); and (iv) borrowing from the domestic nonfinancial sector (loosely referred to as the "nonbank sector", which includes public and private nonfinancial corporations).[100] Each form of financing can be associated with a major macroeconomic imbalance.

The government can finance its deficit by selling bonds to nonresidents or by obtaining loans directly from foreign governments, foreign private banks, or international institutions. This is called external borrowing, and for most developing and many emerging market economies the loans are usually denominated in foreign currency. Consequently, changes in the exchange rate will affect the amount of debt the government owes in local currency. Note that external borrowing recorded in the fiscal accounts should be consistent with what is recorded in the balance of payments (see Chapters 4 and 7). Financing the deficit with foreign borrowing may initially tend to appreciate the exchange rate, damaging the competitiveness of the traded goods sector. For some developing and transition economies, over-borrowing in the past and a lack of creditworthiness severely limit this source of financing for the present.

Domestic financial sector borrowing usually entails a sale of bonds or bills to the central bank, the commercial banks, or other types of financial corporations. Alternatively, the central bank may allow the government to have an overdraft account. Often loans or advances from the central bank have low interest rates. Government borrowing from the central bank is equivalent to the creation of high-powered money. The central bank's holdings of government bills rises and when the government spends the money, the stock of high-powered money rises by an equivalent amount. Creating money at a rate that exceeds demand in turn creates excess cash balances and eventually drives up the overall price level. The central bank may try to resist lending to the government or to set limits on the amount of credit available, but these attempts may not succeed unless the central bank is truly independent. Some countries have statutory limits on the amount of credit the central bank

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[98] Other macroeconomic impacts of government deficits are not discussed here, but may be important, such as the incidence of taxes and the allocation of spending.

[99] In macroeconomic statistics, a broader term is used for "banks" in order to capture all entities that meet this definition: i.e., deposit-taking institutions.

[100] In the GFS, the classification of stocks positions and flows of financial assets and liabilities according to the institutional sector of the counterparty provides all the information needed for this analysis. Domestic financing is broken down whether the counterparty is general government, central bank, deposit-taking institutions other than the central bank, other financial corporations, nonfinancial corporations, and households and nonprofit institutions serving households. External financing is broken down whether the counterparty is general government, central banks, international organizations, financial corporations not elsewhere classified, and other nonresidents.

can provide the government. Note that domestic bank borrowing recorded in the fiscal accounts must be consistent with what is recorded in the monetary survey (see Chapters 6 and 7).

Borrowing from domestic commercial banks and other deposit-taking institutions does not automatically lead to the creation of high-powered money, unless the central bank accommodates the extra demand for credit from the commercial banks by supplying them with additional reserves. If the central bank does not accommodate the extra demand for credit, the commercial banks and other deposit-taking institutions may be forced to reduce credit to the private sector in order to meet the higher demand for government credit. This phenomenon, referred to as the crowding out of private spending, takes place principally through interest rate increases.

In many countries, the normal way in which budget deficits are financed is through borrowing other than bank borrowing. Usually the government sells bonds with different maturity dates to the private sector or nonfinancial public sector and pays the market rate of interest. Nonbank borrowing allows the government to sustain a deficit in the short run, without increasing the monetary base or depleting international reserves. For this reason, it is often considered an effective way to avoid both inflation and external crises. However, nonbank borrowing carries its own dangers if it becomes excessive. First, bond financing of the deficit, while it postpones inflation, may lead to significantly higher inflation in the future if the stock of government debt is not kept in check. Second, like bank borrowing, borrowing directly from the public puts upward pressure on domestic interest rates and thus crowds out the private sector. Not only do high real interest rates hurt economic growth, but issuing public debt at such rates adds to the cost of future debt servicing and thus to future fiscal deficits. If real interest rates exceed rates of economic growth, debt service can grow explosively, making public debt unsustainable.

In table 5.1, privatization receipts are recorded as disposal of "equity and investment fund shares" under financial assets. Analytical presentations of the fiscal accounts record privatization receipts below the line, along with other financial transactions that do not affect the government's net financial position. Note that revenue is defined as those transactions that increase net worth, but privatization receipts are only seen as a change in asset portfolio. The government can use the proceeds from the sale of enterprises to purchase other assets or to retire a portion of its own debt. Under such a scenario, the government and the private sector have simply exchanged one type of asset for another without affecting the demands for real resources. However, if the government uses the privatization proceeds to raise expenses, cut taxes, or both, the deficit in the year of the sale will be unchanged, while future deficits will be larger and the fiscal policy stance will be affected by privatization.

5.4   Forecasting Revenue

Forecasting tax revenue (including social contributions)[101]

There are several ways to forecast tax revenue. Here, we will review three approaches: (i) the effective tax rate approach; (ii) the elasticity approach; and (iii) the regression approach. We can use any of these approaches in forecasting total revenue or a number of separate (disaggregated) revenue categories.

Effective tax rate approach

The tax rate relates the amount of tax payable to the tax base. The tax base for a given tax is the event or condition that gives rise to taxation. It is defined in the law and in most cases is some economic event or condition. For example, the receipt of wages and the sale of goods are taxable events; ownership of a house can be a taxable condition. The law also defines at what rate the event or condition will be taxed, what items may be deducted in calculating the tax, whether any exemptions are allowed, the deadline for paying, the fines that apply to late payment, and so on.[102]

For forecasting purposes, there are a number of problems with the tax base as defined in the law. One needs an enormous amount of very detailed information to assess developments in the various tax bases. Such data do not always exist, or they are not published. Even if it is possible to measure the tax base for past years, it may not be possible to make an accurate forecast of that base. For these reasons forecasters usually use a proxy tax base to analyze the behavior of tax revenue and to make forecasts. A proxy tax base is an economic variable that is closely related to the actual tax base and for which data are available. For example, we may not have information on the volume of wine sales, but we may assume that trends in the sale of wine are related to trends in the economy as a whole, for example to private consumption. So we could use private consumption as the proxy tax base for forecasting tax revenue on wine. An advantage of using these macroeconomic variables is that often a reasonably accurate forecast is already available. Table 5.2 lists tax categories and suggested proxy tax bases that can be used to study the behavior of these taxes and to forecast future receipts.

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[101] Social contributions are not taxes since they secure entitlement to social benefits.

[102] Any delay that occurs between the taxable event and the time when the tax is actually paid is called a collection lag. This delay may be perfectly legal—indeed, some delay is almost inevitable—but it may also be the result of lax procedures or poor tax administration. In developing countries, collection lags are estimated to average somewhere between five and eight months for most taxes (Choudhry,1991). It is important to look at these collection lags, because they are very helpful in forecasting. For example, if the collection lag is a year or more, we could use the current year's tax base to forecast revenue for next year.

Table 5.2 Suggested Proxy Bases for Tax Revenue (including social contributions)	
Taxes (incl. social contributions)	Suggested Proxy Tax Base
Tax on net income and profits	
Corporate	Profits derived from national accounts, GDP
Individual	Wages and salaries
Sales tax	Private consumption at current prices, GDP
Excise duties	Private consumption at current prices, GDP
Import duties	Value and volume of imports in local currency
Social contributions	Wages and salaries

If we are using a proxy tax base to forecast revenue, we need to find a tax rate that relates actual tax receipts to the proxy base. We can begin by calculating the effective tax rate, which is defined as the amount of taxes paid divided by the proxy tax base:

$$Effective\ Tax\ Rate = \frac{Tax\ Revenue}{Proxy\ Tax\ Base}. \tag{5.1}$$

The effective tax rate shows how much revenue is actually collected as a percentage of the proxy tax base. Using the effective tax rate provides for a more realistic forecast than one based on the tax rate as defined in the law. The reason is that such factors as tax exemptions and tax evasion are explicitly taken into account when calculating the effective tax rate. We can postulate that a relationship exists between the proxy tax base and tax receipts and that the effective tax rate is stable over time.[103] We need to test this assumption, and if our tests confirm it, we can use the effective tax rate to forecast revenue or at least to get an initial idea of receipts. Once we are sure that the effective tax rate is stable, and we have a forecast of the proxy tax base, we can forecast revenue by multiplying the tax base by the tax rate.

If the effective tax rate is not stable, it may be possible to use the marginal tax rate instead. The marginal tax rate is defined as the ratio of the change in taxes to the change in the tax base:

$$Marginal\ Tax\ Rate = \frac{\Delta\ in\ Tax\ Revenue}{\Delta\ in\ Proxy\ Tax\ Base}. \tag{5.2}$$

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[103] The effective tax rate would not be stable when: (i) the law is changing; (ii) the tax is a specific tax which does not vary with the value of the proxy tax base—in this case, the effective tax rate will fall over time as the value of the proxy tax base (say, GDP) increases; or (iii) the tax is progressive, such as a graduated income tax, which is characterized by higher marginal tax rates on persons with higher incomes—as more people move to higher income brackets, the effective tax rate on total income will increase.

If the marginal tax rate is stable, we forecast the change in revenue by multiplying the change in the tax base by the marginal tax rate. The change in revenue from a tax is decomposed into two parts: one corresponding to a change in the tax base and its impact on revenues, and the other corresponding to a change in the tax system (including changes in the tax rate, the tax structure, the coverage of the tax, and so forth).[104]

Elasticity approach

The elasticity of tax revenue is defined as the ratio of the percentage change in tax revenue to the percentage change in the tax base, assuming no change in the tax system during the period. If GDP is taken as a proxy for the tax base, then the elasticity with respect to GDP is:

$$Elasticity = \frac{\Delta T^* / T^*}{\Delta GDP / GDP} \tag{5.3}$$

where T* denotes tax receipts from an unchanged tax system, that is, actual tax revenue adjusted for the estimated impact of changes in the tax system over the period. An estimate of elasticity can be obtained by a rough averaging of the ratio of the percentage change in revenues to the percentage change in the tax base over a period in which there was no change in the tax system. Given an estimate of the elasticity for the tax in question and a forecast of the growth rate of the tax base, a revenue forecast can be obtained by simply multiplying the growth rate in the tax base by the elasticity.

Although it is difficult to obtain precise estimates of elasticities, it is often possible to estimate a range of values for elasticities, especially for taxes on income and profits. This information is based on the experience of the same country or on the experience of countries comparable in levels of income and economic structure. Observed elasticities for major tax categories typically fall into a relatively narrow range of values. Such judgmental estimates of elasticities are useful, especially where historical data for statistical estimation of the elasticities are generally not available. Here are some observations that may be relevant in making judgments about elasticities. First, as a rule of thumb, the values of elasticities with respect to tax bases are likely to be less than one in the case of taxes on consumption. Second, elasticities can decline in the presence of high inflation.[105] Third, taxes on property and land taxes generally have an elasticity with respect to nominal GDP of significantly less than one because of lags in the reassessment of tax bases. Fourth, a tax is likely to have an elasticity of one when its rate structure is proportional rather than progressive, when it is

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[104] The term "tax system" is used here in a broad sense, encompassing the system of tax administration, which influences the compliance ratio.

[105] Elasticities may decline in the presence of high inflation for the following reasons: (i) lags between the time tax liability is generated and the time at which it is paid (unless taxes are indexed); (ii) a specific as opposed to an ad valorem basis for the levy of excise taxes in the presence of inflation; (iii) caps on the taxable base (for example, social security contributions that apply to wages only up to a certain level); and (iv) problems with tax administration and compliance.

levied on an ad valorem basis, and when there are no significant lags in collection. Finally, taxes with a progressive tax structure, especially the tax on personal income, are likely to have elasticities greater than one, particularly if the rate structure is not indexed for inflation.

The main drawback of the elasticity approach is that it does not take into account either past or future changes in the tax system. Since the law defines the tax base, the tax rate, and the allowable deductions and exemptions, any change in the law that modifies these provisions could have a significant impact on receipts. Any changes in tax administration, in the efficiency with which the tax office works, or in enforcement of the tax laws could also have an important effect on tax receipts.

Buoyancy refers to the ratio of the total percentage change in tax revenue, including any effect of policy changes, to the percentage change in the tax base. If GDP is taken as a proxy for the tax base, then buoyancy with respect to GDP is:

$$Buoyancy = \frac{\Delta T / T}{\Delta GDP / GDP} , \qquad (5.4)$$

where T denotes actual tax receipts (without adjusting for the impact of changes in the tax system). A buoyancy equal to 1 means that tax revenue is growing exactly as fast as the tax base (say, GDP)—this implies that the ratio of tax revenue to GDP is constant over time. If the tax rate is constant, this implies that the marginal tax rate equals the average tax rate.

Regression approach

We can use regression analysis to estimate the quantitative effect on tax revenue of variables we would expect to have a major influence. This method will produce accurate forecasts if there is a stable relationship between the explanatory variable(s) and total tax revenue. For example, we can link revenue in the current year to the proxy tax base (say, GDP) of that same year and the previous year and to revenue of the previous year: [106]

$$\ln T_t = \beta_0 + \beta_1 \ln GDP_t + \beta_2 \ln T_{t-1} + \beta_3 \ln GDP_{t-1} + \varepsilon_t , \qquad (5.5)$$

and forecast tax revenue using the estimated regression coefficients, our forecast of GDP, and last year's tax revenue.

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[106] Note that this model is known as the *autoregressive distributed lag* (ADL) *model* discussed in Chapter 1. The ADL model, especially if enough lagged dependent and independent variables are included, does not typically suffer from serial correlation (see more detail in Chapter 1).

Or we can estimate buoyancy as β1 in the following regression:[107]

$$\ln T_t = \beta_0 + \beta_1 \ln GDP_t + \varepsilon_t \qquad (5.6)$$

The buoyancy coefficient reflects both the elasticity of the tax system and any changes in the tax system. If the changes in the tax system are revenue enhancing, then buoyancy will exceed elasticity, because the actual tax revenue will exceed the amount that would have been generated in the absence of changes in the tax system. When using the buoyancy coefficient, therefore, we are assuming that tax laws will change in the future as they have in the past, and the revenue impact of those changes will be the same as in the past, and that any changes in tax administration implemented in the past that resulted in more revenue will be maintained in the future. These assumptions are acceptable if changes in the past have been small. If, however, large changes have been implemented in the past, one can make a more accurate forecast by taking these changes explicitly into account.

It is important to keep in mind, however, that estimations of equations (5.5) and (5.6) using OLS techniques are only meaningful if the variables involved are stationary. In case of nonstationarity, OLS estimation will generate spurious regressions.

Since nominal taxes and GDP series (and their logs) are often nonstationary variables, a more appropriate alternative to OLS is to use cointegration procedures to find a long-run relationship between taxes and GDP. If a cointegrating relationship exists, a linear combination of the log of taxes and the log of GDP will be stationary. Using the notation I(0) to denote stationarity, this means that a coefficient α exists such that:

$$1 * \ln T - \alpha * \ln GDP = I(0) \Leftrightarrow \ln T = \alpha \ln GDP + I(0) \qquad (5.7)$$

Equation (5.7) shows that α can be interpreted as the long-run elasticity of tax collection to GDP.

Forecasting other revenue

In many countries other revenue is not a very important part of total revenue. When that is the case, we can forecast nontax revenue simply by extrapolating its trend or by calculating its ratio to GDP.

In some countries, however, other revenue is very important. For example:

- Some countries export oil or other mineral products, for which the producers must pay a fee to the government.

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[107] Note that this model is most likely to suffer from serial correlation since both dependent and independent variables tend to exhibit stochastic trends. In such a case, further tests are required to ensure that this regression-based method and its estimates *are* reliable (see more details in Chapter 1).

- In some countries a government marketing board guarantees domestic producers a fixed price for the main export crops. If the world price exceeds this fixed price, the marketing board's revenue could be quite high. But its revenue may also fluctuate enormously with swings in world market prices.
- In other countries, profits from public enterprises can be an important source of other revenue.

It is hard to give any general prescription for forecasting these sources of other revenue, except that one should proceed in the same way as for other revenue categories, that is, study the determinants of the revenue source in question and try to quantify any such relationship.

5.5   Forecasting Expenditure

Because many decisions about government expenditure are political in nature, there is less scope for relying on economic relationships in forecasting the level of government expenditure than in forecasting that of revenue. Broadly speaking, expenditure can be divided into two categories.

- Discretionary expenditure is decided from year to year in the budget and can be increased or decreased in the short run. It can be estimated on the basis of decisions made by policymakers, as reflected, for example, in a budget document.

- Nondiscretionary expenditure consists of liabilities of the government stemming from a contract or as a result of existing law. The main nondiscretionary items are interest payments, social security payments, unemployment benefits, and pensions. To forecast these items we need to know what determines them and try to estimate the precise relationship. Nondiscretionary expenditure cannot be changed by policymakers in the short run.

Forecasting noninterest expenditure

Although we could forecast expenditures by using the ratios of the major components of expenditure to GDP from the previous year, it would be hard to defend such a forecast on analytical grounds. Government spending reflects political decisions. A forecast of expenditure could instead start with what we know about fiscal policy in the year ahead. This can be learned from consulting the budget for that year and from an assessment of the impact of announced changes in fiscal policy.[108] The approved budget is thus a useful starting point, but one should remember that the budget sets an upper limit on expenditure, and that during the year supplementary budgets are sometimes added.

If there is no information about the government's planned discretionary policy measures, we can forecast expenditure on the basis of existing policies, assuming that these policies remain unchanged over the forecast period.

The following are some factors to take into account in forecasting individual expenditure categories:

- Expenditure on wages and salaries depends on: government policies; the number of civil servants and military personnel; the average wage rate; wage developments in the private sector; and changes in the cost of living.

- Government expenditure on subsidies, grants, social benefits and other expense like capital transfers[109] represents the cost of programs designed to achieve certain public objectives, including income redistribution. Once established, such programs are difficult to shrink or eliminate. Factors that influence this expenditure item include: government policies; the rate of growth of real GDP; the rate of growth of the population covered by the programs; the rate of inflation; and prices for imports and exports.

- Outlays for other goods and services are the main operating expenses of the government. They are to a large extent discretionary and thus depend mostly on government policies. However, for government to continue operating in an efficient way there must be some relationship between this expenditure and the size of the civil service: for example, if the government hires more teachers, more books and more chalk will be needed. Also, to maintain the level of expenditure in real terms, this expenditure category should move with inflation. Finally, this category should also grow if there have been large investment programs in the past.

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[108] Examples of such changes are loosening or tightening of fiscal policy; changes in staffing; changes in real wages; changes in subsidy policies; and changes in the level of the public debt.

[109] Subsidies are current unrequited payments that governments make to enterprises and grants are transfers payble by governments to other resident and nonresident governments or international organizations. Social benefits are current transfers paid to households to protect against certain social risks and capital transfers are payments to the corporate sector (even NPISH) to finance cost of nonfinancial assets, or large operating deficits accumulated over years, or to cancel a debt by mutual agreement with the debtor, or to assume a debt.

- Acquisition of nonfinancial assets or investment in nonfinancial assets frequently bears the brunt of any planned fiscal tightening. In practice, however, capital projects are not so easy to turn on and off, especially when they depend on external financing. Capital spending in most countries is set in the context of a rolling, multiyear investment program. It is then subject to annual changes in light of resource constraints and changing fiscal priorities. In projecting investment in nonfinancial assets, we need to take careful account of spending already in the pipeline that is difficult to reverse. Nonfinancial investment depends on government policies, foreign financing, the number and scope of ongoing projects, the exchange rate, and the rate of inflation.

Forecasting interest expenditure

To forecast interest payments, we need to know the interest rate and the average stock of debt in each category. In most cases the applicable interest rate is easy to find out, or you can make assumptions about market reactions and risk premia depending on developments in the primary balance. Estimating the future level of the debt however, is always difficult. Therefore, we will explain a practical approach.

The average debt stock is calculated from the stock at the beginning of the forecast period (which is the same as the stock at the end of the preceding year) and at the end of the forecast period (which we do not know). The stock at the end of the forecast period is the stock at the beginning of that period plus the projected budget deficit. The problem is that we do not yet know either the projected budget deficit or the composition of financing.

We will use an iterative procedure to find the deficit, the level of debt, and the level of interest payments. An iterative method goes through a series of steps and then cycles back to the beginning to start the process over. In this case the steps are as follows:

1. To get a reasonable starting point for interest payments due, start by filling in your forecasts for total revenue and all the expenditure categories except interest payments. The result will be the primary balance (that is, the deficit or surplus on government operations for the current year, excluding interest due on previous deficits). In the first round of iteration, treat the primary balance as the net lending/net borrowing balance.
2. Estimate the composition of financing of the net lending/net borrowing balance (see Section 6 of this chapter).
3. Calculate the average debt stock for the period you are forecasting for each category of debt as the sum of the debt stock at the end of the preceding year plus half of the financing in the period you are forecasting.
4. Calculate the interest payments due on the average debt, using the interest rates obtained as suggested above.
5. Calculate the net lending/borrowing balance.
6. Go back to step 2 and repeat steps 3-5 to recalculate the NLB balance to be financed. Continue this cycle until the difference between your estimates of interest payments or other domestic borrowing in two consecutive cycles is small.

5.6   Forecasting Financing

Total financing is derived from the forecasts of fiscal revenue and expenditure in conjunction with the iterative method described above for calculating interest payments, under the baseline scenario. However, the forecaster needs to assess the breakdown of financing between domestic and external and bank and nonbank categories. The assessment should be made in light of the available information on external financing (from balance of payments) and the scope for the private nonfinancial sector to absorb additional government debt. The forecast also needs to take into account the impact of exchange rate changes on the domestic currency counterpart of external financing, the range of domestic financial instruments available for financing, and the potential consequences for domestic interest rates of the size of nonbank financing. Box 5.4 sets out the relationship between the forecasts of interest expenditure, the fiscal deficit, and financing.

Note that in the policy scenario, domestic bank financing may be constrained by the monetary sector's objective to keep inflation under control.

Box 5.4 Interest Payments, the Fiscal Deficit, and Financing

Let R denote total revenue, NE denote total non-interest expenditure, IE^f denote interest expenditure on foreign debt, and IE^d denote interest expenditure on domestic debt. Assuming no privatization receipts or net lending, the overall fiscal deficit in the forecast period t is financed solely by borrowing (B):

$$B_t = \left(NE_t + IE_t^f + IE_t^d \right) - R_t .$$

Suppose our forecast of foreign borrowing (in dollars) is B_t^f. Then if D_{t-1}^f is the stock of foreign debt (in dollars) at the end of the previous period, i_t^f is the forecast foreign interest rate, and e_t is the forecast average exchange rate (in domestic currency per dollar) in period t, total interest payments on foreign debt (in domestic currency) will be:

$$IE_t^f = e_t i_t^f \left[D_{t-1}^f + \left(B_t^f / 2 \right) \right].$$

If D_{t-1}^d is the stock of domestic debt at the end of the previous period and i_t^d is the forecast domestic interest rate in period t, total interest payments on domestic debt will be:

$$IE_t^d = i_t^d \left[D_{t-1}^d + \left\{ \left(B_t - e_t B_t^f \right) / 2 \right\} \right].$$

Solving these three equations simultaneously for B_t (and, by extension, for domestic borrowing), yields the same outcome as the iterative procedure described in Section 5.2.

VI.   CHAPTER SIX: THE MONETARY AND FINANCIAL SECTOR

6.1   The Monetary Accounts

The financial system consists of: (i) the *depository corporations*, which is made up of the *central bank* and *other depository corporations* (ODCs) such as commercial banks; credit unions, other deposit taking institutions, and money market funds; [110] and (ii) *nonbank* or *other financial institutions* such as insurance companies, mutual funds, pension funds, and other financial corporations (Figure 6.1.) The financial system provides intermediation for the resources flowing among the economic sectors. Because it serves as a clearinghouse for all financial flows, the monetary accounts provide a valuable insight into the behavior of these flows, which mirror the flows of real resources among the sectors. In comparison with the other accounts we have discussed so far—the national accounts, the fiscal accounts, and the balance of payments (BOP)—the monetary accounts are available with little delay and for depository corporations generally provide more timely and reliable information. [111]

The monetary accounts consist of a comprehensive set of stock and flow data on the financial and nonfinancial assets and liabilities of an economy's financial corporations sector. Guidelines for the organization and presentation of these statistics are set out in the IMF's *Monetary and Financial Statistics Manual* (*MFSM*).

Broadly speaking, monetary data are presented on three levels, illustrated in Figure 6.1:

1. The first level consists of: (i) the analytical balance sheet of the central bank, called the *central bank survey*, which shows the components of the monetary base, and (ii) the *ODC survey*, which consolidates the data from the balance sheets of all the ODCs.

2. The second level consolidates the data from the central bank survey and the ODC survey into the *depository corporations survey* (DCS), previously known as the *monetary survey*. The DCS and its component surveys are the major focus of monetary statistics and constitute a core set of data for macroeconomic analysis. The DCS contains stock and flow data on the banking system's liabilities that are components of broad money, and data on the banking system's assets that are claims on (credit to) other sectors of the economy. The DCS also contains data on the banking system's claims on and liabilities to nonresidents.

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[110] In many countries, there are operating money market funds, collective investment schemes that raise funds by issuing shares or units to the public. In line with the updated monetary and financial statistics methodology, the money market funds are classified as depository corporations.
[111] For example, a typical forecasting horizon in a central bank is quarterly, with monthly updates, as compared with an annual horizon at the ministry of finance with a semi-annual update.

3. The third level consolidates the DCS and the balance sheets of nonbank or other financial institutions into the *financial corporations survey* (FCS). The FCS thereby provides the stock and flow data for analyzing claims on and liabilities to all other sectors of the economy and nonresidents, at the level of the entire financial system. In particular, the FCS shows a comprehensive measure of credit extended by financial corporations.

Figure 6.1 Scope of the Financial System
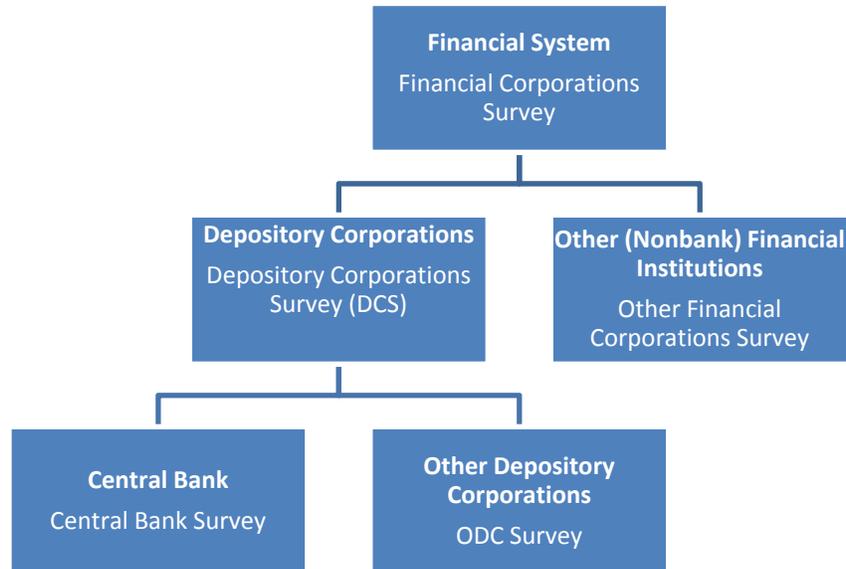
The following accounting conventions underlying the monetary statistics should be noted:

- *Stocks versus flows*. Monetary statistics are based on balance sheets and therefore are compiled in the form of stock data—that is, in terms of outstanding stocks of assets and liabilities at a particular point in time—rather than as flow data, which record transactions carried out over a period of time. However, the statistics are analyzed in terms of changes in stocks from one period to the next, or in terms of flows. Since changes in stocks need to be assessed in relation to the amount of liabilities outstanding at the beginning of the period, both stocks and flows are important.

- *Currency denomination*. Monetary accounts are expressed in domestic currency. All items denominated in foreign currency are converted into domestic currency at the exchange rate prevailing on the date the balance sheet is compiled (that is, the end-period exchange rate), because the balance sheet aggregates are stocks. This procedure is in contrast to the conversion of flow aggregates (for example, imports or exports), which are converted at an average exchange rate for a period.

- *Consolidation*. Unlike aggregation, consolidation involves cancelling out the transactions between the entities being consolidated. For example, in consolidating the accounts of the ODCs, interbank entries (items due from and to other banks) are

canceled out. As noted earlier, two levels of consolidation are carried out for the DCS: first, the balance sheets of all ODCs are consolidated to get the ODC survey; second, the central bank survey is consolidated with the ODC survey to obtain the DCS.

The central bank survey

The central bank is the national financial institution that exercises control over key aspects of the financial system and carries out such activities as issuing currency, managing international reserves, transacting with the IMF, and providing credit to the commercial banks. The central bank survey covers central banking functions performed by the central bank.[112]

Because of its unique nature, the central bank survey has a central place in monetary analysis. The creation of *monetary base* (also known as *high-powered money or the monetary base*) is a prerogative of the central bank—this is the main route through which the central bank controls the money supply and obtains seignorage. Since the central bank creates monetary base whenever it acquires assets and pays for them by creating liabilities, an analysis of its balance sheet is key to understanding the process of money creation. The central bank's operations, such as open market purchases or sales of government securities, its lending to government as well as to the commercial banks, and its purchases and sales of foreign exchange—known as *foreign exchange intervention*—all affect the amount of monetary base. By virtue of being the monopoly supplier of monetary base, the central bank controls monetary conditions in the economy.[113]

An illustrative central bank survey is shown in Table 6.1. The asset side focuses on credit extended to nonresidents and to each of the various domestic sectors. The liability side is structured to show the components of the monetary base.

Net foreign assets (NFA) are the central bank's claims on nonresidents less its liabilities to nonresidents. They include: (i) net official international reserves—on the asset side, including gold, foreign exchange, the country's reserve position in the IMF, and holdings of special drawing rights (SDRs); on the liability side, including short-term liabilities to foreign monetary authorities (that is, deposits of foreign central banks, swap facilities, overdrafts, and some medium- and long-term foreign debt, such as a country's use of IMF credit); and

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[112] In some countries, certain central banking functions—including currency issuance, the holding of international reserves, and transactions with the IMF—are performed wholly or partly by the central government (the treasury, for example). In such situations, the country may compile a monetary authorities account (covering the central bank plus government agencies that perform central bank functions), or else data on monetary authorities' activities outside the central bank may be shown as memorandum items accompanying the central bank survey.

[113] The degree of control the central bank has over the reserve money supply (that is, the degree to which the central bank can exercise independent monetary policy) is highly dependent on the exchange rate regime in the country. This was noted in Chapter 3, and is discussed further in Section 3 of this chapter.

(ii) any other net foreign assets that are not regarded as immediately available if a BOP problem develops and thus should not be included as net official international reserves.[114] In most countries, the second item is negligible so that net foreign assets of the central bank are equated with net official international reserves.

Table 6.1 Central Bank Survey	
Assets	Liabilities
Net foreign assets (NFA)	Monetary base (MB)
	Currency issued
Net claims on the central government (NCCG)	Held in banks
Claims on other depository corporations (CODC)	Held outside banks
Claims on other sectors of the economy sectors (COSE)	Deposits of other depository corporations
	Other deposits
Other items, net (OIN)	

Net claims on the central government (NCG) are direct loans and government securities held by the central bank. They are shown net of central government deposits, because the central government has easier access to credit than other sectors (including overdraft facilities at the central bank), so that its expenditures are not usually constrained by its deposits or cash balances. Claims on the central government are recorded net to facilitate the analysis of the central bank's financing of central government operations—the central bank's net credit to central government corresponds to the creation of high-powered money.

Claims on other depository corporations (CODC) include all direct credits to ODCs, as well as bills of exchange for discount from the ODCs accepted by the central bank. These claims are gross claims, since ODCs' deposits in the central bank are not netted out. The interest rate on central bank loans to ODCs is called the *discount rate* (in some countries the central bank affects its operations through repurchase operations and the corresponding rate is called the *repo rate*). Both the amount of central bank lending to ODCs and the interest rate on these loans can be important instruments of monetary policy. In a financial crisis, the central bank might need to undertake support operations (act as lender of last resort)—such as the provision of liquidity either through the discount window to the affected institutions directly or through open market operations to the financial market as a whole—in order to limit the risk of problems in particular institutions spreading to other parts of the financial system. Such operations are also reflected in claims on ODCs.

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[114] For example, in some countries, net foreign assets include the central bank's holdings of foreign currency that cannot be converted and claims arising from bilateral payments agreements. Since these assets can be used only for official settlements with specific countries, they should not be included in net official international reserves.

Claims on other sectors of the economy (COSE) are in general likely to be insignificant; typically it is the business of the commercial banks, not the central bank, to make loans to public nonfinancial corporations, other nonfinancial corporations, state and local governments, other financial corporations, households, and nonprofit institutions serving households. These claims are gross claims; the deposits of other sectors of the economy at the central bank are not netted out.

Other items, net (OIN) is a category that is usually shown on a net basis, either on the asset side (as in Table 6.1) or on the liability side. This category includes the physical assets of banks (on the asset side); equity (capital and reserves as a liability); profits or losses of the central bank; valuation adjustments to the net foreign asset position resulting from developments such as changes in the exchange rate and including any unrealized profits or losses resulting from these changes; and any other items that have not been classified elsewhere.

Monetary base (MB) is the main liability of the central bank, and it plays a central role in monetary analysis and policy. As noted earlier, it is sometimes called high powered money because any increase in monetary base usually leads to much larger increases in money and credit (Box 6.1).[115] Monetary base includes currency in circulation (that is, currency issued by and held outside the central bank) and deposits that ODCs use to satisfy reserve requirements and for clearing purposes. It excludes deposits of the central government and nonresidents with the central bank; these are netted against central bank claims on the central government and foreign assets, respectively. Monetary base may also contain additional components, depending on the types of liabilities issued by the central bank. Central bank liabilities to other financial corporations, nonfinancial corporations, and other resident sectors are usually included in monetary base.

Given that total assets must be equal to total liabilities, the balance sheet constraint of the central bank is summarized by the identity:

$$NFA+NCG+CODC+COSE+OIN=MB. \tag{6.1}$$

In terms of flows (changes in stocks), this identity can be written as:

$$\Delta MB=\Delta NFA+\Delta NCG+\Delta CODC+\Delta COSE+\Delta OIN. \tag{6.2}$$

The flow data in each category in the monetary accounts can be decomposed into separate flows for transactions, revaluations, and other changes in the volume of assets.

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[115] The central bank is the only entity in the economy that has the power to create money simply by writing a check against itself. For example, when the central bank purchases a government bond from a domestic resident, it pays for it by writing a check against itself. The resident can deposit the check in a commercial bank, which in turn deposits it at the central bank—the resulting increase in bank deposits with the central bank adds to reserve money.

Box. 6.1 The Money Multiplier

Any increase in reserve money serves as a base for financing subsequent monetary expansion by the banking system. Under the fractional reserve system, banks use their deposits to make loans, keeping only a fraction of their deposits as reserves. The *money multiplier* (*m*) is defined as the ratio of the money stock to reserve money. It shows how much broad money (BM) is created by one unit of monetary base (MB):

$$m = \frac{BM}{MB} \implies BM = m(MB).$$

An increase in the money supply can be due to increase in the multiplier and/or an increase in reserve money. The traditional approach to monetary policy has been to assume that the multiplier is constant, or at least predictable, so that the central bank could set reserve money in order to achieve a targeted level of money supply. However, many countries have found that with financial deregulation, which facilitates the creation of close substitutes for money, the stability of the money multiplier can no longer be taken for granted and consequently have abandoned this approach.

The other depository corporations (ODC) survey

ODCs consist of all resident financial corporations (except the central bank) that are mainly engaged in financial intermediation and that issue liabilities included in the national definition of broad money. They include commercial banks, merchant banks, savings banks, savings and loan associations, building societies and mortgage banks, credit unions and credit cooperatives, rural and agricultural banks, and travelers' check companies that mainly engage in financial corporation activities.

The ODC survey is not very different from the central bank survey (Table 6.2).

The asset side focuses on credit extended to nonresidents and to each of the various domestic sectors. The liability side is structured to show those liabilities that are included in broad money. Note that liabilities are classified by type of instrument—in terms of liquidity—rather than by sector. This classification system allows central banks to distinguish between various measures of the money supply on the basis of liquidity, which is determined by the liability's maturity.

ODCs hold a fraction of their total assets in the form of reserves with the central bank, as required by law, in an arrangement known as the fractional (or required) reserve system. The central bank mandates that ODCs have a certain percentage of their deposits available as cash (required reserves) to ensure that the money is readily available should depositors request it.[116] Most ODCs hold excess reserves at the central bank as an additional safety margin.

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[116] Until the 1990s, many central banks used required reserves to help control the money supply—an increase in the required reserve ratio limited bank lending and the growth of the money supply. But the level of required reserves has declined dramatically in recent years and their monetary role has diminished accordingly.

Table 6.2 ODC Survey	
Assets	Liabilities
Net foreign assets	Deposits included in broad money
	Transferable deposits
Claims on the central bank	Other (time and savings) deposits
Currency	Foreign currency deposits
Reserve deposits	
	Deposits excluded from broad money
Domestic credit	
Net claims on the central government	Liabilities to the central bank
Claims on other sectors of the economy	
Other items, net	

The depository corporations survey (DCS)

The DCS covers the accounts of the depository corporations and is a consolidation of the central bank survey and the ODC survey. The DCS constitutes the principal set of monetary statistics for macroeconomic policy. It is designed to present, in a timely fashion, data on monetary and credit developments for the entire depository corporations subsector. Therefore, it facilitates the analysis of broad money and its components, credit aggregates and their components, depository corporations' positions in foreign assets and liabilities, and the composition of other assets and liabilities. The DCS links the depository corporations' broad money liabilities to its foreign assets and liabilities and to its claims on and liabilities to central government, thereby linking the monetary statistics to the BOP and government finance statistics, respectively.

A typical DCS is illustrated in Table 6.3. On the liability side, the DCS contains the overall liquidity generated by the depository corporations, or the stock of money. Narrowly defined, the money stock consists of currency in circulation outside the depository corporations plus transferable deposits at the depository corporations. A broader definition of money consists of time and savings deposits at the depository corporations and short-term securities issued by the depository corporations. The concept of *broad money (BM)* covers the liabilities of the depository corporations included in broad money. In particular, in addition to *narrow money* it includes long-term (saving) deposits, certificates of deposit, foreign currency deposits of residents, and security repurchase agreements.

Table 6.3 Depository Corporations Survey (DCS)

Asset	Liabilities

Net foreign assets (*NFA*)
    NFA of the central bank (*NFA*)
    NFA of the ODCs (*ONFA*)
 	
Domestic credit (*DC*)
    Net claims on the central government (*NCCG*)
    Claims on other sectors of the economy (*COSE*)
 	
Other items, net (*OIN*)
	Broad money (*BM*)
	        Currency outside depository corporations
	        Transferable deposits
	        Time and savings deposits
	    Foreign currency deposits
	    Debt securities

The balance sheet identity implies that broad money liabilities (BM) equal the sum of net foreign assets (NFA), domestic credit (DC), and other items, net (OIN):

$$BM = NFA + DC + OIN \tag{6.3}$$

Total flows (closing stocks less opening stocks) for the DCS can be expressed as:

$$\Delta BM = \Delta NFA + \Delta DC + \Delta OIN \tag{6.4}$$

where:

$$\Delta DC = \Delta NCG + \Delta COSE \tag{6.5}$$

Dividing both sides of equation (6.4) by the opening stock of broad money allows us to express the growth rate of broad money in terms of the contributions of its components:

$$\frac{\Delta BM}{BM} = \frac{\Delta NFA}{BM} + \frac{\Delta DC}{BM} + \frac{\Delta OIN}{BM} \tag{6.6}$$

or:

$$\frac{\Delta BM}{BM} = \left(\frac{\Delta NFA}{NFA}\right)\left(\frac{NFA}{BM}\right) + \left(\frac{\Delta DC}{DC}\right)\left(\frac{DC}{BM}\right) + \left(\frac{\Delta OIN}{OIN}\right)\left(\frac{OIN}{BM}\right) \tag{6.7}$$

that is, the growth rate of broad money is equal to the sum of the weighted growth rates of its components.

The other financial corporations (OFCs) survey (OFCS)

The OFCS consist of data for all other resident financial corporations that are mainly engaged in financial intermediation, but that do not issue liabilities included in the definition of broad money. Thus, the OFCS consolidates the accounts of the following types of OFCs:

non-MMF investment funds, captive financial institutions and money lenders, insurance corporations, pension funds, other financial intermediaries except insurance corporations and pension funds, and financial auxiliaries.

Similar to the ODCS, the consolidation adjustment within Other Items (net) in the OFCS shows the discrepancy that remains after netting out inter-OFC claims and liabilities in the consolidation process.

The financial corporations survey (FCS)

The FCS comprises surveys for the three subsectors of the financial corporations subsector, namely, the central bank, ODCs, and OFCs. As mentioned at the beginning of this chapter, the CBS and the ODC survey are consolidated to obtain the DCS, and the three subsector surveys (CBS, ODCS, and OFCS) are consolidated to obtain the FCS.

The FCS provides comprehensive data for the financial corporations sector's claims on and liabilities to all domestic sectors and nonresidents. The FCS contains the same asset categories as the DCS. However, the FCS contains considerably fewer subcategories of liabilities than in the DCS, because the FCS is not structured to show the liability components of broad money. The FCS also contains a separate liability category for insurance technical reserves, reflecting the significant contribution of such reserves to the total liabilities of the financial corporations sector in many countries.

We shall not go into further detail on the FCS as the depository corporations and the DCS are the main focus in the financial programming exercise. But it is important that the financial sector as a whole should be assessed for vulnerability and debt sustainability; financial sector indicators will be discussed in Section 3.

6.2   Links to Other Sectors

The DCS highlights two essential relations: the link between a country's external position and the net foreign assets of the depository corporations, and the direct link between the central government accounts and government financing provided by the depository corporations. The depository corporations are also linked to the real sector (and the national accounts) through the demand for money and through credit provided to the private sector.

Link to the BOP

As discussed in Chapter 4, the overall balance in the BOP is financed by the change in the central bank's net international reserves. The change in the central bank's reserves is largely the same whether it is derived from the DCS or from the BOP accounting identity. Any discrepancy is due to (i) valuation changes that affect ΔNFA but not ΔRES and (ii) ΔRES being a gross reserve concept while ΔNFA are recorded on a net basis. To a large extent these discrepancies can be quantified.

In the DCS:

$$\Delta\text{NFA} = \Delta\text{BM} - \Delta\text{DC} - \Delta\text{ONFA} - \Delta\text{OIN} . \tag{6.8}$$

And in the BOP:

$$CAB + FI + \Delta RES = 0. \tag{6.9}$$

Since $\Delta NFA = -\Delta RES$, we can write:[117]

$$\Delta DC + \Delta ONFA + \Delta OIN - \Delta BM = \Delta RES \tag{6.10}$$

The DCS balance sheet identity indicates that changes in broad money liabilities can arise from changes in the foreign assets and foreign liabilities of the depository corporations. For instance, a favorable external environment and robust macroeconomic performance may attract strong capital inflows, leading to a buildup of net international reserves and a concomitant increase in the broad money supply. To ease the threat of currency appreciation or inflation, the central bank may attempt what is known as *sterilization* of the capital flows:

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[117] As noted in Chapter 4, an increase in reserves is recorded with a negative sign in the BOP accounts. But in the DCS, an increase in the NFA is recorded with a positive sign. Therefore, $\Delta RES = -\Delta NFA$. In countries where the net foreign position of the commercial banks is under the effective control of the central bank, it can be argued that net foreign assets of depository corporations (*ONFA*) should be included with ΔNFA for the purpose of arriving at ΔRES—in this case ΔRES would have the same coverage as ΔNFA of the depository corporations.

this involves reducing the domestic component of the monetary base—usually by selling treasury bills and other instruments—to offset the increase in NFA (an example to illustrate sterilization is shown later in this chapter).

Abstracting from changes in net foreign assets of ODCs and OIN, any excess of domestic credit expansion over the increase in the broad money stock (which, in equilibrium, is equal to the demand for money) is reflected in a decline in the central bank's net international reserves. This relation constitutes the basis of the monetary approach to the BOP and provides the theoretical justification for setting ceilings on net domestic assets in IMF-supported programs.[118]

Link to the government accounts

The depository corporation's net claims on the government appear on the asset side of the DCS. The components of $\Delta NCCG$ in the DCS are directly linked to the government finance statistics. Data on the transaction flows for the underlying components of net claims on the central government can be used to analyze the expansionary or contractionary effects on broad money that can arise from financial transactions between the depository corporations and the central government. Growth in the claims on the central government—through a rise in depository corporations' holdings of central government securities, direct lending to central government, and/or reduction in central government deposit holdings—will exert an expansionary influence on the broad-money liabilities of the banking system.

Link to the private sector

On the asset side, the credit the depository corporations provide to the private sector has a clear impact on developments and growth in that sector. $\Delta COSE$ shows the total flows arising from changes in the depository corporation's claims on resident sectors other than the government. An increase in these claims—a positive $\Delta COSE$—has an expansionary effect on broad money liabilities, whereas a decrease in these claims has a contractionary effect. Data on the sectoral components of $\Delta COSE$ can be used to analyze the sources of expansionary or contractionary effects on broad money. On the liability side, the private sector's desire to hold the cash balances generated by the depository corporations constitutes an important determinant of the rate of inflation in the economy.

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[118] Indeed, the distinction between money of domestic origin (domestic credit) and money of external origin (net foreign assets) and the linkages between the two are at the core of the IMF's traditional financial programming framework. This is discussed in Chapter 15.

6.3 Monetary Analysis

Monetary and liquidity aggregates

Money, which takes the form of various types of financial assets, is held for its usability as a medium of exchange, store of value, or both. In constructing money aggregates, it can be useful to evaluate the degree of "moneyness" of a wide array of financial assets, focusing on the extent to which each type of financial asset provides liquidity and a store of value. Currency and transferable deposits are the most liquid financial assets. In many countries, they comprise what is often termed *narrow money*.

National definitions of *broad money* vary considerably across countries. All countries include currency and transferable deposits in their broad money aggregates.[119] Once we move from currency and transferable deposits to other components of broad money, liquidity becomes a relative concept, and store of value becomes a more prominent property—some broad money components are relatively liquid, being convertible into currency or transferable deposits without incurring significant costs or delay, while others are less liquid but generate greater interest or noninterest returns. Examples of other broad money components include all types of nontransferable deposits such as term deposits, savings deposits, and foreign currency denominated deposits. Financial assets must possess at least some liquidity if they are to be included in broad money; hence loans, shares and other equity, financial derivatives, insurance technical reserves, and other accounts payable/receivable are usually excluded from broad money.

Liquidity aggregates include, in addition to broad money liabilities, other liabilities that are viewed as somewhat liquid, but not sufficiently liquid to be included in broad money as nationally defined. Examples are treasury bills and short term securities issued by the central government and commercial paper and other securities issued by financial and nonfinancial corporations.

Credit and debt aggregates

Credit creation involves the provision of resources by one institutional unit (the creditor or lender) to another unit (the debtor or borrower)—the creditor acquires a financial claim, and the debtor incurs a liability to repay. Credit is a major link in the money transmission process. Credit to nonfinancial sectors finances production, consumption, and capital formation. A credit multiplier exists in the same sense as a money multiplier and, except in cases where money expansion arises from external factors, credit expansion is usually accompanied by an expansion of the money stock.

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[119] When foreign currency is widely accepted as a medium of exchange within a country, holdings of resident units other than depository corporations should, in principle, be included in the currency component of broad money.

The surveys of the financial corporations sector presented in Section 1 provide data on credit extended by financial corporations to other domestic sectors.[120] Credit measures that are important for the formulation and implementation of monetary and other macroeconomic policy include:

- *Central bank credit to ODCs:* Extension of credit by the central bank to ODCs (and sometimes to other financial corporations) is important for implementing monetary policy. Such credit may be extended to provide liquidity to fund ongoing operations of ODCs; enable ODCs to respond to seasonal credit demand; influence national financial conditions and the amount of broad money; or provide emergency assistance. The central bank can either place deposits in, or grant loans to, financial corporations—either method provides ODCs with funds to support expansion of credit, leading to growth of broad money. Central banks regulate the cost at which financial corporations acquire such funds and attach other terms and conditions to the access to such credit, thereby influencing credit and monetary conditions in the economy.

- *Credit to the central government:* As noted in Chapter 5, the central government may borrow from the domestic banking sector to finance its fiscal deficit, but excessive resort to such borrowing carries the risk of high inflation and/or crowding out of private investment.

- *Central government credit to financial corporations:* In some countries, the central government may supply credit to financial corporations by extending loans or by providing deposits that are intended to be used for credit expansion by the financial corporations.[121]

Debt gives rise to future payment obligations. As a consequence, debt liabilities have the potential to create circumstances that render an institutional unit, a sector, and even the whole economy vulnerable to liquidity and sustainability problems. For these reasons, there is analytical interest in debt measures. Among financial instruments, deposits, loans, securities other than shares and other accounts payable are all debt instruments.

A key element in debt analysis is *maturity structure*, although features such as callability reduce, to some extent, the importance of the maturity of some debt. For maturity analysis, debt data should be disaggregated, at a minimum, into short- and long-term categories, and more detailed maturity breakdowns are often useful. Countries compile a wide range of debt measures, covering specific sectors and subsectors or an entire economy.[122] In many cases,

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[120] Credit measures cover financial assets only and therefore exclude contingent positions such as lines of credit, loan commitments, and guarantees. Supplementary information on such contingent positions, if available, may be of value in projecting credit expansion and assessing credit policy.

[121] As noted in Chapter 5, central governments also often provide credit to nonfinancial sectors to foster public policy goals such as development of specific industries or regions or to provide emergency aid. Credit from the central government is often granted at subsidized (below-market) interest rates.

[122] Data can be compiled on either an original or remaining maturity basis.

there are credit measures that correspond to the debt measures (for example, consumer credit and consumer debt). Some of the more common debt measures are:

- *Household debt:* Household debt is incurred for a variety of purposes. Often debt is incurred to finance the purchase of specific assets that are pledged as collateral for loans. For example, the assets being purchased usually collateralize mortgage loans and auto loans. Units in the household sector also incur debt for current consumption in the home, for financing education or medical expenses, for obtaining working capital or longer-term funds for proprietorships, and for funding the purchase of equity or other financial assets. Interest rates, the amount of monthly payments for installment loans, wealth, and expectations regarding future income all affect households' decisions to borrow. Because of the difficulty of obtaining data directly from households, data on consumer debt are usually derived from creditor sources.

- *Business debt:* Corporations and other business entities incur short-term debt to finance current production, acquire inventories, and meet recurring expenses such as tax and interest payments. They also acquire long-term debt to finance capital formation. Corporations may finance these activities by obtaining trade credit, by borrowing from financial corporations, and by issuing securities.

- *Public sector debt:* Data on government debt are often disaggregated by debt to residents and to nonresidents. Supplementary data on debt that is incurred by other sectors, but is guaranteed by the government, should also be compiled if the amounts of such guarantees are substantial (see Chapter 9).

- *External debt:* As noted in Chapter 4, external debt refers to debt liabilities of a country, sector, or unit to nonresidents that require payment of interest and/or principal by the debtor at some point in the future. External debt statistics, including debt service payments data, are used in the analysis of vulnerability to solvency and/or liquidity problems (see Chapter 10). They are useful for general macroeconomic analysis, for negotiations of debt rescheduling, and for preparation of estimates of international flows of property income.

Interest rates and the yield curve

In an environment of low and stable inflation, the behavior of *nominal interest rates* can serve as a useful indicator of monetary developments and the stance of monetary policy. But in general, and particularly in the presence of high inflation, one should focus instead on movements of the *real interest rate* to properly assess monetary developments and policies. The real interest rate (r, in percent) is the nominal interest rate (i, in percent) adjusted for the expected rate of inflation (π^e, in percent):

$$1 + \frac{r}{100} = \frac{1+(i/100)}{1+(\pi^e/100)}. \tag{6.11}$$

When inflation is low, the real interest rate can be approximated by:

$$r \approx i - \pi^e . \tag{6.12}$$

Of course, interest rates do not all move together. In reality, the interest rates on bonds of different maturities behave quite independently of each other, with short-term rates and long-term rates often moving in opposite directions simultaneously. What is important is the overall pattern of interest rate movement, and what it says about the future of the economy. The *yield curve*—or the *term structure of interest rates*—captures the overall movement of interest rates (Box 6.2). It plots the interest rate ("yield") against various maturities of a given financial security.

Exchange rate regimes, intervention in the foreign exchange market, and monetary analysis

Exchange rate concepts and exchange rate regimes were covered in Chapter 3. As mentioned in that chapter, exchange rate policy and monetary policy are often closely linked, and the type of exchange rate regime has important implications for the conduct of monetary policy. In countries with "hard peg" exchange rate arrangements, such as formal dollarization, membership in a currency union, or a currency board arrangement, there is no central bank in the traditional sense. Specifically, under formal dollarization or a currency union, currency issuance is no longer a function of the domestic monetary authorities; under a currency board arrangement, the currency board's balance sheet basically reduces to net foreign assets (on the asset side) and currency issued (on the liability side).[123] Hence, there is practically no scope for independent monetary policy.

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[123] Under such regimes, there is no room for traditional central bank functions, such as monetary control and lender-of-last-resort; some flexibility may be afforded under a currency board arrangement, depending on how strict the banking rules of the currency board arrangement are.

Box 6.2 Shapes of the Yield Curve

Yield curves are normally upward sloping—the longer the maturity, the higher the yield. The reason is that longer maturities typically entail greater risks (more things can affect the value of the bond in ten years than in two, such as default and higher inflation), and investors who risk their money for longer periods expect to get a bigger reward—in the form of higher interest—than those who risk their money for shorter time periods. If the slope of the yield curve is very steep, this means that investors expect the economy to improve quickly in the future. This situation is typical just after the end of a recession, as the economy begins to turn around and interest rates begin to rise. At that point, long-term investors fear being locked into low rates, so they demand greater compensation more than short-term investors, who can trade out of their securities in a matter of months, giving them the flexibility to buy higher-yielding securities when the opportunity arises.

The opposite case—a downward sloping (inverted) yield curve, with short-term interest rates higher than longer-term rates—also can occur. This situation is usually associated with economic downturns, even recessions. If investors think that interest rates (and economic growth) are going to fall even lower in the near future, investors may be happy to look in long-term rates that are lower than prevailing short-term rates.

Also, institutional or political changes may cause expected future interest rate to fall, leading to an inverted yield curve. For example, in early 2005, the yield curve for Turkish paper was inverted as the markets anticipated that Turkey's eventual accession to the European Union (EU) would generate a fall in inflation and a convergence of long-term rates toward EU levels.

Under fixed or crawling exchange rate pegs or bands, the central bank stands ready to maintain the fixed parity through direct intervention (via sale/purchase of foreign exchange in the market) or indirect intervention (for example, via aggressive use of interest rate policy, imposition of foreign exchange regulations, exercise of moral suasion that constrains foreign exchange activity, or through intervention by other public institutions). Under managed and independently floating exchange rate regimes, the central bank may (and often does) intervene in the foreign exchange market—to influence either the exchange rate or its rate of change, but without having committed to a specific exchange rate path or target range.

The stronger the exchange rate commitment, the less room for the central bank to conduct an independent monetary policy. This is straightforward in the case of indirect intervention: if the interest rate is tightly constrained by a narrow exchange rate target, then there is little or no scope for using it to directly target domestic inflation and/or economic activity. In the case in which the central bank uses direct intervention, a sale (purchase) of foreign assets leads to a decline in domestic money supply, as domestic currency is withdrawn from the market (see Box 6.3). To preserve money market equilibrium, the domestic interest rate has to rise, which may or may not work in the same direction as the desired change in monetary policy.

Box 6.3 Foreign Exchange Intervention and the Money Supply

Suppose country X's central bank survey consists of the following assets and liabilities:

Assets		Liabilities	
Net foreign assets	1000	Currency issued	2000
Domestic assets	1500	Deposits by ODCs	500

Now suppose the central bank goes to the foreign exchange market and sells foreign bonds for 100 units of domestic currency (call them pesos). The sale reduces official holdings of foreign assets from 1000 to 900 pesos, causing the assets side of the central bank balance sheet to shrink from 2500 to 2400 pesos. The payment the central bank receives for these foreign assets automatically reduces its liabilities by 100 pesos as well.

- If the central bank is paid with domestic currency, the currency goes into its vault and out of circulation—thus, currency issued falls by 100 pesos, and reserve money declines by 100 pesos as a result of the central bank's intervention in the foreign exchange market:

Assets		Liabilities	
Net foreign assets	900	Currency issued	1900
Domestic assets	1500	Deposits by ODCs	500

- If the central bank is paid with a check for 100 pesos drawn on an account at a domestic commercial bank, the central bank debits 100 pesos from the commercial bank's account with the central bank (and the commercial bank debits 100 pesos from the bond buyer's account). Once again, the central bank's liabilities fall by 100 pesos and the domestic money supply shrinks by that amount:

Assets		Liabilities	
Net foreign assets	900	Currency issued	2000
Domestic assets	1500	Deposits by ODCs	400

- If the central bank decides to sterilize its foreign exchange intervention, that is, negate the effect of its foreign asset sale on the domestic money supply, it can buy 100 pesos of domestic assets, such as government bonds, with a check written on itself—in this way, the 100-peso decrease in the central bank's foreign assets is matched with a 100-peso increase in its domestic assets, so the liabilities side of the balance sheet (reserve money) does not change:

Assets		Liabilities	
Net foreign assets	900	Currency issued	2000
Domestic assets	1600	Deposits by ODCs	500

In practice, it may be possible to break the link between foreign exchange intervention, the money supply, and the domestic interest rate through *sterilization*. For instance, suppose capital inflows push the exchange rate up and the central bank intervenes to stem the appreciation. Intervention leads to an expansion in the domestic money supply, which could be inflationary. To withdraw liquidity, the central bank can sell securities in the open market, thereby sterilizing the intervention. The problem with sterilized intervention is that it can be costly to the central bank if the interest it pays on domestic securities is higher than the

interest earned on foreign reserves, which is often the case in developing countries. A second problem is that sterilized intervention may perpetuate the capital inflows and delay external adjustment: if capital inflows were allowed to increase domestic liquidity, the domestic interest rate would decline (to preserve money market equilibrium) and incentives for additional foreign capital to come in would be reduced. Sterilized intervention prevents this automatic adjustment mechanism from operating.

Financial sector vulnerabilities

Before forecasting monetary aggregates as part of a baseline scenario, it is important to have a sense of the health of the financial system. Weaknesses in bank balance sheets can affect the supply of credit and, through that channel, the real sector. For example, losses resulting from nonperforming loans or increases in short term interest rates erode bank capital. If they cannot raise capital easily in the short run, banks may face a capital shortage and be unable to increase credit at the desired pace. Also, mounting losses may lead to doubts about the quality of the banks' portfolio, eroding the confidence of depositors and other creditors. Weak banks will see the cost of borrowing on the interbank market rise and, in extreme cases, may lose access to that market altogether. Depositors, fearing insolvency, may rush to withdraw their deposits, and credit lines from foreign investors may also dry up. As a result, weak banks will be forced to withdraw credit lines to their borrowers, thereby transmitting the liquidity shortage to the corporate sector.

The macroeconomic consequences of bank weaknesses are likely to be limited if there are sizable segments of the banking sector that are healthy and retain the confidence of depositors and other creditors. Panicked depositors will switch deposits from weak to healthy banks, and these banks will be able to reinvest the deposits to fund the corporate sector. Also, healthy banks will likely be able to continue borrowing from foreign investors to continue funding profitable investment projects inside the country.

By contrast, if most banks experience liquidity problems, because they are weak or because their creditors cannot distinguish the strong from the weak, the effects of bank weakness on macroeconomic stability can be substantial. Withdrawn deposits will not find their way back into the domestic financial system but will be kept as cash or, in relatively open economies, invested abroad. The exchange rate is likely to come under pressure, encouraging further flight from the domestic currency. If domestic banks also have direct or indirect exposure to foreign exchange risk, the currency depreciation will add to the losses, taking the crisis one step further.[124]

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[124] Banks may have indirect exposure to foreign exchange risk when they lend in foreign currency to parties who do not have foreign exchange revenues or other hedges. In this case, when the exchange rate depreciates those parties will likely default, and banks will experience losses. Another form of indirect exposure is when banks hedge their foreign exchange position using derivatives, but the parties providing the hedge are not able to fulfill the contracts in case of a sharp depreciation. If banks have foreign exchange exposures, a sharp depreciation of the exchange rate will weaken bank balance sheets even if other sources of weakness are not at work.

Weakness in the banking sector can thus lead to a sharp decline in bank deposits, other bank liabilities, and bank credit. Production and investment may fall as credit is no longer available. Bank weakness can also lead to capital outflows and depreciation of the exchange rate, as foreign creditors withdraw their credit lines to domestic banks and domestic investors look for a safe store of value abroad.

The policymakers' response to mounting bank weaknesses can have important effects on crisis resolution. For instance, the central bank, in its role as *lender of last resort*, will have to decide to what extent to fulfill the demand for liquidity from weak banks. Lender-of-last resort operations will be reflected in the monetary accounts as an increase in domestic credit creation by the central bank and a corresponding increase in liabilities to the central bank in the ODC survey. Even though these operations are consolidated (canceled out) in the compilation of the DCS, funds provided by the central bank are available to ODCs and are reported as ODC assets until used—either changed to other types of assets (that will show up in the DCS), or used to reduce liabilities.

Lender-of-last-resort lending can be useful if the banks are experiencing a temporary loss of liquidity. It may also buy time to make clear to the public the extent of bank problems and identify which banks remain healthy. On the other hand, if losses are widespread and the problem is one of insolvency, lender-of-last-resort lending will only postpone the inevitable and expose the central bank to substantial losses. Another concern is that, if the public fears a large depreciation of the exchange rate, the domestic currency liquidity injected by the central bank may simply fuel additional capital flight and worsen pressures on the exchange rate.

Lender-of-last-resort lending may also be complicated if a sizable fraction of bank deposits is denominated in foreign currency, as is the case in a number of developing and emerging economies. In this case, the central bank needs to provide domestic banks with foreign currency to satisfy deposit withdrawals, and official reserves may not be sufficient for this purpose.

Policymakers can try to contain the crisis by offering a *government guarantee on bank deposits* and, possibly, other bank liabilities.[125] As with lender-of-last-resort lending, however, guaranteeing the domestic currency value of bank liabilities may not be sufficient if depositors fear a sharp devaluation. In those cases, capital flight would still be the most attractive option. Government guarantees may also be of limited use if the solvency of the government itself is questionable.

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[125] If the country has already in place a deposit insurance system, and the system is credible, then further guarantees may be needed only to extend the amount of protection. For instance, many deposit insurance schemes insure deposits only up to a maximum, and it may be necessary to revoke this ceiling during a crisis. In some cases, deposit insurance may not be credible if the deposit insurance fund is underfunded.

Thus, crisis containment is very challenging when financial sector weaknesses occur in economies with a very open financial account and where banks have substantial direct or indirect foreign exchange exposure. A comprehensive policy package to reestablish confidence in the exchange rate and in a core of domestic financial institutions is necessary.

Because banking crises can be very disruptive, it is important to try to identify financial sector weaknesses at an early stage and take measures to control the spread of insolvency and maintain the public's confidence. One of the tasks of prudential supervision is to give bank supervisory agencies the instruments to identify problems and the powers to force banks to take corrective action. Banks need to report information regularly both to supervisors and to market analysts. The quality of the reported information needs to be bolstered by the adoption of good accounting standards, auditing requirements, and off-site and on-site inspections by supervisors. It is important that countries liberalize their financial sectors in a manner that stays in pace with their capacity to monitor financial developments effectively and guard against imprudent behavior.

At the aggregate level, *financial soundness indicators* (FSIs) are measures that indicate the current financial health and soundness of a country's financial institutions, and their corporate and household counterparts. They include both aggregated individual institution data and indicators that are representative of the markets in which the financial institutions operate. FSIs are used in *macro prudential analysis*, which is the assessment and surveillance of the strengths and vulnerabilities of a financial system (IMF, 2006).

FSIs for deposit takers

FSIs for deposit takers are primarily derived by using consolidated underlying data for the deposit takers sector as a whole as numerators and denominators—that is, FSIs are compiled at the sector level on a weighted-by-contribution approach[126] The so-called CAMELS framework is a useful way to organize them—it involves the analysis of six groups of indicators: (i) Capital adequacy; (ii) Asset quality; (iii) Management soundness; (iv) Earnings; (v) Liquidity; and (vi) Sensitivity to market risk.

Capital adequacy and availability measures the ability of financial institutions to absorb losses. Aggregate risk-based capital ratios (the ratio of regulatory capital to risk-weighted assets) are the most common indicators of capital adequacy.

Risks to the solvency of financial institutions most often derive from impairment of assets. Monitoring credit risk involves looking at the bank *asset quality* and the quality of off-balance-sheet positions—namely, their repayment performance and capacity to pay,

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[126] Simple aggregation can disguise important structural information. Therefore, based on the *FSI Compilation Guide,* FSIs should be compiled using a weighted-by-contribution approach. In addition,, it is often important to supplement the FSI data for the sector as a whole with information on dispersion or peer-group analysis.

diversification by individual borrower, by sector, and by country, and currency composition (notably in countries that allow domestic lending in foreign currency).

Management soundness is difficult to capture with quantitative indicators. While this aspect is key to bank performance and, to some extent, is reflected in the institution's financial records, its evaluation is primarily a qualitative exercise (and an integral part of banking supervision).

As weak profit performance can ultimately threaten bank solvency, it is important to monitor *bank profitability*, which is often sensitive to poor asset quality and unsustainable asset/liability management. Accounting data on bank margins, income and expenses are the most widely used indicators of bank profitability. Common operating ratios include net income to assets (also known as "return on assets" or ROA) and net income to equity (also known as "return on equity" or ROE).

Even solvent financial institutions may suffer liquidity problems, such as those resulting from shocks to depositor or investor confidence—hence the need to look at aspects of *bank liquidity*. As the liquidity of bank assets and liabilities depends on a country's liquidity infrastructure, including access to and depth of external and domestic money and capital markets, it is also important to monitor systemic liquidity. Systemic liquidity can be captured by indicators of the tightness and depth of key markets, such as bid-ask spreads and turnover ratios, and relevant sectoral balance sheet indicators (e.g., reserve adequacy, funding volatility) that influence bank and market liquidity.

Banks are increasingly involved in diversified operations that make them *sensitive to market risks*. Interest rate risk can be monitored through indicators of the interest rate mismatch of bank assets and liabilities, such as durations or repricing periods. Net open positions can be used to assess exchange rate and other price risks.

FSIs for other financial corporations and nonfinancial sectors

Indicators of the health of financial systems should not simply look at the banking sector or ODCs. Risks to financial system stability can also derive from developments in other financial corporations (OFCs), the corporate sector, households, and the real estate market. In many countries, OFCs play a large enough role to be considered systemically important. OFCs and ODCs often have ownership and investment linkages that make each subsector vulnerable to adverse developments in the other. [127]

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[127] For instance, the collapse of OFCs during the Asian turmoil in the late 1990s contributed directly or indirectly to systemic financial crises. The systemic risks arising from a particular class of OFCs—the highly leveraged financial institutions—were highlighted by market turmoil following the near-failure of a large hedge fund in 1998.

The quality of financial institutions' loan portfolios is directly dependent upon the financial health and profitability of the institutions' borrowers, especially the nonfinancial corporate sector. The corporate sector is typically exposed to shocks that affect its future cash flow and value of collateral—such as falls in asset prices, increases in interest rates, or a slowdown in growth. Prolonged distress in the corporate sector negatively affects firms' repayment capacity and creditworthiness, and will result in a worsening of bank asset quality and ultimately in higher nonperforming loans (NPLs). Thus, measures of corporate health—notably focusing on leverage, cash flow adequacy, profitability, and foreign currency exposure—can be valuable in detecting potential bank problems at an early stage.

While banks are often more exposed to companies than to households, their exposure to the latter can be substantial in some countries. Moreover, household consumption behavior has a strong effect on banks' main credit customers—the corporate sector—and household asset allocation decisions have important implications for bank liabilities (customer deposits) and asset prices. The vulnerability of households may be assessed through data on household debt to GDP and household debt service and principal payments to income. Financial institutions' vulnerability to households may be assessed through data on credit outstanding to the sector.

In many countries, unbalanced real estate market developments have contributed to financial sector distress. Rapid increases in real estate prices—often fueled by expansionary monetary policies or by large capital inflows—followed by a sharp economic downturn, can have a detrimental impact on financial sector profitability by affecting credit quality and the value of collateral. Thus, residential and commercial real estate prices are included in the list of FSIs along with depository corporations' lending in real estate. These additional FSIs are summarized in Box 6.4.

Box 6.4 Core and Encouraged Set of FSIs

The CAMELS framework specifies the core set of FSIs. In addition to these, the IMF's *Financial Soundness Indicators Compilation Guide* lists the encouraged set of FSIs, which includes additional indicators for deposit takers, as well as data on other institutions and markets that are relevant in assessing financial stability:

Core Set

Deposit takers	
Capital adequacy	Regulatory capital to risk-weighted assets
	Regulatory Tier 1 capital to risk-weighted assets
	Nonperforming loans net of provisions to capital
Asset quality	Nonperforming loans to total gross loans
	Sectoral distribution of loans to total loans
Earnings and profitability	Return on assets
	Return on equity
	Interest margin to gross income
	Noninterest expenses to gross income
Liquidity	Liquid assets to total assets (liquid asset ratio)
	Liquid assets to short-term liabilities
Sensitivity to market risk	Net open position in foreign exchange to capital

Encouraged Set

Deposit takers	Capital to assets
	Large exposures to capital
	Geographical distribution of loans to total loans
	Gross asset position in financial derivatives to capital
	Gross liability position in financial derivatives to capital
	Trading income to total income
	Personnel expenses to noninterest expenses
	Spread between reference lending and deposit rates
	Spread between highest and lowest interbank rate
	Customer deposits to total (non-interbank) loans
	Foreign-currency-denominated loans to total loans
	Foreign-currency-denominated liabilities to total liabilities
	Net open position in equities to capital
Other financial corporations	Assets to total financial system assets
	Assets to GDP
Nonfinancial corporations	Total debt to equity
	Return on equity
	Earnings to interest and principal expenses
	Net foreign exchange exposure to equity
	Number of bankruptcy proceedings initiated
Households	Household debt to GDP
	Household debt service and principal payments to income
Market liquidity	Average bid-ask spread in the securities market (or in other markets that are most relevant to bank liquidity, such as foreign exchange markets)
	Average daily turnover ratio in the securities market (or in other markets that are most relevant to bank liquidity, such as foreign exchange markets)
Real estate markets	Residential real estate prices
	Commercial real estate prices
	Residential real estate loans to total loans
	Commercial real estate loans to total loans

Other indicators of financial stability

Monitoring and analyzing FSIs are just one element in an overall assessment of financial stability. Information from a bank's financial statements and balance sheet can be useful, but because it is typically available only with a lag and it can be manipulated, it may not be sufficient to reveal vulnerabilities that may emerge suddenly. *Market information*, when available, can be very useful. A sudden decline in the *stock price* of a bank may signal an impending problem. Also, an *increase in deposit interest rates* or other interest rates the bank pays on its liabilities can be a signal of trouble. *Loss of access to the interbank market* or access at high interest rates is also evidence something is amiss, especially since other banks are likely to have relatively good information on the financial status of one of their peers. *Rapid growth of exposure* to particular clients may also be an attempt to conceal nonperforming loans through ever greening (by lending the borrower the money needed to cover payments due).

These elements, which feed into macro prudential analysis, will help to identify various dimensions of risks as well as the capacity of the system to cope with and manage these risks, thereby helping to form a judgment on overall financial stability. Using FSIs and other indicators, a variety of methods are available to derive conclusions about the stability of financial systems—from simple ratio analyses to more complex macro- and microeconomic modeling.

6.4   Forecasting the DCS

Forecasting the DCS involves the following steps: (i) forecasting the demand for broad money: assuming equilibrium in the money market, this pins down the money supply, or the liability side of the DCS; (ii) forecasting the components on the asset side of the DCS, taking account of consistency with the BOP forecast, government sector forecast, and inflation forecast obtained earlier.

Forecasting money demand

In principle, money demand can be estimated in two ways. The first, less formal, approach concentrates on trends in the velocity of money. The other is based on the use of regression techniques to estimate a demand for money function. The choice of method is generally dictated by the availability of data and the stability of institutional arrangements and behavioral relations over time in the country in question.

Velocity approach

The *equation of exchange* states that the amount of money multiplied by the velocity of circulation (how fast money is changing hands) is equal to total spending:

$$MV = PY .$$ (6.13)

where M is the quantity of money, V is the velocity of money, P is the price level, and Y is the number of transactions (proxied by real income or GDP). Equation (6.13) is always true by definition: if an economy had 5 billion dollars of money, and each dollar was spent four times a month, total monthly spending must be 20 billion dollars (assuming no barter transactions).

Rewriting equation (6.13) in terms of changes in variables gives us:

$$1+\frac{\Delta M}{M} = \frac{\left(1+\frac{\Delta P}{P}\right)\left(1+\frac{\Delta Y}{Y}\right)}{1+\frac{\Delta V}{V}} .$$ (6.14)

If V can be predicted with confidence, then we can estimate the level of the money supply that is consistent with the forecast of real GDP growth and inflation (the rate of growth of the GDP deflator).[128] For example, if one assumes a constant velocity of money, then Equation (6.14) is a simple restatement of the *quantity theory of money* equation of exchange (Chapter 3)—for a constant velocity, growth in the money supply beyond the growth in real incomes will lead to inflation; the higher the growth in the money supply, the higher the inflation rate. In reality, however, velocity is seldom constant. In many countries, financial market reforms and financial innovations can change the velocity of broad money in either direction. Increased monetization of the economy or financial deepening may cause velocity to decline over time. On the other hand, reforms that increase the number of banks and spur institutional and technological advances such as credit cards, cash machines, and electronic transfers of deposits make it easier to convert money into money substitutes and can raise velocity. Furthermore, there can be shifts between the various categories of money—for example, as interest rates are liberalized on time deposits, private agents may shift their assets from currency and transferable deposits to time deposits, raising the velocity of narrow money but lowering the velocity of broad money.

Regression approach

The *nominal demand for money* is the demand for a given number of specific currency units, such as rubles or pesos. The real demand for money, or the *demand for real money balances*,

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[128] Past trends in velocity can be discerned by calculating the ratio of nominal GDP to the nominal money stock (BM).

is the demand for money expressed in terms of the number of units of goods that the money balance can buy, deflated by the index for the general level of prices. The demand for real money balances, like the demand for any other asset, is a function of its price, the price of related assets, income, wealth, tastes, and expectations. In a simplified form, the demand for real money balances (*M/P*) is positively related to real income (*Y*) and negatively related to various opportunity cost of holding money:

$$\frac{M}{P} = f\left(Y, Rb, Rd, \pi^e, s^e, ...\right), \tag{6.15}$$

where *Rb* is a nominal interest rate on alternative financial assets to money, say, government bonds, *Rd* is a nominal interest rate on deposits and other components of the monetary aggregate, π^e is the expected inflation rate, and s^e is the expected rate of change in the exchange rate. As *real income* grows, the demand for real money balances is expected to increase also, reflecting the higher level of transactions. The o*pportunity cost of holding money* is the cost of holding money balances as opposed to other forms of wealth, such as bonds. Since currency earns zero interest and other broad money components pay relatively little interest, the opportunity cost of keeping one's assets in the form of broad money needs to be compared with the nominal rate of interest on less liquid assets such as government or corporate bonds. While an increase in bond rates will lower demand for money, an increase in deposit rates will increase demand for money. *Expected inflation* is also used as a proxy of the opportunity cost of holding real money balances. *Expected rates of exchange rate appreciation/depreciation* are used as a proxy for currency substitution.

A large body of literature is available on estimating money demand functions. Although different econometric approaches have been used, error correction models have proved quite successful and have emerged as the workhorse of money demand research (see Chapter 2).[129] In conventional money demand equations such as equation (6.15), if *M/P, Y, Rb, Rd,* π^e , and s^e are cointegrated, this means that in the long run, there is a stable relationship between money, real income, and the opportunity cost of money—if some shock drives the long-run relationship between money, real income, and the opportunity cost of money out of equilibrium, there will be a tendency for real money balances to adjust, and for these variables to move together again.

Provided that a stable money demand function exists and is estimated, it can be used to forecast the money stock given our forecasts of real GDP, inflation, and interest rates.[130] There are several possible methods to forecast interest rates. First, one can look at the interest

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[129] For applications of this methodology to specific country cases, see Calza, Gerdesmeier, and Levy (2001), Dekle and Pradhan (1997), Hauner and Di Bella (2005), Kalra (1998), Nachega (2001a, 2001b), Oomes and Ohnsorge (2005), and Sriram (1999).

[130] Of course, no variable is truly exogenous in a money demand regression—income is affected by the stance of monetary policy, and so are inflation and interest rates (especially those on the short end of the yield curve). For practical purposes, however, one typically projects these variables separately and treats them as exogenous.

rate path in other countries with similar circumstances. If the country in question has a substantial risk premium, a judgment has to be made as to how long it will take for the short-term interest rate to return to the average rate of similar countries. If the increase in risk premium is negligible, we can assume that the short-term interest rate is based on a Taylor rule (Box 6.5). We can estimate the Taylor rule using historical data on the short-term interest rate, the output gap and the difference between actual and desired inflation, and then use this estimated relationship to obtain our interest rate projection given our forecast of output and inflation.

Box. 6.5 The Taylor Rule

The *Taylor rule* (Taylor, 1993) argues that a central bank sets short-term interest rates to achieve both its short-run goal of stabilizing the economy and its long-run goal of low inflation. Specifically, the rule states that the real short-term interest rate is determined according to three factors: (i) where actual inflation is relative to the targeted level that the central bank wishes to achieve; (ii) how far economic activity is above or below its full employment, or potential, level; and (iii) what level of the short-term interest rate would be consistent with full employment, or the "natural" level of the real interest rate. (The Taylor rule typically includes also lagged short-term interest rates to capture monetary authorities' revealed preference for not adjusting interest rates abruptly to new macroeconomic data.) If real GDP rises above potential GDP or inflation rises above its target, the short-term interest rate is raised relative to the current inflation rate. When real GDP is equal to potential GDP and inflation is equal to its target, then the short-term interest rate remains at the "natural" level that is consistent with full employment.

In practice, it may not be possible to obtain a stable real money demand function econometrically. In many countries, financial market reforms and financial innovations may cause money demand to respond more rapidly to interest rate changes, thereby increasing the interest elasticity of money demand. More generally, measures that promote financial market development could result in the introduction and/or deepening of markets for more sophisticated instruments such as money market paper, stocks, and bonds, and may cause gradual portfolio shifts away from monetary assets, possibly reducing the predictability of money demand.[131]

Forecasting net foreign assets (NFA)

Projections of net foreign assets are directly linked to the prospects for the overall BOP. Reconciliation of the DCS with the BOP entails comparing the change in official international reserves, as recorded below the line in the BOP, and the change in the stock of net foreign assets of the depository corporations over the same period, as recorded in the DCS. Since the DCS is presented in domestic currency, the main complication is that the

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[131] Many industrial countries that went through substantial episodes of financial deregulation and financial innovation during the 1980s found that their money demand functions were no longer stable or predictable (see Chapter 12 for more on monetary policy frameworks).

existing stock of foreign assets needs to be revalued to take account of changes in the exchange rate since the end of the previous period. To simplify the calculation, all foreign assets and liabilities of the depository corporations are usually assumed to be denominated in U.S. dollars. Thus, the central bank's stock of net foreign assets in domestic currency (*NFA*) at the end of period *t* can be projected as:

$$NFA_t = e_t^{EOP}\left(\frac{NFA_{t-1}}{e_{t-1}^{EOP}} - \Delta RES_t\right), \tag{6.16}$$

where e_t^{EOP} is the exchange rate (domestic currency per U.S. dollar) at the end of period *t*, and ΔRES is the change in reserves (in U.S. dollars) from the BOP. Recall that in the BOP accounts, an increase in assets is recorded with a negative sign; this is why we subtract ΔRES from the central bank's stock of net foreign assets valued in dollars at the end of the previous period in equation (6.16). Net foreign assets of ODCs can be projected in a similar way if separate flow forecasts were made in the BOP.

Forecasting other items, net (OIN)

OIN, by its nature, is difficult to forecast. Factors that influence the movements of this variable include changes in the capital of depository corporations, valuation changes in NFA and foreign currency deposits as a result of changes in the exchange rate (or cross rates of foreign assets held in different currencies), and the profits or losses of the depository corporations, as well as changes in all of the items in the accounts of depository corporations that have not been identified separately.[132]

Clearly, a rule of thumb is useful for forecasting OIN, at least after allowing for valuation changes due to exchange rate changes (Box 6.6). If OIN minus the valuation adjustment is small, approximately constant, or dominated by trend (say, a gradual growth of depository corporations' capital, perhaps in line with nominal GDP), then it needs little attention in a monetary analysis. However, if assets that are significantly liquid are hidden in this category (off-balance sheet items of commercial banks, for example), then the DCS will not contain all of the relevant liquidity growth in explicit form and will tell a misleading story. Fundamentally, if OIN contains transactions that change by irregular, large amounts, then an effort must be made to identify and forecast them. One example of large changes in OIN may be changes in depository corporations' capital resulting from increased provisions against bad loans during periods of financial sector fragility.

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[132] Losses of the depository corporations are recorded in OIN as if the depository corporations were extending a credit to itself, with a positive sign, the counterpart entry being a rise in monetary aggregates. Profits that are not distributed but are held as part of the depository corporations' capital and reserves are recorded as a repayment of a credit to the system and constitute a reduction in OIN.

Box 6.6 Valuation Adjustment

As noted earlier, changes in stocks between two periods reflect transactions, revaluations, and other changes in the volume of assets (such as write-offs of claims and allocation or cancellation of SDRs). Revaluations are financial flows arising from changes in the prices of financial assets and liabilities and/or the exchange rates that affect the domestic currency values of assets and liabilities denominated in foreign currency. For simplicity, let us abstract from price changes and other changes, so that the change in the stock of a foreign currency denominated asset (such as NFA) can be broken down into transaction flows and valuation changes arising from exchange rate changes:

$$\Delta S_t = (Transaction\ flows) + (Valuation\ adjustment),$$

where:

$$\Delta S_t = S_t - S_{t-1} = e_t^{EOP} S_t^{\$} - e_{t-1}^{EOP} S_{t-1}^{\$},$$

and: S_t is the value of the stock in domestic currency at the end of period t; $S_t^{\$}$ is the value of stock in foreign currency (U.S. dollars) at the end of period t; and e_t^{EOP} is the exchange rate (domestic currency units per unit of foreign currency) at the end of period t.

To convert foreign currency denominated transaction flows into domestic currency, the period average exchange rate (e) is typically used to reflect the assumption that these transactions take place throughout the period and not just at the end of the period:

$$Transaction\ flows = e_t \left(S_t^{\$} - S_{t-1}^{\$} \right).$$

Therefore the valuation adjustment can be estimated as the total change in stocks minus transaction flows valued in domestic currency:

$$Valuation\ adjustment = (S_t - S_{t-1}) - e_t \left(S_t^{\$} - S_{t-1}^{\$} \right).$$

Equivalently, we can think of the valuation adjustment as comprising: (i) the valuation adjustment on last period's stock due to the difference in the exchange rate at the end of the two periods; plus (ii) the valuation adjustment on this period's flows due to the difference in the end-period exchange rate and the average exchange rate:

$$Valuation\ adjustment = \left(e_t^{EOP} - e_{t-1}^{EOP} \right) S_{t-1}^{\$} + \left(e_t^{EOP} - e_t \right) \left(S_t^{\$} - S_{t-1}^{\$} \right).$$

Forecasting net domestic credit

Once projections for real GDP, prices, money growth, and NFA have been made, and given some reasonable assumption with respect to the change in OIN, the amount of domestic credit may be calculated as a residual. This procedure follows from the DCS identity. Domestic credit consists of two components: (i) net claims on the central government and (ii) claims on other sectors of the economy, which is essentially credit to the private sector. In a scenario where the policies of the central government are taken as given, the amount of net credit extended to the central government subsector is usually dictated by the existing budgetary position of the government in relation to the cost and availability of external and nonbank financing. Thus, as noted in Section 2, the projected change in net claims on the central government should be equal to the forecast of the domestic financing from depository corporations of the fiscal deficit in the government accounts (Chapter 5). This leaves private

sector credit to be determined as a residual. The derived growth in private sector credit should be consistent with projected output developments as well as with the assessment of financial fragilities. Otherwise, a further iteration of the economic forecast across sectors will be required.

If the stance of monetary policy is expected to remain unchanged and there are no significant structural changes occurring, a reasonable assumption is that private credit will grow at about the same rate as the increases in nominal GDP and nominal investment. In countries in which the financial sector is developing rapidly, on the other hand, it may be reasonable to assume that the stock of credit will grow faster than output or investment, as the country undergoes financial deepening. Financial development and globalization may also create opportunities for firms to finance investment outside the domestic depository corporations subsector, by accessing directly global capital markets, or using domestic securities markets. A careful analysis of the structure of the financial sector and its recent developments is a useful tool to assess the short-term relationship between depository corporations credit and economic growth.[133]

6.5   Forecasting the Central Bank Survey

Forecasting the central bank survey involves the following steps: (i) forecasting the demand for monetary base on the liability side of the central bank survey; and (ii) forecasting the supply of monetary base on the asset side of the central bank survey, ensuring consistency with the BOP forecast, government sector forecast, and inflation forecast obtained earlier.

Forecasting the demand for monetary base

The demand for monetary base is equal to the sum of currency held outside the central bank, required reserves held at the central bank against deposits, and excess reserves that banks wish to hold. There are two ways to project monetary base.

Money multiplier approach

As shown in Box 6.1, monetary base is linked to the money supply process by the money multiplier (m):

$$m = \frac{BM}{MB} \tag{6.17}$$

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[133] There is not necessarily a precise link between the stock of credit available to the private sector and interest rates, real output, and prices. In many countries, depository corporations' credit is needed for investment so credit to the private sector in real terms should increase with private investment in real terms. But in some countries, particularly those with financially repressed markets, many of the investments undertaken by firms are financed out of the enterprise's retained earnings rather than credit from the depository corporations—in these countries, the link between private sector credit and private investment will be much weaker.

If the money multiplier is relatively stable, we can make an assumption on *m* and use equation (6.17) to obtain our forecast of monetary base (MB) given our forecast of BM from the DCS.[134]

Financial fragility may also lead to changes in the money multiplier, as depositors concerned about bank solvency may withdraw bank deposits and hold cash as a store of value. For instance, Kaminsky and Reinhart (1999) find that the BM money multiplier rises before banking and balance of payments crises and declines as the crisis unfolds.

Disaggregated (components) approach

Alternatively, we can estimate the demand for monetary base generated by each component on the liability side of the table: (i) currency held by depository corporations and outside depository corporations; (ii) required reserves; and (iii) excess reserves. Forecasting the first item involves estimating a cash demand equation similar to equation (6.15) where *M* includes cash in circulation only and *Y* and *i* are the appropriate income and interest rate variables respectively. Required reserves—if used in the national financial system—are projected simply as a fraction of deposits at the depository corporations. Excess reserves are typically small.

Forecasting the supply of monetary base

The following forecasting methodology for the supply of monetary base can be adapted to the case where the central bank has a monetary target (and sterilizes all foreign currency inflows) as well as to the case where the central bank does not have any monetary targets and quantitative operational objectives.

As shown in equation (6.16), the projected change in the central bank's net foreign assets should be consistent with the change in reserves forecasted in the BOP. Net credit to the central government from the central bank is related to the size of the fiscal deficit and alternative sources of financing, in particular, the amount of financing that can be raised from commercial banks. The central bank's claims on ODCs may vary considerably, reflecting, among other things, swings in the banks' holdings of excess reserves, their ability to attract deposits, lending opportunities, lender-of-last-resort lending, and changing terms of access to central bank credit. As noted earlier, the central bank's claims on other sectors of the economy is likely to be insignificant. Other items, net (OIN) can be left as a residual or forecast in a similar way as the corresponding item in the DCS.

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[134] Past trends of the money multiplier can be discerned by looking at the historical ratio of BM to reserve money.

VII.   CHAPTER SEVEN: THE BASELINE SCENARIO

7.1   Putting the Accounts Together

Chapters 2 through 6 reviewed the basic features of the four main macroeconomic accounts—the national income and product accounts, the balance of payments (BOP), the fiscal accounts, and the monetary accounts—and how to forecast the key macroeconomic aggregates in each account on the basis of available information. As outlined in Chapter 2, the procedure for coming up with a consistent overall forecast for the economy is as follows:

1. Forecast real output (GDP) from the supply side, based on either output gap analysis or disaggregated sectoral forecasts (Chapter 2).
2. Forecast private consumption and private investment (Chapter 2). This can be done any time before Step 7.
3. Forecast the key prices—CPI, the GDP deflator, and the nominal exchange rate (Chapter 3).
4. Forecast the BOP (Chapter 4), based on the same assumptions and estimates used in the preceding steps.
5. Forecast the fiscal accounts—revenue, expenditure, and financing (Chapter 5), based on the same assumptions and estimates used in the preceding steps.
6. Forecast the monetary accounts (Chapter 6) based on the same assumptions and estimates used in the preceding steps.
7. Put together your forecast of the GDP components from the expenditure side: private consumption (C_p) and private investment (I_p) from Chapter 2; government consumption (C_g) and government investment (I_g) from Chapter 5; and exports and imports of goods and services (X and M, respectively) from Chapter 4:

$$GDP = \left(C_p + C_g\right) + \left(I_p + I_g\right) + X - M .$$

Compare the resulting GDP estimate from the demand side with the initial GDP forecast from the supply side. Review and adjust your assumptions and estimates as necessary, and repeat the process until the two GDP estimates are equal.

In this way, our forecasts of the key macroeconomic aggregates are derived from an interconnected network of macroeconomic accounts. Understanding the links between the various accounts (which encompass both accounting and behavioral relationships) is fundamental to constructing a consistent overall macroeconomic forecast. The main interrelations among the accounts are shown in Figure 7.1:

- *Exports and imports in the national accounts (Chapter 2) should, in principle, correspond to the figures for exports and imports of goods and services recorded in the BOP (Chapter 4), with the conversion to domestic currency taking place at average exchange rates.* Small discrepancies may occur owing to the averaging

process and other differences between accounting procedures in the national accounts versus those in the BOP.

- *Government consumption in the national accounts (Chapter 2) should be consistent with current expenditures in "wages and salaries" and "other goods and services" reported in the fiscal accounts (Chapter 5).* Potential discrepancies may arise from (i) the breakdown of fiscal accounts not showing exactly the two expenses named above, perhaps by reporting some of them lumped in a broader category such as "other expenses;" and (ii) the fact that the fiscal accounts are normally reported on a cash basis, when the national accounts should be reported on an accrual basis.

- *Government investment in the national accounts (Chapter 2) should correspond to capital expenditures in the fiscal accounts (Chapter 5).* Notice the coverage of the fiscal tables (central government and other decentralized government agencies) and the use of cash versus accrual accounting to verify consistency. Remember that capital expenditures by public enterprises are normally considered "private sector investment" in the national accounts.

- *External financing or foreign borrowing in the fiscal accounts (Chapter 5) should relate to "other investment, net" and "portfolio investment, net" in the BOP (Chapter 4).* Within these categories loans to the public sector and net issuance of public sector securities, respectively, are usually recorded separately and should be consistent with flows recorded in the fiscal accounts. The coverage of the BOP may differ from that of the BOP, however: official flows in the BOP may include both borrowing by the central government and borrowing by public enterprises. In addition, small discrepancies are expected owing to fluctuations of the exchange rate: if we convert the BOP figures at the annual average or even monthly average exchange rates, these rates are likely to differ from the exact exchange rate prevailing on the day of the loan disbursement and recording in the government accounts.

- *Bank financing or domestic financing from the banking system in the fiscal accounts (Chapter 5) should have its counterpart in "net claims on the central government" of the monetary survey (Chapter 6).* Remember that the monetary accounts record stocks. Once the flow data are obtained from the monetary accounts by subtracting the respective stocks, they should correspond exactly to the amount listed in the fiscal accounts, since bonds and other securities are normally recorded at face value (rather than at market value) in the monetary tables.

- *The change in reserves recorded in the BOP (Chapter 5) should relate to the change in net foreign assets recorded in the monetary accounts (Chapter 6).* The main sources of discrepancies are changes in the valuation of existing reserves. For instance, if a country holds some of its reserves in euros, and the euro appreciates relative to the U.S. dollar and the domestic currency, the stock of reserves expressed in U.S. dollars in domestic currency will increase even if there are no new flows of reserves from the BOP perspective. Other than that, and some smaller discrepancies due to the averaging of exchange rates, the change in reserves implied by the depository corporations survey (DCS) and the central bank balance sheet should move together with the change in reserves recorded in the BOP.

- *The change in the net foreign assets position of the banking system implied by the monetary accounts (Chapter 6) should be related to net capital flows in the financial account of the BOP (Chapter 5).* A direct, exact relationship is difficult to establish for many reasons, notably: (i) it is often difficult to separate all private capital flows in the financial account of the BOP into flows to private companies, banks, and other financial institutions; and (ii) it is even more difficult to estimate changes in valuation of existing assets and liabilities of the banking system.

Figure 7.1 Interrelations among the Macroeconomic Accounts
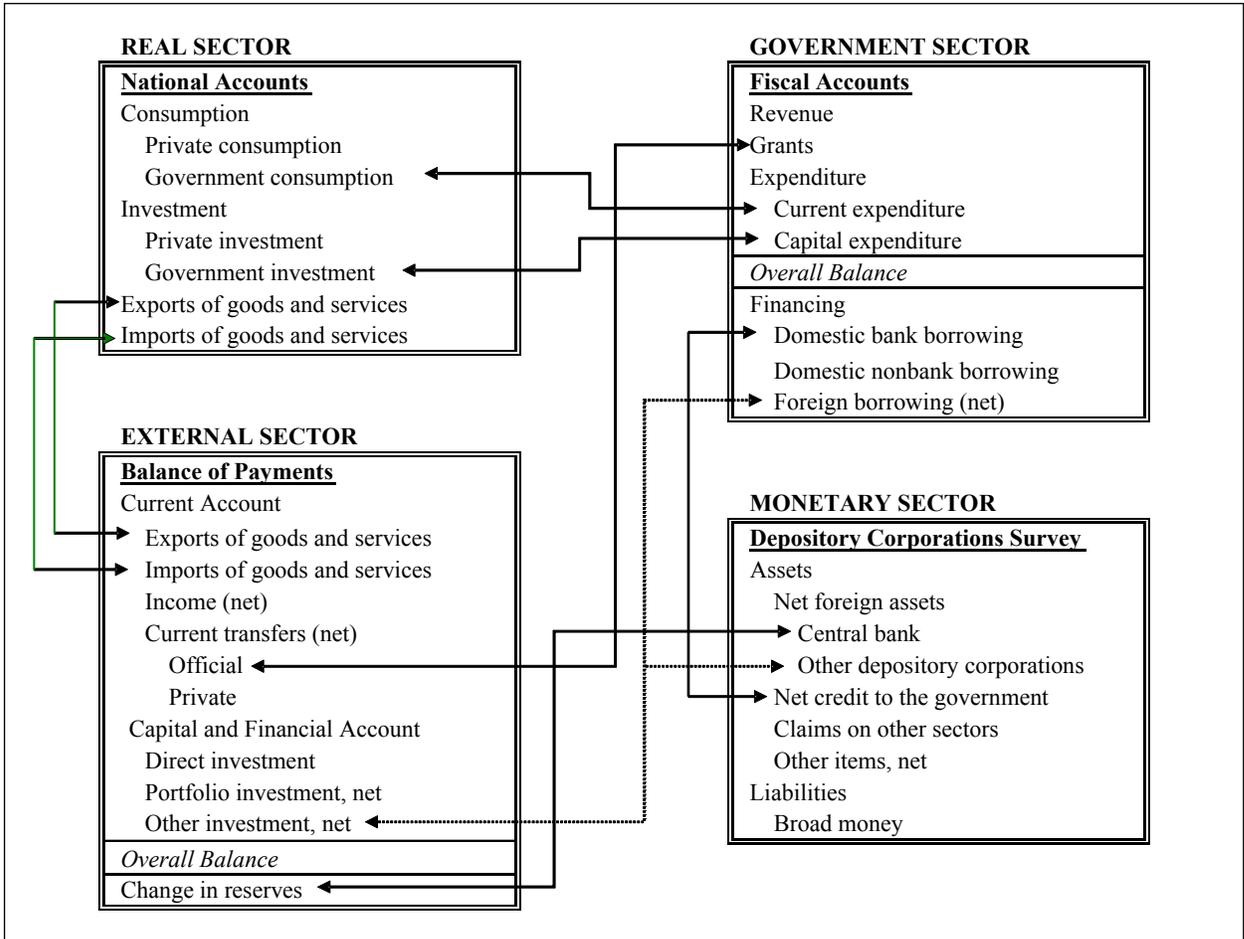
7.2 Diagnosing the Short-Run State of the Economy: Flow Analysis

The principal objectives of macroeconomic policy are typically price stability, economic growth, and employment. The achievement of these objectives is subject to a budget constraint, which is derived from the relationship between aggregate expenditure (absorption) and income (output); the difference between these variables is equivalent to the current account of the BOP, as shown in earlier chapters. This constraint is defined specifically by the need to stay within a particular level of the current account deficit, such that the financing (capital inflows as well as financing out of own reserves) is both feasible (in the sense that it can actually be obtained) and sustainable.

A *financial program* is a comprehensive set of policy measures designed to achieve a given set of macroeconomic goals. The goal could be simply to maintain a given level of economic performance. But more often, a financial program is designed to eliminate a macroeconomic imbalance in the economy. When macroeconomic imbalances exist in the economy, some form of correction (or adjustment) will be necessary in order to bring claims on resources in line with the resources available. If deliberate policy actions are not taken at an early stage, the adjustment is likely to be disorderly and inefficient. For example, if external debt reaches very high levels, foreign creditors may become unwilling to lend further to a country, resulting in a drastic cut in spending and negative effects on economic growth and welfare. The distinguishing feature of a financial program is that it seeks to achieve an *orderly* adjustment, through the early adoption of corrective policy measures, and through the provision of appropriate amounts of external financing.

The first step in preparing a financial program is to determine if there exist significant imbalances in the economy that require reduction or elimination in order to attain an improved economic performance. The preceding chapters have explained how to develop sector-by-sector projections of likely developments in the economy for the next year, assuming that existing policies remain unchanged. Section 1 of this chapter described how to put the sectoral projections together to come up with a consistent overall forecast for the economy. This set of projections is often referred to as the *baseline (or reference) scenario*. As explained in Section 1, the baseline scenario has to be (internally) consistent in the sense that all the linkages among the accounts are respected. But a consistent baseline scenario does not mean that there are necessarily internal and external balance and a sustainable debt profile. There can be large imbalances in the baseline that will have to be reflected in financing gaps if all the linkages are to hold. The baseline scenario therefore provides a foundation for identifying significant imbalances in the economy and assessing whether existing problems are likely to resolve themselves, remain the same, or worsen.

On the basis of the baseline scenario, a diagnosis should be made regarding:

- The *nature* of the economic imbalance: Imbalances may be macroeconomic, reflecting a discrepancy between aggregate demand and supply, which may be manifested either internally (through high inflation or high unemployment, for example) or externally (through an undesirably large current account deficit, for example). There may also exist imbalances in particular markets or sectors that result in a misallocation of resources, for example, balance sheet mismatches in the corporate and/or financial sector—such weaknesses can linger for years, becoming visible only when a country suffers a negative shock, at which point creditors may refuse to provide new financing or roll over existing loans, thereby triggering a crisis.

- The *source* of the imbalance: The problem(s) could originate from any sector(s) in the economy. For example, high inflation may be traced to excessive fiscal expenditure coupled with monetary accommodation; a large current account deficit may be traced to excessive consumption (private or public) and/or a private investment boom; maturity and currency mismatches in corporate balance sheets may be traced to excessive reliance on short-term external financing, relative to domestic and longer-term borrowing and equity financing. Imbalances in one sector are often mirrored in vulnerabilities in others.

- The *seriousness* of the imbalance: The size and persistence of the imbalance determine the urgency with which it should be addressed. Imbalances may be one-off, short-lived (cyclical or seasonal), or persistent; they may relate to a country's short-term financing needs or longer-term capacity to repay (liquidity versus solvency). Persistent flow problems ultimately turn into stock imbalances, and liquidity problems can quickly lead to insolvency.

Determining what constitutes an "unchanged policy" stance for the purposes of the baseline scenario involves a certain degree of subjective judgment. For example, if an exchange rate "rule" can be discerned from historical data showing regular adjustments being made based on the differential between domestic and trading partners' inflation rates, this rule can be regarded as an element of an unchanged policy. Similarly, if large overruns on budgeted expenditures or shortfalls in budgeted revenues are a regular feature of fiscal performance, they can be considered representative of an unchanged policy stance.

Because of the "unchanged policy" assumption, the baseline scenario may not correspond to what you judge to be the most likely outcome: in many circumstances, it is reasonable to expect that policies will change in response to economic development, especially if large imbalances are building up. For instance, suppose the government has been running large fiscal deficits financed by borrowing from the central bank. Assuming unchanged policies, the baseline scenario would most likely show accelerating inflation at home, lower exports, increased imports (if the exchange rate is not freely floating), and a disincentive to foreign investors and lenders that will tend to shrink financial inflows. The incipient overall deficit

may exceed the country's international reserves, resulting in a hypothetical *financing gap*. In practice, such a large deficit cannot occur—the government would be forced to rein in its expansionary fiscal and monetary policies, or arrange for special loans, or allow a large devaluation of the currency, or fail to make agreed payments. In reality, therefore, some factor(s) would have to change, allowing the accounting identity underlying the BOP to be satisfied.

The usefulness of building an "unchanged policy" scenario is to break down the policymaking process into two parts. In the first step, the question is, "What will happen if no new policy action is taken?" In the second step, the question becomes, "What options are available to avoid large imbalances and achieve a desirable outcome?" The policy scenario will provide an answer to the second question, and it is discussed in Part III of this volume.

The saving-investment balance and the external current account

As we saw in Chapter 2 and Chapter 4, the identity between the economy-wide resource gap and the external current account balance is as follows:

$$
\begin{pmatrix}
\text{Economy} - \text{wide} \\
\text{saving} - \text{investment} \\
\text{gap} \\
S - I
\end{pmatrix}
\equiv
\begin{pmatrix}
\text{External} \\
\text{current account} \\
\text{balance} \\
CAB
\end{pmatrix}
\equiv
\begin{pmatrix}
\text{Use of} \\
\text{foreign} \\
\text{savings} \\
-FI + \Delta RES
\end{pmatrix}
\tag{7.1}
$$

Although this identity is central to macroeconomic analysis, it does not make explicit the respective roles of the government and private (or nongovernment) sectors. The link between the fiscal aggregates and the BOP can easily be derived from the basic saving-investment gap for the economy as a whole by decomposing saving (S) and investment (I) aggregates into their private and government sector components:

$$
\left(S_p + S_g\right) - \left(I_p + I_g\right) \equiv CAB ,
\tag{7.2}
$$

where the subscripts p and g refer to the private and government sector, respectively. This relationship can also be rearranged as:

$$
\begin{pmatrix}
\text{Private sector} \\
\text{saving-investment} \\
\text{gap} \\
S_p - I_p
\end{pmatrix}
+
\begin{pmatrix}
\text{Government sector} \\
\text{saving-investment} \\
\text{gap} \\
S_g - I_g
\end{pmatrix}
\equiv
\begin{pmatrix}
\text{External} \\
\text{current account} \\
\text{balance} \\
CAB
\end{pmatrix} .
\tag{7.3}
$$

This identity shows that there are important relationships among: (i) the saving-investment gap of the private sector, (ii) the overall fiscal position of the government sector, and (iii) the

current account of the BOP. It focuses on the separate roles that the private and public sectors play in a current account imbalance.

Box 7.1 shows three different combinations of private and public sectoral balances and the corresponding current account balances. Situation 1 is typical of many countries undertaking adjustment programs: a fiscal deficit is the main source of the current account deficit. This case involves the so-called "twin deficits;" accordingly, reducing the current account deficit will require fiscal adjustment. In many economies, however, a large fiscal deficit is more than offset by an excess of private saving over investment.

In situation 2, the current account deficit represents both a government deficit and a private sector saving shortfall in relation to private investment.

Situation 3 indicates that a current account deficit coexists with a fiscal surplus and a private saving shortfall. If the current account deficit reflects a private investment boom financed by capital inflow, the policy implications are different than they are if the current account deficit reflects a private consumption boom that mirrors a private saving shortfall.

Box 7.1 Relations between Sectoral Balances and the Current Account

Sectoral Balances		Current Account Balance
Private	Public	
(1) $S_p - I_p > 0$	$S_g - I_g < 0$	$CAB < 0$ if $\lvert S_g - I_g \rvert > \lvert S_p - I_p \rvert$
(2) $S_p - I_p < 0$	$S_g - I_g < 0$	$CAB < 0$
(3) $S_p - I_p < 0$	$S_g - I_g > 0$	$CAB < 0$ if $\lvert S_p - I_p \rvert > \lvert S_g - I_g \rvert$

Hence, the current account balance per se, while an important indicator, is not by itself indicative of the need for policy action and even less of the appropriate policy response. The need for policy action and the choice of the appropriate policy will depend on a closer examination of the source of the imbalance. This can be done through the flow of funds table, to which we turn next.

The flow of funds table

The interrelations among the various sectors (private, government, monetary, and external) are brought together in the framework of a flow of funds (FOF) table. The FOF table contains all the income and financial transactions undertaken in the economy, showing: (i) that what flows out of one sector (the sector's expenditures) flows into another sector (the sector's income); (ii) how excess income over expenditure in some sectors (saving) finances excess expenditures over income in others (dissaving); and (iii) the financial transactions that are involved. As an analytical tool, the FOF table may be helpful for the following reasons:

- It summarizes the interrelationships among the different sectors (including the foreign or rest of the world sector) in a systematic and coherent way.

- It shows which sector of the economy is generating an overall surplus and which is generating a deficit, helps identify the origins and causes of the surpluses and deficits, and sheds lights on how the surpluses are utilized and the deficits are financed in each sector.

- It helps to ensure the consistency of the data and projections, thus facilitating effective macroeconomic analysis, forecasting, and policy making.

The following recording conventions are used in the FOF table.

- *Coverage*. The FOF table records transactions between two sectors. Transactions taking place within a given sector are not shown, since they disappear in the consolidation of the sector. Some transactions (such as changes in arrears, valuation changes, and other items net) are grouped together for each sector under a balancing item ("other items, net").

- *Source*. Whenever data for the same transaction differ (for example, changes in net foreign assets in the BOP and in the monetary survey), a single source must be selected. The primary sources used for establishing a FOF table are the national income and product accounts and the macroeconomic accounts based on the three linked systems, namely the government finance statistics (GFS), the BOP, and monetary and financial statistics (MFS).

- *Banking system*. For the purpose of the FOF table, this sector is assumed to have no nonfinancial transactions—that is, its saving-investment gap is identically equal to zero.

- *External sector*. This sector is viewed from the point of view of the rest of the world. Therefore, a current account deficit for the country is a current account surplus for the rest of the world and should be entered as such.

Box 7.2 shows the necessary accounting identities used to complete the FOF table. A schematic FOF table is shown in Table 7.1. The columns represent the broad economic sectors; the first column is simply the aggregation of all the domestic sectors. The rows represent transactions among the sectors. The table comprises two blocks: (i) nonfinancial transactions, and (ii) financial transactions. The upper block contains all nonfinancial transactions for each sector; summing them yields the nonfinancial balances for each sector, shown in Row A.

The lower block of the table (Rows B and C) contains all financial transactions for each sector. Hence, the FOF table provides an overall description of the intersectoral financial flows that are intermediated through the country's financial system. For the whole economy,

the saving-investment balance is matched by the current account balance, which is financed through capital and financial account transactions, changes in net foreign assets, or exceptional financing (such as the accumulation of external arrears). The saving-investment balance of a given sector is financed by the other domestic sectors and by the rest of the world. For each column (sector), the sum of all financial and nonfinancial transactions must add up to zero. In other words, each sector's nonfinancial balance must be completely financed. For all sectors, a balancing item called "net errors and omissions" (or OIN, which stands for "other items, net") has been added in order to capture those items in the financing of nonfinancial balances that have not been explicitly entered and any errors arising from data that is inconsistent across sectors.

More specifically:

- Column 1 shows, in the upper part of the table, the savings-investment balance for the aggregate domestic economy as the sum of the savings-investment balance of the domestic sectors (columns 2, 3, and 4). In the lower part, this column shows how the savings-investment balance is financed.

- Column 2 shows the resource gap for the government sector and how this gap is financed, based on the fiscal accounts described in Chapter 5.

- Column 3 shows the resource gap for the nongovernment or private sector and how this gap is financed. Since there is no set of formal accounts compiled exclusively for private sector transactions, the items in this column are either deduced from the other accounts or derived as residuals.

- Column 4 shows the resource gap for the banking system (which, by convention, is identically zero) and how this gap is financed, based on the monetary survey described in Chapter 6. Note that the monetary survey records end-period stocks—to convert this information to flow data for entry in the FOF table, you should calculate the change in stocks for each item, with valuation adjustments for foreign currency denominated items.

- Column 5 shows the resource gap for the rest of the world, and how this gap is financed. This column is the mirror image of the compiling country's current account balance and its financing, based on the BOP accounts.

- Column 6 provides a horizontal check for the nonfinancial balances and their financing components. For each row, the elements in columns 1 and 5 should sum to zero.

As noted above, the usefulness of a FOF table lies in the fact that it describes the financing of various economic sectors and the broad categories of market instruments used in financial transactions. By explicitly utilizing the main macroeconomic identities, the FOF also provides us with a consistent means of checking our overall forecast.

Table 7.1 Schematic FOF Table

Transactions/Sectors	Domestic Economy (1)	General Government (2)	Private Sector (3)	Banking System (4)	Rest of the World (5)	Horizontal check (6)
Gross national disposable income (GNDI)	$GNDI$	$GNDI_g$	$GNDI_p$			
Final consumption	$-C$	$-C_g$	$-C_p$			
Gross investment	$-I$	$-I_g$	$-I_p$			
Exports of goods and nonfactor services					$-X$	
Imports of goods and nonfactor services					M	
Net factor income					$-Yf$	
Net transfers					$-TRf$	
(A) Nonfinancial balances	$S-I$	S_g-I_g	S_p-I_p	0	$-CAB$	0
(B) Foreign financing						
Monetary						
Change in net foreign assets	$-\Delta NFA$	0	0	$-\Delta NFA$	ΔRES	0
Nonmonetary						
Direct investment	FDI	0	FDI	0	$-FDI$	0
Net foreign borrowing	NFB	NFB_g	NFB_p	0	$-NFB$	0
(C) Domestic financing						
Monetary						
Domestic credit	0	ΔNDC_g	ΔDC_p	$-\Delta DC$	0	0
Broad money	0	0	$-\Delta M2$	$\Delta M2$	0	0
Nonmonetary						
Government net lending	0	$-NL$	NL	0	0	0
Nonbank	0	NB	$-NB$	0	0	0
(D) Net errors and omissions	OIN_e	0	$OIN_e + \Delta OIN_m$	$-\Delta OIN_m$	$-OIN_e$	0
Vertical check: (A) + (B) + (C) + (D)	0	0	0	0	0	0

Box 7.2 Main Macroeconomic Accounts and Accounting Identities

	Government Sector (Fiscal Accounts)
Rev	Total revenue and grants
	Total expenditure and net lending
C_g	Current expenditure except transfers and interest payments
I_g	Capital expenditure except transfers
Tr	Transfers (current and capital) and interest payments
NL	Net lending
	Financing
NFB_g	Foreign financing
	Domestic borrowing
ΔNDC_g	Bank borrowing
NB	Nonbank borrowing
Accounting identity:	$Rev - C_g - I_g - Tr - NL + NFB_g + \Delta NDC_g + NB = 0$
Nonfinancial transactions balance:	$S_g - I_g$
	where: $S_g = GNDI_g - C_g$
	$GNDI_g = Rev - Tr$
Financing:	$NFB_g + \Delta NDC_g + NB - NL$
	Rest of the World (BOP Accounts)
CAB	Current account balance
	Capital and financial account balance
FDI	Direct investment
NFB	Portfolio and other investment
OIN_e	Net errors and omissions
ΔRES	Change in reserves
Accounting identity:	$CAB + FDI + NFB + OIN_e - \Delta RES = 0$
Nonfinancial transactions balance:	$-CAB$
Financing:	$-(FDI + NFB + OINe - \Delta RES)$
	Monetary Sector (Monetary Accounts—change in stocks)
ΔNFA	Change in net foreign assets
ΔDC	Change in domestic credit
ΔNDC_g	Claims on government, net
ΔDC_p	Claims on nongovernment sector
ΔOIN_m	Other items, net
$\Delta M2$	Change in broad money
Accounting identity:	$\Delta M2 - \Delta NFA - \Delta DC - \Delta OIN_m = 0$
	where: $\Delta NFA = -\Delta RES$ (in the monetary accounts, a positive ΔNFA denotes an increase in reserves, but in the BOP accounts, a negative ΔRES denotes an increase in reserves)
Nonfinancial transactions balance:	0 (by convention)
Financing:	$\Delta M2 - (\Delta NFA + \Delta DC + \Delta OIN_m)$

7.3   The Balance Sheet Approach: Stock Analysis[135]

The traditional financial programming approach may be insufficient in explaining some of the dynamics underlying modern-day capital account crises. Its flow-based analysis focuses on the gradual buildup of unsustainable fiscal and current account positions. The balance sheet approach, by contrast, focuses on shocks to stocks of assets and liabilities, which can trigger large adjustments in (capital) flows. Such an approach can therefore be a useful complement to the traditional flow analysis.

The focus on balance sheets is of particular relevance for emerging market economies. While these countries have gained access to capital markets and benefit from their ability to mobilize foreign savings, the related capital flows are often subject to great volatility. Importantly, emerging market countries' foreign borrowing typically is foreign-currency denominated and at shorter maturities. Their local markets are typically thin, and the institutional capacity to manage the associated risks remains limited. Although significant differences exist among emerging markets, in general their vulnerability to sudden shocks tends to be higher than that in mature markets.

Capital account crises typically occur as creditors lose confidence in the exchange rate or in the creditworthiness of some segments of the economy—a financial institution, some parts of the corporate sector, or the government itself. This confidence loss can prompt sudden and large-scale portfolio adjustments such as massive withdrawals of bank deposits, panic sales of securities or abrupt halts of debt roll-overs. As the exchange rate, interest rates, and other asset prices adjust, the balance sheets of an entire sector—which may be largely solvent in absence of these adverse events—can sharply deteriorate. In an integrated financial system and with an open capital account, concerns about asset quality on domestic balance sheets can provoke creditors to shift towards (safer) foreign assets. This will often result in capital outflows, exerting further pressure on the exchange rate or official reserves and ultimately resulting in a BOP crisis.

Balance sheet concepts

Unlike the more traditional analysis of an economy that looks at the flows occurring over a defined period of time (such as the annual output, fiscal balance, current account balance, or investment flows), a balance sheet analysis looks at stocks of assets and liabilities at a certain point in time (such as debt, foreign reserves, loans outstanding, inventory at the end of the year). Obviously, the two approaches are interrelated, as the difference in a stock variable at two dates is related to the flow in the period between them.

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[135] This section draws on Allen and others (2002), Mathisen and Pellechio (2006), and Rosenberg and others (2005).

As a first step, one may distinguish an economy's main sectoral balance sheets: (i) the government sector (including the central bank); (ii) the private financial sector (mainly banks); and (iii) the nonfinancial sector (corporations and households).[136] These sectors have claims on and liabilities to each other and to external (nonresident) entities. When consolidating the sectoral balance sheets into the country's balance sheet, the assets and liabilities held between residents net out, leaving the country's external balance vis-à-vis the rest of the world (nonresidents).

Sectoral balance sheets provide important information that remains hidden in the consolidated country balance sheet. A country's balance sheet can show the potential scale of vulnerability to reversals in external financing flows, but it is often inadequate for examining the genesis of such reversals. Weaknesses in certain sectoral balance sheets may contribute to the creation of a countrywide BOP crisis, yet they may not appear in a country's aggregate balance sheet. An important example is foreign currency debt between residents, which is netted out of the country's aggregated balance sheet—if the government is unable to roll over its foreign currency debts to residents and must draw on its reserves to honor its debts, the drawdown can trigger concerns that lead to a BOP crisis. The risk that difficulties in rolling over domestic debts can spill over into a BOP crisis is particularly acute in a world where capital flows have been liberalized. Such risks are augmented if difficulties in one sector can cascade into other healthy sectors as a result of financial interlinkages.

Balance sheet vulnerabilities

Four general types of risks are worth highlighting when assessing balance sheet weaknesses:[137]

- *Maturity mismatch risk* arises typically when assets are long term and liabilities are short term. Maturity mismatches create *rollover risk*—the risk that maturing debts will not be refinanced and the debtor will have to pay the entire principal as it matures in cash. Maturity mismatches also create *interest rate risk* for the debtor—the risk that the level and/or structure of interest rates that the debtor has to pay on its outstanding stock will change. Maturity mismatches can arise in either domestic or foreign currency. For example, a debtor may have short-term foreign currency debts that exceed its liquid foreign currency assets, even if his aggregate foreign currency debts match foreign currency assets.

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[136] For the purpose of the following analysis, it is most important to distinguish assets that are under control of the country authorities from those that are being controlled by the private sector. To simplify the presentation, the separation of the government and the central bank is therefore not highlighted.

[137] This is not an exhaustive list of the risks on a balance sheet. Moreover, there are other possible ways of breaking down various types of balance sheet risks—for example, one could identify rollover risks, market risks (which would include both currency and interest rate risk), credit risk, operational risk and solvency risks. The categorization laid out here has the advantage of highlighting the underlying mismatches that create sources of vulnerability from a debtor's perspective.

- *Currency mismatch risk* is caused by a disparity in the currencies in which assets and liabilities are denominated. Liabilities may be denominated in a foreign currency, while assets are denominated in domestic currency, leading to severe losses when the domestic currency depreciates.[138] Currency mismatches tend to be more pronounced in emerging economies than in advanced industrial economies because emerging market agents—public and private—often find it very expensive or impossible to borrow in local currency from nonresidents (or even, in many cases, from residents). As a result, obtaining capital for investment often involves taking on currency risk. Attempts by one sector to hedge currency risk associated with such borrowing will just transfer the currency mismatch to other sectors within the country. For example, banks borrowing in dollars and then on-lending in dollars to corporations can technically reduce the currency risk on their books. But this increases the corporate sector's currency risk, and—if the firms borrowing in foreign currency are not large net exporters—the risk that the firms will be unable to pay the banks in the event of devaluation (credit risk, see below). Moreover, currency mismatches can trigger shifts in capital flows that create pressure on reserves. The direct impact of a real depreciation on a net foreign currency debtor is an adverse income or wealth effect, as the real size of the debtors' liabilities increase relative to its assets. Net foreign currency debtors often seek to protect themselves against further real depreciation by purchasing additional foreign currency assets, which is why a surge in demand for instruments that provide currency hedges is particularly common immediately before and immediately after the collapse of an exchange rate peg.

- *Capital structure mismatch risk* results from relying excessively on debt financing rather than equity. While payments from equity are state contingent, with profits and dividends falling in bad times, debt-service payments generally remain unchanged in bad times. The absence of an "equity buffer" can lead to financial distress when a sector encounters an adverse shock.

- *Solvency risk* arises when an entity's assets no longer cover its liabilities; in other words, net worth is negative. The concept of solvency is relatively straightforward for the private sector's balance sheets: the value of a private firm's assets—appropriately valued—need to exceed its liabilities. But it requires some further explanation for the government sector and the country as a whole. Aside from privatization revenues and other possible asset sales, governments repay their debts by running primary fiscal surpluses, i.e., by raising more revenue from taxes than they spend. A government is solvent as long as the present discounted value of all future fiscal primary balances is greater than the current stock of net government debt (see Chapter 9 below).

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[138] Maturity and currency mismatches are sometimes hidden in indexed or floating rate debt instruments. In some emerging market economies, liabilities may be denominated in local currency but indexed to the exchange rate. Similarly, the nominal maturity of an asset may be long but the interest rate it bears may be floating. Such indexation creates the same mismatches as if the debt were denominated in foreign currency or as if the maturity were as short as the frequency of the interest rate adjustments.

Similarly, a country as a whole is solvent as long as the present discounted value of all future balances in the noninterest current account is greater than the current stock of net external debt. Thus, when assessing solvency, government debt is often compared to flow figures such as GDP or revenues, and a country's debt is compared to GDP or exports.

Box 7.3 summarizes how balance sheet risks apply to different sectors. These different types of risks are closely related and may all lead to *credit risk*, that is, the risk that a debtor will not be able to repay its debts. Solvency risk to the debtor is credit risk to its creditors.

Off-balance-sheet activities can substantially alter the overall risk exposure. Financial transactions such as forwards, futures, swaps and other derivatives are not recorded on a balance sheet, but imply predetermined or contingent future flows that will eventually affect it. Such transactions can be used to effectively reduce the risk created by balance sheet mismatches: for example, corporations with a foreign currency mismatch enter into foreign currency forward contracts to reduce their exposure to exchange rate risk. Off-balance-sheet activities can also be used to increase the risk exposure, when they are used to speculate (taking a position that is negatively correlated to an existing balance sheet risk) or, in the particular case of the central bank, to support the domestic currency against market pressures.

Shocks and interactions

The initial shock to a balance sheet may take various forms, its impact depending on the existing mismatches on the balance sheet. Several patterns can be detected in capital account crises of the last decade and have been subject to recent research. A currency mismatch leaves a balance sheet vulnerable to a depreciation of the domestic currency (*exchange rate shock*). A maturity mismatch exposes a balance sheet to risks related both to rollover and to interest rates, as mentioned above; a sharp increase in interest rates (*interest rate shock*) can dramatically increase the cost of rolling over short-term liabilities, leading to a rapid increase in debt service. Other potential shocks include any *sharp drop in the price of assets* such as government bonds, real estate, or equities (market risk), to which the balance sheet of a certain sector may be particularly exposed. Any of the above shocks can bring about a deterioration in the value of a sector's assets compared to its liabilities and hence to a reduction of its net worth; in the extreme, the net worth may turn negative and the sector becomes insolvent. The greater a balance sheet's capital structure mismatch, the smaller its buffer against such an event.

Box 7.3 How Balance Sheet Risks Apply to Different Sectors

Government	
Maturity mismatch	•Government's short term hard currency debt (domestic and external) versus government's liquid assets (reserves). Note that not all central bank reserves are available for government debt service; some may be pledged to back currency, lent to banks, etc. •Short-term domestic currency denominated government debts versus liquid domestic currency assets of the government.
Currency mismatch	•Government's debt denominated in foreign currency (domestic and external) versus government's hard currency assets (reserves).
Capital structure mismatch	N/A
Solvency	•Liabilities of government and central bank versus their assets. Assets include discounted value of future primary surpluses (including seignorage revenue) and the financial assets of the government and central bank, including privatizable state owned enterprises; liabilities may include implicit liabilities from pension plans as well as contingent liabilities stemming from government guarantees.
Banks	
Maturity mismatch	•Short-term hard currency debts (domestic and external) versus banks' liquid hard currency assets (and ability to borrow from central bank). •Short-term domestic currency debts (often deposits) versus liquid assets.
Currency mismatch	•Difference between foreign currency assets (loans) versus foreign currency liabilities (deposits/interbank lines).
Capital structure mismatch	•Deposits to capital ratio (closely related to capital to assets ratio).
Solvency	•Bank liabilities versus bank assets and capital.
Firms	
Maturity mismatch	•Short-term debts versus firms' liquid assets.
Currency mismatch	•Debts denominated in foreign currency (domestic and external) versus hard currency generating assets.
Capital structure mismatch	•Debt to equity ratio.
Solvency	•Firms liabilities versus present value of firms' assets.
Households	
Maturity mismatch	•Short-term debt versus liquid household assets.
Currency mismatch	•Foreign currency assets (deposits) versus foreign currency liabilities (often mortgages).
Capital structure mismatch	N/A
Solvency	•Liabilities versus future earnings (on wages and assets).
Country as a whole	
Maturity mismatch	•Short-term external debt (residual maturity) versus liquid hard currency reserves of government and private sector. (The latter includes foreign exchange reserves of the central bank/government plus liquid foreign currency reserves of banks and firms.)
Currency mismatch	•Net hard currency denominated external debt (external debt denominated in hard currency minus external assets denominated in hard currency).
Capital structure mismatch	•Net external debt stock (external debt minus external assets) relative to net stock of FDI. (Flow analog: Heavy current dependence on debt rather than FDI to finance current account deficit.)
Solvency	Stock of external debt relative to both external financial assets held by residents and the discounted value of future trade surpluses (resources for future external debt service). A more complex analysis would need to include remittance of profits on FDI as well. While such remittances are variable, they are another claim on the external earnings of the country as a whole.

Many shocks originate in the real economy. For example, a *collapse in the demand for a country's main commodity or other major export product* will lead to a deterioration in corporate earnings or government revenues. This will prompt a reassessment of these sectors' sustainability and thus a reevaluation of the market value of their debt and other assets. Such real shocks are particularly dangerous when combined with financial vulnerabilities, as a real shock is often correlated with reduced market access. The impact of the commodity price shock of 1998, for example, was magnified in countries such as Russia, where maturity mismatches left balance sheets vulnerable to rollover risk and interest rate shocks.

Balance sheet problems in one sector can spill over into other sectors, often snowballing in the process. Balance sheet crises can originate in the corporate sector (as in some Asian countries in 1997–98) or the fiscal sector (as in Russia 1998 and Turkey 2001), with the banking sector playing a key transmission role in all these episodes. If a shock causes the corporate sector or the government to be unable to meet its liabilities, another sector— typically the banking sector—loses its claims. If banks tighten their lending to prevent their asset portfolio from deteriorating, this further complicates the situation of a corporate sector or a government in dire need for fresh financing or debt rollovers.

A loss of confidence in the banking system often not only triggers a run on deposits but also a flight from the currency. The authorities may expand liquidity or lower interest rates to support the ailing banking system, while the depositors may seek to protect their savings by switching into foreign currency assets. Both create pressure on the exchange rate. A depreciating exchange rate, however, further weakens the asset side of a banking sector that has a currency mismatch on its balance sheet. Thus, banking and currency crises may reinforce each other, leading to the "twin crises" frequently observed in past cases.

Although a crisis may not originate in the government's balance sheet, it is likely to spread to it, partly as a result of contingent liabilities. For instance, the banking system's integrity is often explicitly or implicitly guaranteed by the government. In the event of a crisis, such contingent (off-balance-sheet) commitments become definite (balance sheet) liabilities, further adding to the deterioration of the government's balance sheet and the fiscal pressures created by the crisis. Contingent commitments may even exist to bail out corporations, especially when governments are involved in their investment and borrowing decisions. Furthermore, monetary authorities may be engaged in forward contracts and other off-balance-sheet transactions, which can entail large contingent drains on their foreign currency assets.

The interaction between financial balance sheets also magnifies the negative impact of a shock on real output. Autonomous investment cuts by corporations to restore the financial health of their balance sheets are usually compounded by a forced reduction in credit from distressed banks and lower consumption by households that experience a negative wealth effect. All this may accumulate to a sharp decline in aggregate demand.

Implementing the balance sheet approach

IMF economists apply insights from the balance sheet approach in their work on financial sector assessment (Chapter 6), liquidity and debt management (Chapter 8), and fiscal and external sustainability (Chapters 9 and 10). But a comprehensive analytical framework that examines the balance sheets of an economy's major sectors for maturity, currency, and capital structure mismatches is needed to sharpen our understanding of a country's vulnerabilities. Such an analysis requires taking into account the asset and liability positions, including their currency denomination and maturities, not only for an economy as a whole (vis-à-vis nonresidents) but also for each of the country's sectors (vis-à-vis one another).

The information can be presented in a matrix such as the one shown in Table 7.2:

- *The rows contain the financial liabilities issued by the different sectors*, broken down by maturity (residual basis) and currency; where applicable, issued equity is also reported. All liabilities or equity issued by the rest of the world to residents is normally denominated in foreign currency (in the matrix, these represent the external assets held by domestic residents, including the reserves of the central bank). For most emerging markets, the debt liabilities that residents issue to the rest of the world are mostly denominated in foreign currency.

- *The columns indicate the sector that holds the respective instruments*. Since the holder of a liability views that liability as an asset, the columns show each sector's assets. For example, the row "Financial Sector: Deposits and other short-term liabilities," shows the liabilities that domestic banks (might) have to repay in the short term, which are equal to the liquid assets that corporations and households have in the form of bank deposits.

- As the liabilities already represent consolidated sectoral data, the matrix's *diagonal* of intrasectoral holdings (for example, the financial sector holdings of liabilities issued by the financial sector) remains empty.

- *Additional rows with memorandum items* may cover off-balance-sheet activities and contingent liabilities taken on by certain sectors (for example, financial derivative positions or debt guarantees).

Table 7.2 Intersectoral Asset and Liability Position

Issuer of Liability (debtor) \ Holder of Liability (creditor)	Government Sector (including central bank)	Financial Sector	Nonfinancial Sector	Rest of the World	Total
Government Sector (including central bank)					
Domestic currency	0				
Total other liabilities	0				
Short term	0				
In foreign currency	0				
In domestic currency	0				
Medium and long term	0				
In foreign currency	0				
In domestic currency	0				
Financial Sector					
Total liabilities		0			
Deposits and other short term		0			
In foreign currency		0			
In domestic currency		0			
Medium and long term		0			
In foreign currency		0			
In domestic currency		0			
Equity (capital)		0			
Nonfinancial Sector					
Total liabilities			0		
Short term			0		
In foreign currency			0		
In domestic currency			0		
Medium and long term			0		
In foreign currency			0		
In domestic currency			0		
Equity (capital)			0		
Rest of the World					
(All in foreign currency)				0	
Total liabilities				0	
Currency and short term				0	
Medium and long term				0	
Equity (capital)				0	

This matrix presentation of sectoral asset and liability positions can serve as a basis for a sectoral balance sheet analysis. The concept allows highlighting the key balance sheet mismatches and sectoral inter-linkages at one point in time. Simple simulations can also be carried out, which, despite their static nature, help better understand the impact of possible shocks, such as a sudden withdrawal of bank deposits or a decline in rollover rates for external debt, and how such shocks could spill from one sector into another.

The balance sheet approach has increasingly become a regular element in the IMF's tool kit for surveillance in emerging market countries.[139] Existing data from national sources, the IMF's *International Financial Statistics* and *Coordinated Portfolio Investment Survey*, and some international data sources (such as the Bank for International Settlements' banking statistics) can provide the basis for a sectoral analysis. However, significant data constraints remain. Often balance sheet data—especially with regard to the corporate sector—are not readily available or not available in a useful format. The same is true to an even greater extent for information on off-balance sheet positions, which is crucial for a complete analysis of risk exposures. Even an analysis limited to the balance sheets of the banking sector and the sovereign—for which data are more readily accessible—can provide valuable information about an economy's resilience to potential shocks. But the usual caveats about drawing premature policy conclusions apply even more strongly to such partial analysis. In particular, it is prone to the danger of providing a misleading picture of the risks to an economy, especially if information on off-balance sheet activities is incomplete.

7.4 Recap: Some Practical Steps in Formulating Baseline Scenarios

We have now reached a critical point in the financial programming exercise. In Parts I–II of this book, we assembled most of the elements needed to begin formulating a *baseline scenario*. In this scenario, macroeconomic projections assume that economic policies will remain broadly unchanged from current or recent trends. The baseline is a key diagnostic tool: it helps to identify the imbalances building up in the economy and suggests policy corrections. A high-quality baseline helps the team identify the nature and gravity of economic and financial vulnerabilities and lays the foundation for designing the program scenario, as will be described in detail in Part III.

Sound macroeconomic projections utilize all three analytical frameworks—financial programming, debt sustainability analysis, and balance sheet analysis—discussed in this book.[140] But while useful, these frameworks do not pin the projections down precisely. The forecasting team must use considerable judgment in formulating the projections and continue cross checking them to ensure overall consistency.[141] The following are some consistency

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[139] For country applications, see Barnett and others (2004), Fritz-Krockow and others (2005), Rennhack and others (2005), and Wolfe and others (2004).

[140] Debt sustainability analysis will be discussed in detail in Part III.

[141] Baselines may differ for a number of reasons, including differences in the assumptions about exogenous variables, varying views and interpretations of what constitutes an unchanged policy stance, and divergent calibrations of the key behavioral equations or other forecasting methods.

checks for the baseline and, by extension, the policy scenario. The list is only suggestive. Depending on the exchange rate regime, monetary framework, and other macroeconomic considerations specific to the country examined, some of these checks are irrelevant while others, not mentioned here, will emerge as essential.

- *Time Series Checks.* In the absence of significant shocks, trends observed in the past will probably continue. The most robust consistency check in this context is provided by the dynamics of the Saving-Investment balance. In particular, domestic saving in relation to GDP tends to change quite slowly over time.

- *Monetary-Monetary Checks.* If there is no plausible reason to expect an abrupt change in the demand for money, broad money growth should be related to the growth in the real economy and inflation projections. In other words, a high rate of growth in broad money would *not* be consistent with a relative low projection of inflation and a moderate projection of real GDP growth.

- *Monetary-Real Checks.* As the private sector is typically the engine of growth, it is reasonable to assume that economic growth should be accompanied by growth of credit to households and enterprises to finance increases in consumption and/or investment. Hence, special attention should be paid to ascertain that the growth of real credit to the rest of the economy is consistent with (and conducive to) the projected real GDP growth rate.

- *Fiscal-Monetary Checks.* What is the role of the fiscal deficit in inflation determination? This relationship should be considered from at least two perspectives. First, fiscal deficits can be an automatic source of inflationary pressures if they are monetized. In such a context, a reduction in projected inflation would not be consistent with an unchanged fiscal stance. Second, financing of the government deficit from the domestic banking system needs to be reflected in the monetary survey as growth of net claims of the banks on the government. Moreover, nonbank financing must not be used a "residual" to finance the deficit. Are relative asset returns commensurate with a demand for government paper by nonbanks?

- *Fiscal-Debt-Interest Rate Checks.* Is government spending crowding out the private sector? After public sector borrowing requirements are reflected in the stock of debt and its maturity structure, what is the likely impact on treasury-bill auction rates?

- *Monetary-BoP Checks.* What is the monetary policy stance in a country that is experiencing large financial inflows and significant reserves accumulation? In a fixed or heavily managed exchange rate regime, disinflationary policies will have to be accompanied by sterilization to restrain commercial bank liquidity. Is the assumed sterilization consistent with projections of the monetary survey and interest rates?

- *BoP-BoP Checks.* Double entry book keeping ensures that the balance of payments is always in equilibrium in an accounting sense: a current account deficit will be financed by a financial account surplus, that is, through foreign savings, and a reduction in the central bank's holdings of international reserves. What is needed is a macroeconomic assessment of the plausibility of the assumed flows. You may want

to reflect on whether, for example, the projected rollover rates are realistic given the global cyclical outlook. Alternatively, if the country relies on short-term inflows, are relative asset returns—interest parity—conducive to these inflows?

In addition, the following considerations could be helpful in formulating projections.

- *External Checks.* Assumptions about external developments, such as the likely evolution of the price of imported energy and of the main commodity exports, are crucial ingredients of macroeconomic projections under either the baseline or the policy scenario. More generally, external sector forecasts involve interrelationships with the rest of the world and must take account of developments in the world economy. Forecasts of foreign trade prices, world interest rates, and demand and output growth in partner and competitor countries can be obtained from various private, government, and international financial institutions. Nevertheless, a considerable degree of uncertainty underlies these forecasts. For this reason, it may be useful to check the sensitivity of the projections to changes in the assumed levels of the more important external variables.

- *Sustainability Checks.* As stated above, the baseline is the "no policy change" scenario. From this perspective, a medium-term sustainability check will reveal the need for short-term policy corrections as well as structural measures. Furthermore, in the context of a "policy scenario," DSA is essential to assess the medium-term prospects of the program itself. In particular, what are the constraints imposed on the fiscal stance by the need to guarantee public or external debt sustainability?

- *Comprehensiveness Checks.* Projections under the baseline or policy scenario need to adopt a comprehensive view of economic developments in each sector. Some countries failed to reign in extra budgetary spending and quasi-fiscal operations of enterprises and banks. If these practices are important sources of vulnerability, they need to be reflected in the projections even if they are not included in official presentations of the accounts. The lack of official figures on these operations may raise substantially the uncertainty surrounding their nature and effects. A strong justification would be needed in order to assume that these activities are no longer a major factor in the baseline. The authorities may have adopted specific policies, such as a new expenditure management system or regulations banning policy lending.

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Part II

Medium-Term Scenario and External and Fiscal Sustainability

VIII.   CHAPTER EIGHT: WHAT IS DEBT SUSTAINABILITY ANALYSIS?

Debt sustainability analysis (DSA) asks if, under current policies, a country or a government will be able to service its debts in the medium and long run without renegotiating or defaulting, and without having to undertake policy adjustments that are implausibly large economically and politically. DSA frameworks provide an intertemporal consistency check by testing whether macroeconomic plans are viable not only from a "flow balance" perspective but also from a "stock balance" point of view. They may also help dissuade policymakers from pursuing policies that deliver short-term benefits at the cost of creating unsustainable debts in the future.

In recent years, the IMF developed an approach to debt sustainability that is now used in surveillance and lending decisions. [142] These DSAs help the IMF and policymakers assess the risks associated with short-run macroeconomic forecasts and the policies on which such forecasts are based. A first risk, as discussed in detail in Chapters 9 and 10, is that projections of external or public debt may not be always grounded on sufficiently conservative assumptions. For instance, some IMF-supported programs have been based on assumptions about growth in export volumes and prices that proved to be optimistic, contributing to excessive borrowing. A second key risk to the realism of forecasts is the assumed path of the real exchange rate. Countries may be able to sustain relatively large stocks of foreign-currency denominated debt through real exchange rate appreciation over the medium term. As discussed in Chapter 4, moreover, it may be reasonable to assume that some countries will experience secular real appreciation as an equilibrium phenomenon due to catch-up growth. While the assumption of real appreciation may be defended in some circumstances, experience in several countries that underwent substantial real depreciations following crises suggests that it is risky to base policies on the assumption that real appreciation will continue indefinitely.

DSAs also allow policymakers to identify the economic sectors responsible for excessive debt accumulation, be they the national government (as in a number of African countries in the 1990s), subnational governments and state enterprises (as in some transition economies), or the private sector (as in the Asian crisis countries).

In many emerging market countries, debt ratios may be moderate and the main risk to sustainability may arise from liquidity problems. In some cases, countries do not have sufficient liquidity to cover maturing obligations even when they can be considered solvent, i.e., have relatively low and declining external debt-to-GDP ratios. Concerns about liquidity may arise, for instance, if the sovereign or private sector needs to make large amortization payments to creditors in the near future and foreign exchange or government revenues are insufficient. In such cases of temporary illiquidity, much depends on the willingness of

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[142] See, "Assessing Sustainability," IMF (2002, 2003).

creditors to maintain or increase their exposure in the short run. Market confidence is a crucial ingredient, and the vulnerability to confidence crisis needs to be evaluated and addressed alongside long-term sustainability.

For low-income countries that do not borrow from private capital markets, the sustainability of the public debt is largely de-linked from the sentiments of the market. It depends, instead, on the willingness of official creditors and donors to continue providing positive net transfers through concessional loans and grants.[143] For low-income countries that have high debt ratios, solvency is more of a concern than liquidity. DSAs allow a study of the exposure of the IMF and other multilateral creditors to individual borrowers.

Finally, DSAs are also useful to assess the impact of—and response to—powerful technological and demographic changes that constrain government policies in the long run. Fiscal DSAs help quantify the fiscal impact of population aging, immigration, and other long-run population changes.

The IMF's DSA framework presented in Chapters 9 and 10 is a simple quantitative model of the evolution of (external or public) debt. It is based on the intertemporal accounting identity linking external or fiscal deficit flows to the accumulation of the corresponding debt stocks over time. In building any DSA framework, analysts must make baseline assumptions about the time paths of a number of macroeconomic variables – real GDP growth, inflation, interest and exchange rates, budget and external debts and deficits. In the IMF's DSA framework, the choice of baseline is a judgment made by the country team on the basis of consultations with country authorities and other IMF staff through the internal review process. The baseline projection is then stress-tested by subjecting it to plausible macroeconomic shocks. To be useful, stress tests must choose shocks of reasonable type, size, and cross-correlation. What "plausible" shocks are is a matter of judgment and depends on the specifics of the country's situation and outlook. As Chapters 9 and10 will explain, to make DSAs more systematic and disciplined, the stress tests in the IMF's framework are derived from the country's past history of shocks. Sometimes the country teams complement the mechanical, history-based scenarios with alternative scenarios that assume more adverse external conditions and/or suboptimal policies.

While they are an extremely valuable tool, DSAs have certain limitations. For one thing, DSAs do not assign explicit probabilities to the likelihood of crises. While desirable in principle, probabilistic approaches are more difficult to implement, especially for countries in which limited data or rapid structural change make it difficult to estimate these probabilities. A second limitation of existing DSA approaches, including the IMF's, is that they abstract from second-round behavioral responses of economic agents to shocks. For example, shocks to GDP do not affect the government's tax collections or spending plans.

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[143] For treatment of debt sustainability in low-income countries, see IMF,(2004, 2004a).

The literature has begun to incorporate such effects by estimating fiscal reaction functions that endogenize the economy's response to shocks (Celasun and others, 2006).

A third limitation of DSA analyses is that they focus mainly on debt dynamics rather than threshold levels of debt. DSAs regard debt paths as sustainable so long as the debt-to-GDP ratio declines. While this is, in principle, correct in the sense that it meets the intertemporal budget constraint, it may be problematic to assume sustainability if the debt ratio is stabilized at a high level. Clearly, stabilizing the debt-to-GDP ratio at 30 percent is different from stabilizing it at 90 percent. Some industrial countries—including Greece, Italy, Belgium, and Japan—have been able to sustain debt-to-GDP ratios that exceed 100 percent for decades without having to pay high interest rates. Developing or emerging market economies, on the other hand, often do not have such luxury. For example, in the case of Argentina during the pre-2001 crisis period, the debt-to-GDP ratio was approximately 50 percent, not high by international standards.[144]

A fourth limitation of DSAs is that they focus more on debt dynamics and less on liquidity risk. As noted earlier, the risk that maturing debt cannot be refinanced may arise even in solvent countries. The IMF's DSA templates provide gross financing needs and other information on rollover risks. On the other hand, a full evaluation of these risks requires more disaggregated—and higher frequency—data on the debt stock.

Finally, a word of caution is in order. With the benefit of 20/20 hindsight, the path to many of the recent crises and episodes of unsustainable debt dynamics now seems obvious. And yet most observers failed to spot the initial policy mistakes that eventually led to these crises. Why is it so difficult to diagnose sustainability problems? No simple or sophisticated model will be able to predict crises well in advance while avoiding false alarms. The main problem with all approaches, including DSAs, is two-fold: first, changes in the external environment are difficult to predict beyond a short-term horizon, and a single set of policies can result in very different outcomes depending on external events; second, the reaction of domestic and foreign investors and the public is difficult to gauge, especially when information is scarce, perhaps owing to lack of policy transparency, and economic agents act in "herd-like" manner. Economists can at best prepare DSAs or other model scenarios and explore the circumstances under which crises or debt problems are more or less likely to develop.

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[144] IMF (2003) takes a closer look at how these debt ratios can be interpreted, and concludes that for emerging markets a total debt above 40–60 percent of GDP leads to sharply higher crisis probabilities (the more so the more closed the country is to foreign trade).

IX. CHAPTER NINE: FISCAL SUSTAINABILITY

This section examines public debt dynamics. Starting from the government's cash-flow constraint, it examines the factors affecting fiscal sustainability and shows how a stream of budget deficits can, over time, lead to unsustainable public debt levels and their macroeconomic consequences. Both the closed and open economy cases are considered.

9.1 Debt Dynamics in a Closed Economy

Consider first an economy that does not trade with the rest of the world. Denote by Y_t the economy's real GDP in year t and P_t the GDP deflator. Nominal GDP is the product $P_t Y_t$.

Let π_t denote the rate of increase in prices between years t-1 and t, expressed as $\pi_t = \dfrac{P_t}{P_{t-1}} - 1$.

Similarly, let g_t denote the real growth rate of output, expressed as $g_t = \dfrac{Y_t}{Y_{t-1}} - 1$.

Let M_{t-1} denote the stock of money at the end of year t-1 and assume, for simplicity, that all interest-bearing government debt has one-year maturity. Denote by D_{t-1} the stock of one-period government bonds outstanding at the end of year t-1. The average nominal interest rate on government debt issued at t-1 is i_t. The government's expenditure in year t consists of two components, non-interest spending, denoted G_t, and interest payments on the debt, $i_t D_{t-1}$.

Next consider the government's cash-flow constraint in year t. As a matter of accounting, government expenditure must be financed by raising tax and nontax revenues net of transfers to the private sector, denoted R_t, through money issuance, M_t–M_{t-1} $(=\Delta M_t)$, and by issuing interest-bearing securities, D_t–D_{t-1}.

$$G_t + i_t D_{t-1} = R_t + (D_t \text{-} D_{t-1}) + (M_t \text{-} M_{t-1}). \tag{9.1}$$

The government's overall budget balance is the difference between revenue and expenditure, R_t–$(G_t + iD_{t-1})$. The primary budget balance, PB_t, is the difference between revenue and non-interest expenditure, R_t - G_t. As we are interested in the evolution of the stock of interest-bearing public debt, we solve (9.1) for D_t, yielding

$$D_t = (1 + i_t) D_{t-1} - (PB_t + \Delta M_t). \tag{9.2}$$

To derive an expression for the stock of public debt in relation to GDP, we divide equation (9.2) by nominal GDP:

$$\frac{D_t}{P_tY_t} = \frac{(1+i_t)D_{t-1}}{P_tY_t} - \left(\frac{PB_t}{P_tY_t} + \frac{\Delta M_t}{P_tY_t}\right)$$

$$= \frac{(1+i_t)}{(1+g_t)(1+\pi_t)}\frac{D_{t-1}}{P_{t-1}Y_{t-1}} - \left(\frac{PB_t}{P_tY_t} + \frac{\Delta M_t}{P_tY_t}\right).$$

(9.3)

Denote by lower-case letters the stock of debt, primary balance, and seignorage expressed as shares of GDP: $d_t \equiv D_t/P_tY_t$, $d_{t-1} \equiv D_{t-1}/P_{t-1}Y_{t-1}$, $pb_t \equiv PB_t/P_tY_t$, and $\mu_t \equiv \Delta M_t/P_tY_t$. The parameter multiplying d_{t-1}, denoted ϕ_t, is key in debt sustainability analysis.

Use the Fisher equation linking the nominal and real interest rate, $1+r_t \equiv (1+i_t)/(1+\pi_t)$, to write ϕ_t as the ratio of one plus the real rate of interest on government debt over one plus the real rate of GDP growth:

$$\phi_t \equiv (1+i_t)/[(1+g_t)(1+\pi_t)] = (1+r_t)/(1+g_t).$$

(9.4)

With this notation, the government budget constraint can now be rewritten as:

$$d_t = \phi_t d_{t-1} - (pb_t + \mu_t).$$

(9.5)

We can draw equation (9.5) in a phase diagram as shown in Figure 9.1 to examine how the debt-to-GDP ratio evolves over time. The horizontal axis plots the debt-to-GDP ratio in year t-1, d_{t-1}, while the vertical axis shows the resulting value of d_t in year t. The 45° line shows debt-to-GDP ratios that do not change over time. Suppose, for simplicity, that the parameters ϕ_t, pb_t, and μ_t are constant over time at ϕ, pb, and μ, respectively, so that d_t and d_{t-1} have a linear relationship.

Whether the public debt-to-GDP ratio is explosive or not depends on the value of the parameter ϕ. The non-explosive case $\phi < 1$ is shown on the left-hand side panel of Figure 9.1. In this case, the initial level of debt-to-GDP ratio d_0 eventually falls to d^* and stays at that level forever. The explosive debt case $\phi > 1$ is shown on the right-hand side panel of Figure 9.1. Here, the real interest rate r_t which the government pays on its debt exceeds the real GDP growth rate g_t. Starting from any positive initial level of debt-to-GDP ratio $d_0 > d^*$ in year 0, the debt to GDP ratio grows without bound, which is obviously unsustainable.

Figure 9.1 Debt Dynamics

a. Stable debt dynamics

d_t

45º line

$d_t = \phi d_{t-1} - (pb + \mu)$
where $\phi < 1$ or $r < g$

$-(pb+\mu)$

d^* d_0 d_t

b. Explosive debt dynamics

d_t

45º line

$d_t = \phi d_{t-1} - (pb + \mu)$
where $\phi > 1$ or $r > g$

$-(pb+\mu)$

d^* d_0 d_t
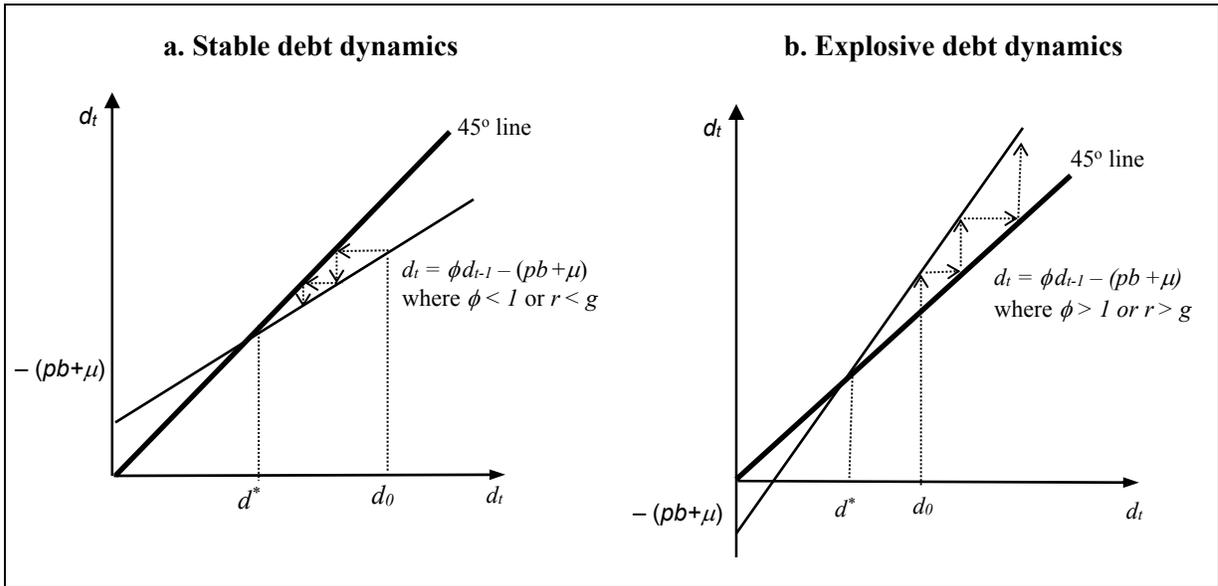
The speed at which debt can explode in realistic cases is surprisingly fast. Suppose the public debt-to-GDP ratio is initially $d_0 = 50$ percent. Assume a nominal interest rate, $i = 14$ percent, real GDP growth rate $g = 4.0$ percent, annual inflation $\pi = 4.3$ percent, primary deficit pb = -2.7 percent of GDP, and seignorage, $\mu = 1.1$ percent of GDP. Applying the Fisher equation, the real interest rate is 9.3 percent ($= (1.14/1.043 - 1) \times 100$ percent), which exceeds real GDP growth, implying $\phi > 1$. The debt-to-GDP ratio is explosive (see Figure 9.2) and reaches 80 percent of GDP—sometimes considered the threshold for "severe" indebtedness—in about five years.

Figure 9.2 The Debt-to-GDP Ratio in a Closed Economy
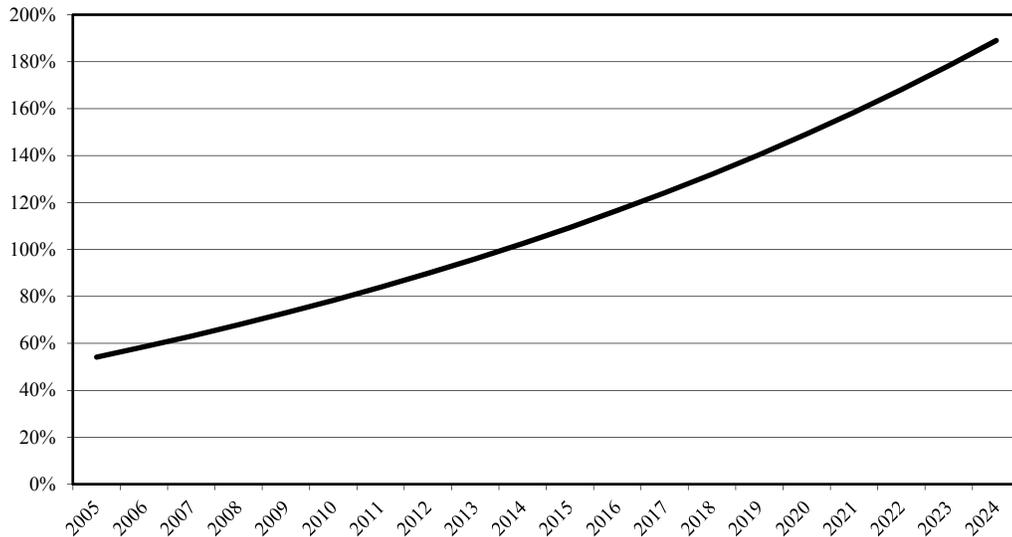
The explosive nature of the government's debt dynamics can also been seen by differencing equation (9.5) to calculate the change in the debt-to-GDP ratio, $\Delta d_t = d_t - d_{t-1}$. Subtracting d_{t-1} from both sides of equation (9.5) yields the following

$$\Delta d_t = (\phi_t - 1) d_{t-1} - (pb_t + \mu_t). \tag{9.6}$$

Equation (9.6) underscores the factors that affect the change in the debt-to-GDP ratio: the size of the primary budget balance pb_t, seignorage μ_t, and the built-in momentum of debt, $(\phi_t - 1) d_{t-1}$. If the real interest rate on government debt exceeds real GDP growth, debt becomes explosive. Primary surpluses are then needed to offset the automatic debt dynamics. The size of the primary surplus in relation to GDP, pb_t, is a good indicator of the government's fiscal adjustment effort.[145] Equation (9.6) is useful in calculating the primary surpluses needed to achieve specific objectives, such as stabilizing the debt at its existing level or even reducing it to a lower level, as needed, for example, to meet the criteria of the Maastricht Treaty for European Union member countries.

As a first step to fiscal sustainability, the authorities may pick fiscal targets with a view to halt further increases in the public debt to GDP ratio. This requires raising the primary balance to GDP ratio sufficiently to stabilize the debt-to-GDP ratio. To obtain the debt-stabilizing primary balance, set $\Delta d_t = 0$ in equation (9.6) to obtain:

$$pb_t = (\phi_t - 1) d_{t-1} - \mu. \tag{9.7}$$

Continuing with our earlier example, if the country is to avoid the ever-rising debt path shown in Figure 9.2, the primary balance surplus needs to be at least 1.45 percent of GDP $\{[((1.093 - 1.04)/1.04) \times 0.5] - 0.011\} \times 100$ percent instead of 2.7 percent of GDP in deficit.

The debt-stabilizing primary balance depends on several factors. First, if the existing level of debt is large, large primary surpluses are needed to prevent it from growing further. Second, if the difference between the real interest rate and real GDP growth is large, then the primary surplus also needs to be large. Third, if seignorage or other sources of government finance are available (such as privatization receipts), these can be used to pay off the debt and will result in lower debt-stabilizing values for the primary surplus. Of course, many countries likely would like to reduce their stock of debt relative to GDP, rather than just stabilize it. Those countries must then achieve a primary surplus in excess of the debt-stabilizing level.

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[145] The government can manipulate the money growth rate to increase revenue from money creation, or *seignorage*. But raising money growth and inflation leads to currency substitution, which places limits on the amount of real resources the government can obtain from seignorage.

9.2   Debt Dynamics in an Open Economy

The analysis of public debt sustainability is similar when the government can borrow from international financial markets to cover part of its budget deficit. Under these conditions, public debt sustainability depends on the path of the nominal and real exchange rate and foreign interest rates.

When the government borrows abroad, a distinction needs to be made between domestic currency-denominated debt D_t^h and foreign-currency denominated debt D_t^f. Letting e_t be the nominal exchange rate (local currency per unit of foreign currency), the debt stock is $D_t = D_t^h + e_t D_t^f$ and the government budget constraint can be written

$$D_t = \left(1+i_t^*\right)D_{t-1} - \left(PB_t + \Delta M_t\right). \tag{9.8}$$

In equation (9.8), i_t^*, the effective nominal interest rate, is a weighted sum of the domestic and foreign interest rates i_t^h and i_t^f, and also depends on the exchange rate

$$i_t^* = \left((1-\alpha)i_t^h + \alpha i_t^f\right) + \alpha\varepsilon_t\left(1+i_t^f\right), \tag{9.9}$$

where $\alpha = \left(e_t D_t^f\right)/D_t$ is the portion of foreign currency denominated debt, and ε_t is the rate of depreciation of the currency. It can be shown that the public debt to GDP ratio evolves according to the following equation, which is analogous to (9.5):

$$d_t = \phi_t^* d_{t-1} - \left(pb_t + \mu_t\right), \tag{9.10}$$

In equation (9.10), $\phi_t^* \equiv \left(1+i_t^*\right)/[(1+g_t)(1+\pi_t^*)]$ is analogous to ϕ_t, and π_t^*, the GDP deflator, depends on domestic inflation π_t^h, foreign inflation π_t^f, and exchange rate movements:

$$\pi_t^* = \left((1-\beta)\pi_t^h + \beta\pi_t^f\right) + \beta\varepsilon_t\left(1+\pi_t^f\right), \tag{9.11}$$

where $\beta = \left(e_t P_t^f Y_t^f\right)/P_t Y_t$ is the output share of tradables in GDP.

The intuition discussed in the closed economy case still holds: Debt dynamics are explosive if the real interest rate $r_t^* \equiv \left(1+i_t^*\right)/\left(1+\pi_t^*\right)-1$ is greater than real GDP growth g_t. In the open economy the interest rate relevant for the DSA calculation depends on domestic and foreign interest rates and inflation, on exchange rate movements, and on the size of foreign borrowing and foreign trade.

In terms of our earlier example, suppose $i^d =14$ percent, $i^f =8$ percent, $\alpha =0.5$, $\beta =0$, and $\varepsilon =0$. Then the effective nominal interest rate i^* is 11 percent $= (0.5 \times 14$ percent $+ 0.5 \times$

8 percent)+0.5×0×1.08), and the effective real interest rate r^* is 6.4 percent $(= (1.11/1.043-1)×100$ percent), which is greater than the real GDP growth rate of 4.0 percent. As in the closed economy case, the debt-to-GDP ratio is explosive (see Figure 9.3). Moreover, if the exchange rate depreciates by 30 percent, the effective nominal interest rate and the effective real interest rate become as high as 27.2 percent and 22.0 percent. The debt-to-GDP ratio rises much more rapidly and exceeds the 80 percent threshold in less than 5 years, assuming a crisis does not force an adjustment first (see Figure 9.3). The debt stabilizing primary balance in this case rises to 7.6 percent of GDP $(= (22.0$ percent $- 4.0$ percent)$/1.04 ×0.5-1.1$ percent).

Figure 9.3 The Debt-to-GDP Ratio in an Open Economy
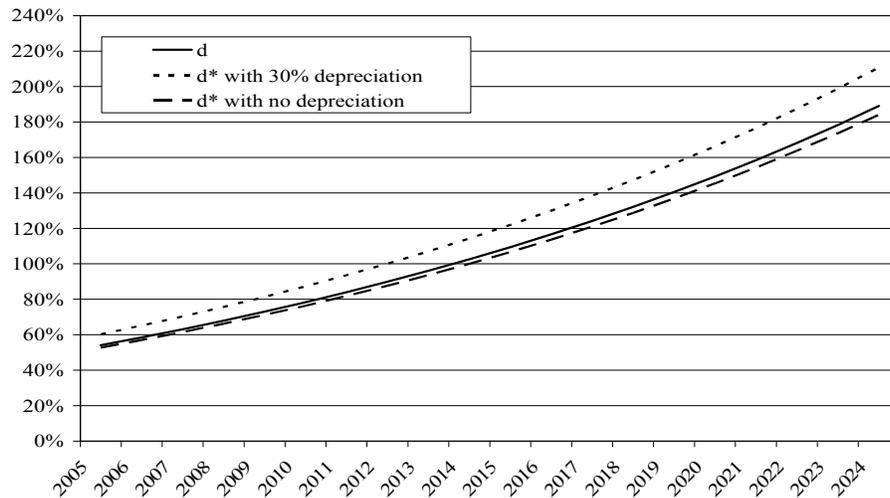
9.3   The IMF's Approach to Public Debt Sustainability

Basic macroeconomic assumptions

In this section, we focus on public DSAs relevant for countries with access to international capital markets. The fiscal DSA framework consists of a baseline scenario and sensitivity tests of debt dynamics to a number of assumptions.

There are many difficulties in constructing realistic projections of public debt and debt service. In particular, three important risks need to be assessed. A first risk comes from contingent liabilities (Box 9.1). Many contingent liabilities, by nature, go unnoticed in normal times but are more likely to emerge in crises. Contingent liabilities are exceedingly difficult to measure in practice, both because the amounts involved are often unknown and because the precise circumstances under which they would turn into actual liabilities are often unknowable.

Box 9.1 Contingent Liabilities

The government's contingent liabilities are potential claims on the government that may or may not be incurred depending on macroeconomic conditions and other events. Unlike direct liabilities, such as pension obligations, which are predictable and will arise in the future with certainty, contingent liabilities are obligations triggered by discrete but uncertain events. By nature, contingent liabilities are difficult to measure. While information is usually available on debt formally guaranteed by the central government, debt not explicitly guaranteed has often been an important contributor to public debt build-up.

Contingent liabilities, especially those arising from the need to rescue banks, were responsible for large jumps in the public debt to GDP ratio in several countries affected by past financial crises. Capturing the hidden fiscal risks arising from contingent liabilities is therefore an important task for public DSAs. One of the stress tests in the public debt sustainability template examines the effect on the public debt dynamics of the realization of contingent liabilities, specified as an exogenous increase in the debt ratio of 10 percent of GDP. This shock is exogenous and is not linked to the country's financial sector vulnerabilities and other shocks examined in the template (e.g., to growth, interest rates, or the exchange rate).

Explicit liabilities are those recognized by a law or contract, such as government guarantees for non-sovereign borrowing and obligations issued by subnational governments and public or private sector entities or trade and exchange rate guarantees. *Implicit liabilities* are obligations that may be assumed by government due to public and interest-group pressures, such as financial sector bailouts, or bailouts of non-guaranteed social insurance funds.

A second risk is an abrupt change in financing conditions in international markets affecting both the availability and the cost of funds. Such changes may reflect developments in the financial markets, such as contagion, or funding difficulties specific to the country. These changes may give rise to a liquidity crisis if the country is unable to rollover its maturing obligations or result in sharply higher interest rates, calling into question the long-term solvency of the borrower.

A third risk is a depreciation of the exchange rate, possibly in the aftermath of the collapse of an exchange rate peg, which increases the domestic currency value of the stock of external public debt. A key factor in determining the post-crisis evolution of the exchange rate is the extent of initial overvaluation and the extent of possible exchange rate overshooting. As some cases have shown, once a crisis erupts, the capital outflows can result in exchange rate adjustments far in excess of any initial estimates of overvaluation.

To stress test the baseline projections against these and other risks, the IMF DSA:

- calibrates the size of shocks (reasonable but not extreme; use historical standard deviations or absolute deviations for global shocks),

- assesses interdependencies (perturb correlated parameters at the same time),

- sets durations of shocks (use shock sequences for serially correlated parameters), and

- assesses the effect of other debt-creating flows (e.g., contingent liabilities). [146]

The public sector DSA template

The public sector debt template tracks the behavior of the gross debt-to-GDP ratio shown in equation (9.9). The definition of debt used in the IMF's DSA is based on gross liabilities—that is, public sector liquid or other assets are not netted out. The coverage of public debt is as broad as possible and it includes public enterprises as well as local governments.

Based on equation (9.9), the template identifies the different channels that contribute to the evolution of the debt to GDP ratio, including the primary deficit and endogenous/automatic factors related to interest rates, growth rates and exchange rate changes. The template also includes other debt-creating operations, such as would result from the recognition by the government of contingent liabilities, as well as debt-reducing operations, such as privatizations whose proceeds are used to pay down public debt.

The gross financing needs of the public sector are defined as the sum of the public sector deficit and all debt maturing over the following 12 months. The template also calculates the debt-stabilizing primary balance which would be needed to keep the debt-to-GDP ratio constant if all the variables in the debt dynamics equation remained at the level reported in the last year of the projection.

As discussed in Chapter 8, in the IMF's public debt sustainability framework, the baseline paths of the public debt-to-GDP ratio and the variables on which it depends are projected by IMF staff in consultation with country authorities. The baseline projections are conditional in the sense that they assume that the authorities will fully implement the announced fiscal, monetary, exchange rate, and structural policies.

In addition, the public debt sustainability template presents projections under a historical scenario. This is an alternative path of the debt ratio, constructed under the assumption that all key variables stay at their historical averages throughout the projection period. This scenario is a test of the "realism" of baseline projections: if the deviations of assumed policies and macroeconomic developments in the baseline are very different from those in the historical scenario, these will need to be justified by referring to credible changes in policies.

The template also contains a no-policy-change scenario. This is derived under the assumption that the primary balance is constant in the future and equal to the projection for the current year. The no-policy-change scenario can be modified to assume an unchanged cyclically

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[146] In 2005, the IMF reviewed its DSA framework and revised the size and duration of the shocks used in the stress tests. The new approach considers the effects of smaller but more persistent shocks.

adjusted primary position, or to make adjustments for the expiration of one-off measures, as necessary.

The baseline scenario is also stress-tested using different assumptions on key parameters. Permanent shocks equal to one-half standard deviation are applied to the baseline projections of each of the parameters, and paths of debt ratios are then derived. One-quarter standard deviation shocks are applied in the combined shock test. These shocks are applied to the interest rate, growth rate, and primary balance. In addition, the template examines the debt trajectory in the case of a 30 percent depreciation of the local currency and a contingent liabilities shock of 10 percent of GDP. The latter is presented as a rough measurement of an increase in debt-creating flows, given the difficulties in discussing contingent liabilities risk. If better measures are available, the staff is encouraged to use them in stress tests.

Table 9.1 lists the data inputs needed to calculate the debt-to-GDP ratio in the IMF's DSA.

Table 9.1 Data Input Requirements for DSA

Fiscal Variables	Macroeconomic Variables
Public sector debt,	Nominal GDP,
Public sector balance,	Real GDP,
Public sector expenditure,	Exchange rate, national currency per U.S.
Public sector interest expenditure,	dollar, end of period,
Public sector revenue (and grants),	Exchange rate, national currency per U.S.
Foreign-currency denominated debt	dollar, period average,
(expressed in local currency),	GDP deflator
Amortization on medium- and long-	
term public sector debt,	
Short-term public sector debt,	
Interest payments on foreign debt	

It is also desirable to have data on privatization receipts, recognition of implicit or contingent liabilities, and other liabilities (e.g., bank recapitalization). While this data is much harder to collect, it greatly improves the quality of the baseline projection and the stress tests.

Once input data are filled in, the baseline and stress test results are automatically calibrated and presented in a summary table and in charts representing the outcomes of the stress tests, also known as bound tests. See Table 9.2 and Figure 9.4 for an example.

Table 9.2 summarizes the baseline scenario. Lines 1 and 2 show how the debt-to-GDP ratio evolves over time. The key macroeconomic assumptions underlying the baseline are reported at the bottom of the table. The different channels that contribute to the evolution of the debt-to-GDP ratio are: the primary deficit (line 4), the automatic debt dynamics (line 7), and other

identified debt-creating flows (line 12), which include privatization receipts, recognition of implicit or contingent liabilities, and other obligations such as bank recapitalization. These flows are assumed zero in this particular example.

The automatic debt dynamics, in turn, is broken down into contributions from the real interest rate, real GDP growth, and exchange rate. This decomposition allows an assessment of the importance of different factors in the buildup of public debt and also serves as the basis for stress tests, the results of which are summarized together with the baseline projections in Figure 9.3.

Changes in gross debt arising from other below-the-line operations, such as repayment of debt financed by a reduction in financial assets, and cross-currency movements are included in a residual (line 16). It is critical to monitor the behavior of this residual, as it may highlight errors in implementing the approach. A large residual may, in particular, signal a breach of the flow-stock identity linking the deficit to changes in debt. The residual should be small unless it can be explained by specific factors. The gross financing needs of the public sector, in percent of GDP and in billions of dollars, are also calculated.

Table 9.2 also reports the paths of debt to GDP ratio under the historical scenario and under the no-policy-change scenario. These scenarios test the realism of the baseline scenario. Finally, the template also calculates the debt-stabilizing primary balance (last column of Table 9.2).

Table 9.2 Country: Public Sector Debt Sustainability Framework, 2000-2010

Table 9.2. Country: Public Sector Debt Sustainability Framework, 2000-2010

(In percent of GDP, unless otherwise indicated)

	Actual					Projections						Debt-stabilizing primary balance 9/
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	
1 **Baseline: Public sector debt 1/**	47.7	51.8	60.0	56.3	49.4	**49.5**	**48.3**	**47.2**	**45.3**	**43.3**	**41.3**	**0.5**
o/w foreign-currency denominated	26.3	28.5	31.9	29.9	24.4	24.7	24.4	24.0	22.9	22.0	21.2	
2 Change in public sector debt	6.4	4.1	8.2	-3.7	-6.9	0.1	-1.1	-1.1	-1.9	-2.0	-2.0	
3 Identified debt-creating flows (4+7+12)	1.9	0.9	7.1	-4.1	-7.1	-1.5	-2.1	-2.2	-2.4	-2.4	-2.3	
4 Primary deficit	-0.9	-1.3	-0.5	-2.0	-2.9	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	
5 Revenue and grants	28.0	29.5	29.3	30.6	32.5	32.9	32.3	32.1	32.3	32.2	32.1	
6 Primary (noninterest) expenditure	27.1	28.2	28.9	28.6	29.6	30.2	29.5	29.5	29.6	29.6	29.5	
7 Automatic debt dynamics 2/	3.3	2.3	7.5	-2.2	-4.3	1.2	0.6	0.5	0.4	0.2	0.3	
8 Contribution from interest rate/growth differential 3/	-1.1	1.6	0.4	-1.3	-0.2	1.2	0.6	0.5	0.4	0.2	0.3	
9 Of which contribution from real interest rate	-0.1	2.2	1.3	0.8	1.7	3.0	2.4	2.3	2.1	1.9	1.9	
10 Of which contribution from real GDP growth	-1.0	-0.7	-0.9	-2.1	-2.0	-1.8	-1.8	-1.8	-1.8	-1.7	-1.6	
11 Contribution from exchange rate depreciation 4/	4.4	0.7	7.1	-0.9	-4.1	...	...	...	...	...	...	
12 Other identified debt-creating flows	-0.5	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	
13 Privatization receipts (negative)	-0.5	0.0	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	
14 Recognition of implicit or contingent liabilities	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
15 Other (specify, e.g. bank recapitalization)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
16 Residual, including asset changes (2-3) 5/	4.5	3.1	1.1	0.4	0.3	1.6	1.0	1.1	0.5	0.4	0.3	
Public sector debt-to-revenue ratio 1/	170.3	175.4	204.4	184.1	151.8	150.6	149.9	147.1	140.3	134.5	128.5	
Gross financing need 6/	5.9	6.3	8.4	7.5	3.7	5.2	4.6	4.4	4.1	3.9	3.8	
in billions of U.S. dollars	5.0	5.1	6.8	6.0	3.5	5.6	5.0	4.9	4.8	4.7	4.9	
Scenario with key variables at their historical averages 7/						49.5	48.6	47.8	46.6	45.3	43.9	-1.0
Scenario with no policy change (constant primary balance) in 2005-2010						49.5	48.4	47.3	45.4	43.4	41.4	0.5
Key Macroeconomic and Fiscal Assumptions Underlying Baseline												
Real GDP growth (in percent)	2.9	1.5	1.9	3.8	3.8	4.0	4.0	4.0	4.0	4.0	4.0	
Average nominal interest rate on public debt (in percent) 8/	12.3	11.3	9.4	9.0	9.1	11.1	10.6	9.1	8.1	7.7	7.9	
Average real interest rate (nominal rate minus change in GDP deflator, in percent)	0.2	5.1	2.9	1.7	3.6	6.8	5.5	5.3	4.9	4.7	4.9	
Nominal appreciation (increase in US dollar value of local currency, in percent)	-15.9	-2.7	-20.0	3.1	16.3	...	...	...	...	...	...	
Inflation rate (GDP deflator, in percent)	12.1	6.2	6.4	7.2	5.5	4.3	5.1	3.8	3.2	3.0	3.0	
Growth of real primary spending (deflated by GDP deflator, in percent)	-5.5	5.5	4.5	2.8	7.6	6.0	1.7	3.7	4.5	3.9	3.7	
Primary deficit	-0.9	-1.3	-0.5	-2.0	-2.9	-2.7	-2.7	-2.7	-2.7	-2.7	-2.7	

1/ Indicate coverage of public sector, e.g., general government or nonfinancial public sector. Also whether net or gross debt is used.

2/ Derived as $[(r - \pi(1+g) - g + \alpha\varepsilon(1+r)]/(1+g+\pi+g\pi))$ times previous period debt ratio, with r = interest rate; π = growth rate of GDP deflator; g = real GDP growth rate; α = share of foreign-currency denominated debt; and ε = nominal exchange rate depreciation (measured by increase in local currency value of U.S. dollar).

3/ The real interest rate contribution is derived from the denominator in footnote 2/ as r - π (1+g) and the real growth contribution as -g.

4/ The exchange rate contribution is derived from the numerator in footnote 2/ as $\alpha\varepsilon(1+r)$.

5/ For projections, this line includes exchange rate changes.

6/ Defined as public sector deficit, plus amortization of medium and long-term public sector debt, plus short-term debt at end of previous period.

7/ The key variables include real GDP growth; real interest rate; and primary balance in percent of GDP.

8/ Derived as nominal interest expenditure divided by previous period debt stock.

9/ Assumes that key variables (real GDP growth, real interest rate, and other identified debt-creating flows) remain at the level of the last projection year.

Figure 9.4 Country: Public Debt Sustainability: Bound Test [1]
(Public debt in percent of GDP)

Baseline and historical scenarios

Interest rate shock (in percent)

Baseline:	5.1
Scenario:	7.2
Historical:	-0.7

Growth shock (in percent per year)

Baseline:	4.0
Scenario:	2.7
Historical:	2.1

Primary balance shock (in percent of GDP) and no policy change scenario (constant primary balance)

Baseline:	2.7
Scenario:	1.9
Historical:	0.4

Combined shock 2/

Real depreciation and contingent liabilities shocks 3/

Sources: International Monetary Fund, Country desk data, and staff estimates.
1/ Shaded areas represent actual data.Individual shocks are permanent one-half standard deviation shocks. Figures in the boxes represent average projections for the respective variables in the baseline and scenario being presented. Ten-year historical average for the variable is also shown.
2/ Permanent 1/4 standard deviation shocks applied to real interest rate, growth rate, and primary balance.
3/ One-time real depreciation of 30 percent and 10 percent of GDP shock to contingent liabilities occur in 2006, with real depreciation defined as nominal depreciation (measured by percentage fall in dollar value of local currency) minus domestic inflation (based on GDP deflator).

X. CHAPTER TEN: EXTERNAL SUSTAINABILITY

Foreign financial resources can be important to growing economies, as they supplement domestic savings to finance investment, help smooth income fluctuations and, in the case of direct foreign investment, facilitate technology transfer. Access to foreign finance, however, has in the past also led a number of countries to accumulate unsustainable foreign debts, which they were unable to honor in full. Although excessive debt obligations can be renegotiated with creditors in principle, the process is neither smooth nor costless in practice, not least because creditors are multiple and fragmented. Sometimes an initial round of debt reduction needs to be followed by further debt forgiveness. In the meantime, the country typically loses access to foreign financing for a sustained period, its currency depreciates strongly in nominal and real terms, and imports and other foreign spending are compressed. In some instances, as discussed in Chapter 6, balance sheet effects lead to insolvency of domestic firms and depositor runs against the banking system. The effects of financial convulsions on the real economy may be severe, with inflation, interest rates, and unemployment spiking up and output contracting.

Unsustainable foreign debts are thus costly to a country and disrupt the smooth functioning of international capital markets. However, while there is a large payoff to preventing these situations, identifying dangerous imbalances and correcting them as they are building up has proven difficult. The purpose of external debt sustainability analysis (DSA) is to help policymakers in these endeavors.

This chapter presents the analytical and operational considerations relevant to the analysis of external sustainability.

10.1   The IMF's External Debt Sustainability Framework

External sustainability requires a country to be able to fully service its outstanding debt to foreign residents both in the short run and in the long run. To be viewed as sustainable, debt should be serviceable without assuming unrealistically large policy corrections in the future. In contrast with fiscal sustainability, which focuses on debt owed by the national government to either domestic or foreign residents, external debt sustainability considers the total indebtedness of the economy (including debt of the government, the financial sector, the non-financial corporate sector, and households) vis-à-vis foreign residents.

To assess external sustainability, DSAs evaluate the path of a country's external debt stock over time in relation to GDP, exports, or some other indicator of capacity to repay external debt. Sustainability requires that these ratios stabilize at reasonable levels eventually—by the end of the projection period at the latest—and that they do not become explosive thereafter. The time path of the external debt-to-GDP ratio depends on domestic macroeconomic

conditions, the country's macroeconomic and structural policies, and on global trade and capital market conditions. If, under reasonable macroeconomic assumptions, the ratio of external debt to GDP or exports does not stabilize at a prudent level, this will raise alarm bells about the ability of the country to service its foreign debt in the future.

The IMF's assessments of external sustainability proceed in two steps. First, the IMF team working on a country, in cooperation with country authorities, makes projections of the path of policy and endogenous variables. The projections use the intertemporal budget constraint that links the external debt flows needed to finance a country's current account deficits to the stock of external debt at the end of the projection period. A key objective of the DSA is to determine the path of the external debt-to-GDP ratio during the projection period.

These projections involve many judgments about macroeconomic developments, such as economic growth, inflation, nominal and real interest rates, and exchange rates; the portion of the current account deficit that can be financed through non-debt flows; and the extent of official inflows. These macroeconomic assumptions are not standardized but are adapted to the circumstances of the country. They must be scrutinized to ensure that they are internally consistent and conform to developments in the international economy, including likely growth rates and inflation of trading partners and international interest rates.

As in the case of fiscal DSA, sensitivity tests are performed on the baseline to examine the effects on the external debt profile of alternative assumptions about the time paths of key variables.

10.2 The External Sustainability Template

The template summarizes the DSA's baseline assumptions and its implications for external debt dynamics.[147] The starting point is the accounting identity linking the economy's transactions with the rest of the world (see Chapter 4).

Let TB be the sum of the non-interest current account balance, NITB, and non-debt generating capital inflows. Also let D_t denote the stock of external debt at the end of year t and i_t^w the nominal effective foreign-currency interest rate the country pays on its external debt. The increase in the stock of external debt over time is

$$D_t - D_{t-1} = i_t^w D_{t-1} - TB_t, \tag{10.1}$$

which is equivalent to

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[147] External debt obligations should include public sector external debt, non-financial private external debt, and financial sector external debt.

$$D_t = \left(1 + i_t^w\right) D_{t-1} - TB_t. \tag{10.2}$$

It is useful to express the stock of a country's external liabilities in relation to GDP. This requires that we obtain the foreign currency value of the country's GDP where for purposes of illustration, we assume that the foreign currency in which debt is denominated is the U.S. dollar. Let P denote the GDP deflator, Y denote GDP, and let e define the exchange rate in units of domestic currency per U.S. dollar. Then GDP in U.S. dollar terms can be written as PY/e. Dividing both sides of (10.1) by PY/e yields the external debt-to-GDP ratio. The country's external debt dynamics becomes

$$\frac{D_t}{\left(P_t Y_t / e_t\right)} = \left(1 + i_t^w\right) \frac{D_{t-1}}{\left(P_{t-1} Y_{t-1} / e_{t-1}\right)} \frac{\left(P_{t-1} Y_{t-1} / e_{t-1}\right)}{\left(P_t Y_t / e_t\right)} - \frac{\left(P_t^x X_t - P_t^m M_t\right)}{\left(P_t Y_t / e_t\right)} + \frac{OI_t}{\left(P_t Y_t / e_t\right)}, \tag{10.3}$$

where P^X is the price of exports, X is exports, P^M is the price of imports in foreign currency, and M is imports.

The above equation can also be expressed as

$$d_t = \frac{\left(1 + i_t^w\right)\left(1 + \rho_t\right)}{\left(1 + \pi_t\right)\left(1 + g_t\right)} d_{t-1} - tb_t, \tag{10.4}$$

where d is the debt-to-GDP ratio, π is the growth rate in the GDP deflator, g is the real GDP growth rate, ρ is the rate of nominal exchange rate appreciation, and tb is the debt-creating component of the balance on goods and non-interest services in percent of GDP. The baseline medium-term projection of external sustainability is obtained by extending this equation to project the growth rates and balance of payments several years into the future.

To compute the evolution of the debt to GDP ratio, we need starting values for the initial stock of public and private external debt, its maturity profile and schedule of interest payments. To compute future interest payments, an estimate of future external interest rates must be made. The standard practice is to assume one interest rate that applies to both public and private external debt. An alternative approach would be to use a separate interest rate for the public and private sector and interpret the external interest rate as the weighted average external interest rate. Forecasts of growth rates of real exports and imports, along with forecasts of their relevant nominal price growth in foreign currency are needed to compute the relative contribution of the trade balance to external resource needs. Finally, to compute external debt to GDP ratios, we need forecasts of the path of real GDP growth, the GDP deflator, and the nominal exchange rate. Table 10.1 provides an example of the standard template for external sustainability analysis.

The baseline scenario for external sustainability should be constructed with a reasonable set of forecast variables. In other words, the baseline scenario should not achieve sustainability by assuming abnormally high growth rates, abnormally low interest rates, or unreasonable rates of appreciation. The economic performance of the country during the last five to ten years is important in making realistic assumptions. The underlying assumptions should be transparent, and optimism or pessimism can be incorporated by subjecting the baseline projection to a set of alternative assumptions. A separate program scenario that includes an active policy response can then be constructed in a separate step, allowing the authorities to evaluate sustainability under active and passive policy stances.

Determinants of external debt accumulation

Equation (10.4) is composed of two parts. The first component is the effect of changes in economic variables on the existing external debt-to-GDP ratio. This component is the automatic debt dynamics since the changes in the economic variables are automatically applied to the pre-existing stock of external debt. The external debt-to-GDP ratio rises if the nominal external interest rate rises or if the domestic currency depreciates vis-à-vis foreign currencies. An increase in interest rates causes debt service costs to rise, some-of which may be rolled over into additional new debt. A depreciation reduces the foreign-currency value of domestic GDP. However, increases in the growth rate of the GDP deflator and/or real GDP itself cause the external debt-to-GDP ratio to decline.

The second component of external debt dynamics is the debt-creating component of the balance on goods and non-interest services. In the external sustainability template, the starting point is the current account deficit, excluding interest payments. The current account deficit, excluding interest payments, is then adjusted by the level of net non-debt creating capital inflows from the balance of payments. The non-debt-creating capital flows are net foreign direct investment and other net equity investment by firms and households. Net positive inflows on non-debt creating capital flows reduce the need for external resources and are, therefore, recorded as a negative value in the template.

The evolution of external debt over time is influenced by many factors, including decisions of the government and the private sector. Government can clearly control its own rate of external debt accumulation. But its policies must also target actions and expectations of the private sector and aim at overall economic stability. The external balance, for instance, is affected by the private sector's demand for imports and the rest of the world's demand for exports, the real exchange rate, competitiveness considerations, and domestic and foreign income and demand. The evolution of external debt is also influenced by the volume of non-debt inflows, principally FDI and equity investment. The volume of these inflows is determined by international investors who look at the marginal productivity of domestic projects relative to the return available in other markets, the country's business climate, and other considerations. Thus, several sectors jointly help determine the size of the current

account balance and the level and composition of capital inflows that finance it. A loss of confidence that results in rising interest rates and exchange rate depreciation could negatively influence the external debt dynamics of the economy.

External debt stabilization and threshold levels of debt

As in the analysis of fiscal sustainability (Chapter 9), we may calculate the non-interest primary balance needed to stabilize the external debt to GDP ratio. Setting $d_t = d_{t-1}$ in (10.4) yields

$$tb_t = \left[\frac{\left(1 + i_t^w\right)\left(1 + \rho_t\right)}{\left(1 + \pi_t\right)\left(1 + g_t\right)} - 1 \right] d_{t-1}, \tag{10.5}$$

which is the level of non-interest CAB and non-debt generating inflows needed to keep the external debt to GDP ratio from rising. Improvements in the public finances can help improve the external current account and arrest the accumulation of external debt. These must normally be complemented by structural measures and financial sector reforms, with the aim of improving the supply side of the economy, raising the efficiency of intermediation, deepening local capital markets, and attracting more non-debt inflows. Deeper local capital markets increase the amount of domestic currency financing available and help reduce the dependence on foreign currency finance. Improving the currency composition of public and private sector balance sheets and increasing the types of securities available, including derivatives and options, allows private sector borrowers to better hedge currency fluctuations.

Policy may need to do more than stabilize external debt ratios. The authorities may target a "safe" level of external debt and increase international reserves and fiscal cushions to deal with liquidity shocks. They may also improve the structure of the public sector's external debt profile, either by substituting domestic currency borrowing for external borrowing or by lengthening the maturity of external debt. If policy is not successful in stabilizing the external debt dynamics, then the public sector may need to restructure the debt profile to restore sustainability.

Stress tests

In addition to the baseline projection, the standard framework includes a set of standard sensitivity tests. These stress tests examine the implications of alternative assumptions about policy variables, macroeconomic developments, and costs of financing.

The first sensitivity test details the ambitiousness of the baseline projection relative to historical experience. As in the fiscal DSA, key variables—the rate of growth, interest rate,

etc.—are set to their historical averages to test whether the baseline is consistent with the country's historical norm. The other sensitivity tests include: a two-standard deviation adverse shock lasting two years to each of the key parameters; and a one-standard deviation combined shock. These standard deviations are computed using historical data for the country.

The combined shock assumes that each of the variables moves against external debt sustainability (e.g., interest rate increases and exchange rate depreciations simultaneously). The combined shock is also repeated using standard deviations obtained from cross-country studies as a robustness check. Finally, country specific shocks can be tailored to specific features of the economy. For example, in a country that has a fixed exchange rate regime, the volatility of the exchange rate may have been low historically. This would justify a scenario in which there is a large exchange rate depreciation.

An important consideration in the implementation of DSAs concerns the length of the historical series used to compute the historical averages and standard deviations. Long horizons help guard against excessive euphoria or excessive pessimism about, say, growth prospects. Conversely, structural change may limit the relevance of the distant past. The IMF DSA framework normally uses the previous ten years to calculate averages and standard deviations. A five-year period is used in countries that experienced structural changes, such as transition from central planning, or large shocks, such as hyperinflation or currency crisis. Finally, if the data available for a country is too short, cross-country parameters can be substituted instead.

Another key judgment in DSAs is the length and serial correlation properties of the shocks. Low growth in one year may signal a recession, suggesting a positive serial correlation in the level of output, although it is unlikely that there would be repeated negative shocks to output growth. The standard template for external sustainability conducts sensitivity tests based on a two-year sequence of shocks followed by a return to the mean growth rates for the rest of the projection period. The country-specific shocks can be modified to consider shorter or longer intervals.

10.3 An Example: Mexico

The external DSA template was applied recently to Mexico (see Table 10.1). In the baseline, the external debt-to-GDP ratio was projected to decline from 26.1 percent in 2003 to 23 percent in 2009. Despite a slight moderation in GDP growth assumed in the baseline, the sound public finances and healthy non-debt creating capital inflows were expected to cover Mexico's external resource needs. Hence, Mexico's external debt position appeared sound under the baseline.

Table 10.1 also describes the results of stress tests to the baseline. The first alternative scenario (Table 10.1, A1) uses the ten-year historical average for the key macroeconomic variables. The second alternative scenario (Table 10.1, A2) uses a country-specific shock—in this case a negative shock to oil prices. In addition, the stress tests consider two-standard deviation shocks to interest rates, GDP growth, inflation, and the current account that last for two periods (Table 10.1, B1-B4). Finally, a one-standard deviation shock to the combined variables combined with a one-time, one-year, 30 percent nominal depreciation were considered (Table 10.1, B5 and B6).

Mexico's external vulnerability remains low in the higher interest rate-lower oil price scenario. The external debt-to-GDP ratio remains in the 23–26 percent of GDP range throughout the forecast period. The outcome of the stress tests is different under an extreme combination of shocks, namely a peso depreciation by two standard deviations, or 24 percent in 2005 and 2006, and a mix of higher nominal interest rates, lower GDP growth rates, and exchange rate depreciation by one standard deviation. In this scenario, Mexico's external situation would worsen dramatically. External debt would approach 40 percent of GDP.

Table 10.1. Mexico: External Debt Sustainability Framework, 1999–2009
(in percent of GDP, unless otherwise indicated)

	Actual							Projections						
	1999	2000	2001	2002	2003			2004	2005	2006	2007	2008	2009	Debt-stabilizing non-interest current account 7/
								I. Baseline Projections						
External debt	36.9	28.4	26.1	25.2	26.1			24.5	24.2	23.9	23.6	23.4	23.0	-0.7
Change in external debt	-2.1	-8.5	-2.3	-0.8	0.9			-1.7	-0.2	-0.3	-0.3	-0.3	-0.4	
Identified external debt-creating flows (4+8+9)	-4.2	-5.1	-2.3	-0.8	1.0			-1.5	-1.1	-0.8	-0.7	-0.4	-0.3	
Current account deficit, excluding interest payments	0.2	0.8	0.9	0.7	-0.1			-0.6	-0.5	-0.3	-0.3	0.0	-0.1	
Deficit in balance of goods and services	1.5	1.8	2.2	1.8	1.6			1.6	1.5	1.7	1.7	1.9	1.8	
Exports	20.3	20.4	18.2	17.6	18.7			20.8	21.3	21.3	21.5	21.5	21.4	
Imports	21.8	22.2	20.4	19.4	20.3			22.4	22.8	23.0	23.2	23.4	23.3	
Net non-debt creating capital inflows (negative)	-2.2	-1.8	-3.2	-2.0	-1.3			-1.6	-1.6	-1.6	-1.6	-1.5	-1.5	
Automatic debt dynamics 1/	-2.1	-4.0	0.1	0.5	2.4			0.6	1.0	1.1	1.1	1.1	1.3	
Contribution from nominal interest rate	2.7	2.4	2.0	1.4	1.5			1.6	1.8	1.8	1.8	1.8	2.0	
Contribution from real GDP growth	-1.2	-2.0	0.0	-0.1	-0.3			-1.0	-0.8	-0.7	-0.7	-0.7	-0.7	
Contribution from price and exchange rate changes 2/	-3.6	-4.4	-2.0	-0.8	1.2			...	...	...	...	...	...	
Residual, incl. change in gross foreign assets (2-3) 3/	2.0	-3.5	0.0	0.0	-0.1			-0.1	0.8	0.5	0.5	0.2	-0.1	
External debt-to-exports ratio (in percent)	181.9	139.3	143.3	143.3	139.8			117.6	113.8	112.2	109.9	108.8	107.3	
Gross external financing need (in billions of US dollars) 4/	59.2	72.4	71.1	60.1	52.2			43.2	46.7	51.3	56.6	61.0	64.3	
in percent of GDP	12.3	12.5	11.4	9.3	8.2	10-Year Historical Average	10-Year Standard Deviation	6.4	6.6	6.9	7.2	7.4	7.4	Projected Average
Key Macroeconomic Assumptions														
Real GDP growth (in percent)	3.6	6.6	0.0	0.6	1.3	2.7	3.9	4.0	3.2	3.3	3.2	3.1	3.1	3.3
GDP deflator in US dollars (change in percent)	10.1	13.4	7.4	3.3	-4.7	2.5	12.2	2.3	1.5	2.0	2.1	2.1	2.2	2.0
Nominal external interest rate (in percent)	7.9	7.7	7.7	5.7	5.9	7.8	1.2	6.7	7.7	7.8	8.0	8.0	9.0	7.9
Growth of exports (US dollar terms, in percent)	13.0	21.3	-4.2	0.6	3.8	10.6	9.8	18.3	7.3	5.4	6.3	5.1	5.1	7.9
Growth of imports (US dollar terms, in percent)	10.3	22.6	-1.4	-0.7	2.0	8.8	14.8	17.5	6.7	6.0	6.2	6.3	4.7	7.9
Current account balance, excluding interest payments	-0.2	-0.8	-0.9	-0.7	0.1	0.1	2.4	0.6	0.5	0.3	0.3	0.0	0.1	0.3
Net non-debt creating capital inflows	2.2	1.8	3.2	2.0	1.3	2.5	0.8	1.6	1.6	1.6	1.6	1.5	1.5	1.6
								II. Stress Tests for External Debt Ratio						Debt-stabilizing non-interest current account 7/
A. Alternative Scenarios														
A1. Key variables are at their historical averages in 2005-09 5/								24.5	23.6	22.5	21.3	19.8	18.1	-2.1
A2. Country-specific shock of a fall in oil prices 6/								24.5	26.3	26.4	26.1	25.8	25.5	0.0
B. Bound Tests														
B1. Nominal interest rate is at historical average plus two standard deviations in 2005 and 2006								24.5	24.8	25.1	24.9	24.6	24.3	-0.7
B2. Real GDP growth is at historical average minus two standard deviations in 2005 and 2006								24.5	26.4	28.4	28.1	27.8	27.4	-0.9
B3. Change in US dollar GDP deflator is at historical average minus two standard deviations in 2005 and 2006								24.5	31.6	41.0	40.7	40.2	39.7	-1.2
B4. Non-interest current account is at historical average minus two standard deviations in 2005 and 2006								24.5	29.3	34.1	34.0	34.0	34.0	-0.3
B5. Combination of 2-5 using one standard deviation shocks								24.5	31.7	40.1	39.9	39.7	39.5	-0.7
B6. One time 30 percent nominal depreciation in 2005								24.5	34.1	33.8	33.5	33.1	32.7	-1.0

1/ Derived as [r - g - ρ(1+g) + εα(1+r)]/(1+g+ρ+gρ) times previous period debt stock, with r = nominal effective interest rate on external debt; ρ = change in domestic GDP deflator in US dollar terms, g = real GDP growth rate, e = nominal appreciation (increase in dollar value of domestic currency), and a = share of domestic-currency denominated debt in total external debt.

2/ The contribution from price and exchange rate changes is defined as [-ρ(1+g) + εα(1+r)]/(1+g+ρ+gρ) times previous period debt stock. ρ increases with an appreciating domestic currency (ε > 0) and rising inflation (based on GDP deflator).

3/ For projection, line includes the impact of price and exchange rate changes.

4/ Defined as current account deficit, plus amortization on medium- and long-term debt, plus short-term debt at end of previous period. This definition differs from that used in Table 3 of the Staff Report, as it does not reflect the financing requirement resulting from gross reserve accumulation.

5/ The key variables include real GDP growth; nominal interest rate; dollar deflator growth; and both non-interest current account and non-debt inflows in percent of GDP.

6/ The implied change in other key variables under this scenario is discussed in the text.

7/ Long-run, constant balance that stabilizes the debt ratio assuming that key variables (real GDP growth, nominal interest rate, dollar deflator growth, and both non-interest current account and non-debt inflows in percent of GDP) remain at their levels of the last projection year.

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PART III

THE POLICY SCENARIO

INTRODUCTION

In Parts I and II of this Volume we discussed how to prepare a baseline macroeconomic scenario and diagnose short- and long-term vulnerabilities. Part III turns to the subject of designing economic policies to address these vulnerabilities, achieve macroeconomic stabilization, and to lay the foundation for lasting improvements in living standards. Chapter 11 presents a general analytical framework to understand how monetary, fiscal, and exchange rate policies affect the economy and how these policies can be used to eliminate or reduce economic imbalances. This chapter is intended as a guide to the choice of the policy mix best suited to achieve stabilization given the nature of the economy and the imbalances. Chapters 12–14 contain in-depth discussions of monetary and exchange rate, fiscal, and structural policies. The discussion addresses both the design and implementation of policies as these have emerged from experience. Chapter 15 presents some strategic issues that must be addressed in designing adjustment programs, including the choice of nominal anchor, the choice of adjustment and external financing in the program, and the balance between ambition and realism in setting program targets. Chapter 16 then outlines some considerations that are relevant in designing IMF-supported programs and conditionality. Finally, Chapter 17 contains some practical steps that readers may find useful in formulating policy scenarios.

XI. CHAPTER ELEVEN: AN ANALYTICAL FRAMEWORK FOR MACROECONOMIC STABILIZATION

This chapter presents the standard open-economy *IS-LM* model.[148] This model is useful in understanding how monetary, fiscal, and exchange rate policies affect the economy and how they can be used to rectify economic imbalances. A key assumption of both closed- and open-economy versions of the *IS-LM* model is that prices of goods respond slowly to excess demand pressures while asset prices and interest rates respond very quickly to eliminate any excess demand or supply for assets. This assumption means that goods prices are fixed in the short run and that adjustment occurs through changes in output and interest rates. Another important underlying assumption is that fiscal deficits are financed through domestic borrowing rather than external borrowing or money creation.

11.1 The *IS-LM* Model for the Open Economy

The *IS* curve depicts combinations of interest rates and output levels at which the goods market clears. The curve slopes downwards because a decline in the real interest rate leads to more investment spending and higher aggregate demand. Hence, to ensure goods market equilibrium, aggregate supply must also be higher. The *LM* curve depicts combinations of interest rates and output levels at which the money market is in equilibrium for a given price level. Money demand depends positively on aggregate output and negatively on the nominal interest rate. Since money supply is fixed by the monetary authorities, at higher interest rates money market equilibrium can be obtained only through an increase in output that increases money demand. Thus, the *LM* curve is positively sloped. The intersection of the *IS* and *LM* curves determines the levels of the interest rate and output in which both the goods market and the money market are in short-run equilibrium.

To extend the *IS-LM* framework to the open economy context, we introduce a third schedule, the *BP* curve, that depicts combinations of interest rates and output at which the balance of payments is in equilibrium. The Balance of Payments is in equilibrium when the current account balance plus the capital and financial account balance equals zero. At points along this line, the excess of domestic expenditure over domestic production (the current account deficit) is financed by a change in the net foreign asset position of the rest of the economy (a surplus in the capital and financial account). Here it is assumed that changes in official reserves only take place if the central bank needs to intervene to defend the currency parity under a pegged exchange rate. If the exchange rate is flexible, no foreign exchange intervention takes place.

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[148] See Mundell (1963), Fleming (1962), and Frenkel and Razin (1987).

Another important assumption behind the *BP* curve is that the domestic interest rate only affects the capital and financial account of the balance of payments (through the interest parity condition) but does not affect the current account balance directly. The current account balance, on the other hand, is affected by the level of aggregate output (a higher output being associated with higher imports and hence a higher deficit) and the real exchange rate (a more depreciated real exchange rate resulting in a more favorable trade balance and hence a lower current account deficit). In this model, the *BP* curve is upward sloping, because an increase in the domestic interest rate induces capital inflows, creating a surplus in the capital account. To absorb this surplus, an increase in output that worsens the current account balance is necessary.

Another important property of the *BP* curve is that the higher the degree of capital mobility, the more sensitive are capital flows to the interest rate, the flatter is the curve. Hence, with high capital mobility it takes a larger increase in output to restore balance of payments equilibrium for any given increase in the domestic interest rate. [149]

An exchange rate depreciation shifts the *BP* curve to the right. This occurs because the depreciation improves the current account, causing a balance of payments surplus. A higher output level or a lower interest rate is necessary to bring the balance of payments back to balance.

Internal and external balance

At the intersection of the *IS*, *LM*, and *BP* curve the economy is in short-run equilibrium. This equilibrium, however, may not be consistent with full employment, price stability, and a sustainable or desirable external position. Macroeconomic stabilization policies will then be necessary to move the economy to an equilibrium that is consistent with *internal* and *external balance*.

You will recall from Chapter 2 that the economy is in internal balance if output is at full employment and inflation remains low and stable. Full employment means that all factors of production are fully utilized and actual output equals potential output. Low and stable inflation means annual rates of price increases that are between 1-3 percent in industrial country contexts, and perhaps slightly higher in developing or transition countries. The

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[149] The degree of capital mobility depends on the presence and nature of administrative controls on international financial transactions. For instance, in some countries domestic residents are forbidden from investing in foreign securities. In other, domestic residents have limited ability to borrow from abroad. Even if there are no restrictions, transaction costs and informational or other barriers may make it difficult to conduct international financial transaction in some countries, so that domestic and foreign financial markets are not perfectly integrated.

intersection of the *IS-LM-BP* curves may occur at a level of output below or above its potential. Policymakers should consider restoring internal balance using appropriate macroeconomic policies. If output is above potential (a positive output gap) contractionary policies are necessary, while if it is below potential (a negative output gap) expansionary policies are in order.

A second task of short-run adjustment policies is to achieve and maintain external balance, defined as a current account position that the country can finance in an orderly and sustainable manner based on voluntary capital inflows. External balance does not mean that the current account deficit is eliminated. It does, however, require that the country not resort to sharp adjustments of its exchange rate or engage in exceptional transactions, such as contracting emergency loans from the IMF, seeking debt relief, accumulating external arrears, or declaring default on its external obligations. In Chapters 4 and 10 we discussed how to assess external vulnerability and external sustainability. In this chapter, we will examine how macroeconomic policies can be used to achieve external balance.

The short-term equilibrium at the intersection of the *IS-LM* curves does not necessarily coincide with external balance. If it occurs above the *BP* curve the balance of payments is under financed and the country loses official reserves or the exchange rate depreciates. If the *IS-LM* curves intersect below the *BP* curve the balance of payments is over financed and official reserves accumulate or the exchange rate appreciates. Even if the *IS-LM* curves intersect on the *BP* curve the balance of payment might not be sustainable. This might be the case if the current account deficit is financed through volatile, unpredictable, and unsustainable short-term capital inflows, or temporary foreign exchange revenue, such as may result, for example, from a temporary increase in the price of an exported commodity. If policymakers conclude that the deficit is likely to persist but financing flows are not likely continue, they may want to pursue policies to reduce the current account deficit. In terms of the *IS-LM-BP* diagram, a leftward movement along the *BP* curve is an improvement in the current account. In that position, balance of payments equilibrium obtains at a lower level of the domestic interest rate. A lower interest rate means smaller capital inflows, and, by necessity, a smaller current account deficit. Accordingly, policies that move the equilibrium leftwards along the *BP* curve lead to a more favorable current account position.

Next, we consider how fiscal, monetary, and exchange rate policy can change the equilibrium in countries with different degrees of capital mobility and different exchange rate regimes.

Fiscal policy

Suppose that the government engages in a fiscal expansion. What is the likely impact on output, prices, and current account? First, let us assume a *fixed exchange rate.* We will consider two cases, high capital mobility and low capital mobility.

The initial equilibrium position is given by point *E* in Figures 11.1 and 11.2. A debt-financed increase in government spending shifts the *IS* curve to the right. This tends to increase both the interest rate and output. The higher interest rate attracts capital inflows. When capital is *highly mobile*, the *BP* curve is relatively flat, and the capital inflows are larger than what is necessary to finance the higher imports resulting from the increased income. Thus, the central bank has to intervene buying foreign currency and accumulating foreign exchange reserves. This leads to an expansion in the money supply, causing a rightward shift in the *LM* curve. Equilibrium is restored when the money supply has increased enough to bring the *LM* curve to point *E′*. Thus, with a fixed exchange rate and high capital mobility, an increase in government spending has a strong expansionary effect on output.

When *capital mobility is low,* the *BP* curve is relatively steep. A fiscal expansion again produces an increase in the interest rate and output, but it leads to a balance of payments *deficit*, as the capital inflow is smaller than the current account deficit. Now, the central bank has to intervene by selling foreign exchange reserves to buy up the unwanted domestic currency, which causes a reduction in the money supply (a leftward shift in the *LM* curve). The new equilibrium is *E'* and output is little changed. To summarize, under fixed exchange rates, the higher capital mobility, the more effective is fiscal policy at raising output.

Consider next a country with a *flexible exchange rate*. Once again we consider two cases of capital mobility, high capital mobility and low capital mobility. In Figures 11.3 and 11.4, a fiscal expansion again shifts the *IS* schedule to the right. Under *high capital mobility*, at the initial exchange rate the capital inflow is more than enough to finance the deterioration in the current account balance, so the currency has to appreciate to restore balance of payment equilibrium, shifting the *BP* curve upwards. The appreciation also discourages exports, shifting the *IS* curve back to the left. In the new equilibrium output is higher, but the effect of the fiscal expansion on output is smaller than in the case of a fixed exchange rate, because the currency appreciation has an offsetting contractionary impact.[150]

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[150] In the extreme case of perfect capital mobility, a fiscal expansion does not change output.

Figure 11.1 Fiscal Expansion Under a Fixed
Exchange Rate and High Capital Mobility
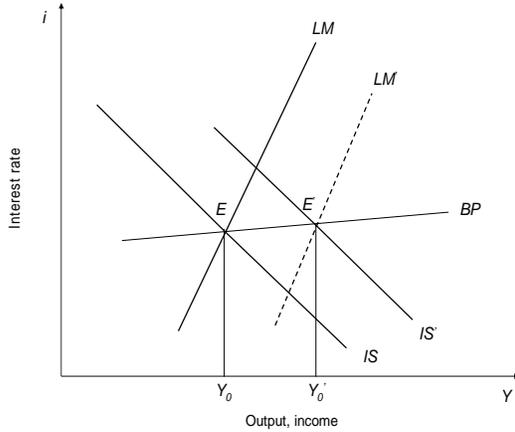
Figure 11.2 Fiscal Expansion Under a Fixed Exchange
Rate and Low Capital Mobility
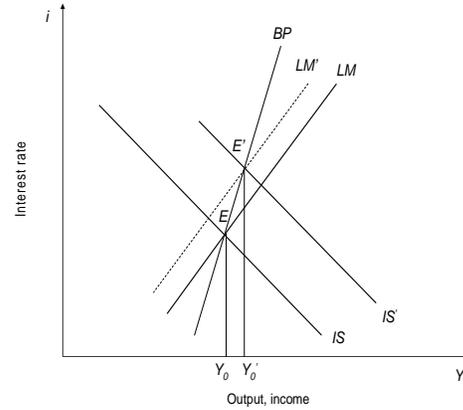
Figure 11.3 Fiscal Expansion Under a Flexible
Exchange Rate and High Capital Mobility
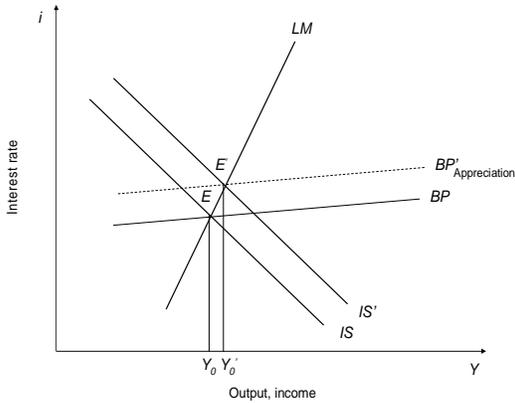
Figure 11.4 Fiscal Expansion Under a Flexible
Exchange Rate and Low Capital Mobility
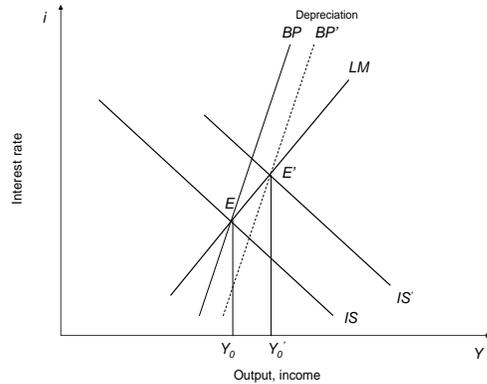
Under *low capital mobility*, the fiscal expansion results in smaller capital inflows, which are not enough to offset the worsening current account balance. Accordingly, in the new equilibrium the currency will depreciate, which results in a larger outward shift of the *IS* curve than in the high capital mobility case. Unlike the case of a fixed exchange rate, under a flexible exchange rate the fiscal stimulus to output is thus greater when capital mobility is low.

Monetary policy

Now we turn to the effect of a monetary expansion (Figures 11.5 and 11.6). An increase in the money supply shifts the *LM* curve to the right, as higher income and lower interest rates are necessary to absorb the additional money balances and equilibrate the money market. Higher income increases imports, causing a current account deficit, while the lower interest rate triggers capital outflows. Thus, the monetary expansion leads to a balance of payments

deficit. If the country has a fixed exchange rate, the central bank will have to sell reserves to defend the parity. This reduces the money supply, effectively undoing the initial monetary expansion. The higher the degree of capital mobility, the stronger is the capital outflow, and the quicker is the decline in reserves and the money supply following a monetary expansion. But regardless of the degree of capital mobility, the monetary expansion has no effect on output.

It is important to point out that with imperfect capital mobility, monetary authorities can restore some effectiveness to monetary policy under a fixed exchange rate by "sterilizing" foreign exchange intervention, i.e., breaking the link between changes in foreign exchange reserves and the domestic money supply. The *IS-LM-BP* framework only looks at the case in which the central bank does not sterilize.[151]

Figure 11.5 Monetary Expansion Under a Fixed Exchange Rate
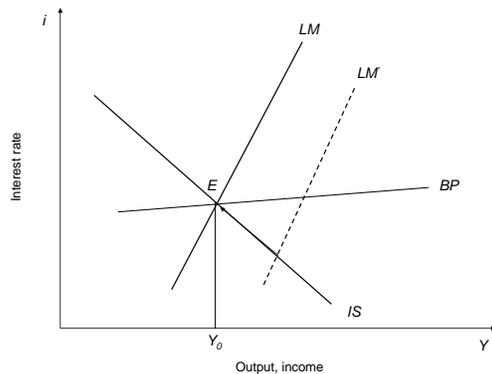
Figure 11.6 Monetary Expansion Under a Flexible Exchange Rate
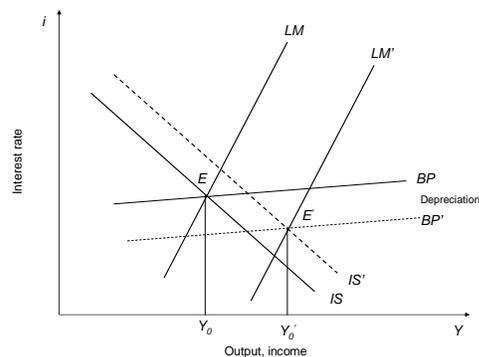
Under flexible exchange rates, the balance of payments deficit resulting from the monetary expansion causes the exchange rate to depreciate and the *BP* curve to shift to the right. The *IS* curve also shifts out, as the depreciation stimulates exports and discourages imports. So in the new equilibrium output is higher, the interest rate lower, and the exchange rate is more depreciated. What difference does the degree of capital mobility make? The stronger is capital mobility, the larger the initial balance of payments imbalance, and the larger is the depreciation of the currency necessary to restore external balance. But a larger depreciation means a larger shift of the *IS* curve, i.e., a stronger stimulus to output. Thus, under flexible exchange rates capital mobility enhances the effectiveness of monetary policy.

To summarize, in a country with a fixed exchange rate the most effective instrument to control output is fiscal policy, while monetary policy tends to be ineffective. If the exchange

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[151] As explained in Chapter 6, when foreign exchange intervention is sterilized, the decline in net foreign assets in the monetary authorities' account resulting from the sale of foreign currency is offset by an increase in net domestic assets rather than a decline in liabilities. Thus, the money supply is not affected by the intervention.

rate is floating, monetary policy is very effective, the more so if capital mobility is high. Fiscal policy, on the other hand, is less effective with high capital mobility. With a floating exchange rate, low capital mobility strengthens the effectiveness of fiscal policy but weakens the effectiveness of monetary policy.

Table 11.1 Macroeconomic Policy Effectiveness

	Exchange Rate Regime	
Fiscal policy	fixed	floating
High capital mobility	*very effective*	*less effective*
Low capital mobility	*less effective*	*very effective*
Monetary policy		
High capital mobility	*not effective*	*very effective*
Low capital mobility	*not effective**	*Effective*

* Unless forex intervention is sterilized.

A devaluation

So far we looked at the effects of monetary and fiscal policies under a given exchange rate regime, fixed or flexible. Under a flexible exchange rate regime, the exchange rate automatically adjusts until the balance of payments is equilibrated. Under a fixed exchange rate regime, on the other hand, the parity is decided by the authorities and it can be changed at their discretion through a devaluation or revaluation. Of course, frequent changes in the parity undermine the credibility of a fixed exchange rate system, but occasional realignments in particular circumstances may be acceptable or necessary.[152]

Consider the case of a devaluation. This shifts both the *BP* curve and the *IS* curve to the right, as the devaluation stimulates exports and improves the current account. The central bank accumulates reserves, expanding the money supply and resulting in a rightward shift of the *LM* curve. In the new equilibrium, output is higher, the interest rate is lower, and the current account has improved. This is exactly the same effect as a monetary expansion under floating exchange rate (Figure 11.6). The devaluation allows the policymakers to simultaneously stimulate the economy and improve the current account.[153]

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[152] Occasional realignments were part of the "rules of the game" of the Bretton Woods system of fixed exchange rates among advanced countries, which prevailed during the postwar years and was eventually abandoned in 1971.

[153] The current account position is not readily visible in the *IS-LM-BP* graph. However, in the equilibrium after the devaluation the interest rate is lower than in the previous equilibrium, which means that balance of payment balance is achieved with a higher capital and financial account deficit and, by necessity, a higher current account surplus.

11.2   Policies to Achieve Internal and External Balance

Consider internal balance first. Monetary, fiscal, and exchange rate policies can be used to alter the equilibrium level of output in the short run to bring the economy to internal balance. Depending on the degree of capital mobility and the exchange rate regime, one or the other policy instrument will be more effective, as shown in Table 11.1.

For example, in a country with a fixed exchange rate and high capital mobility, if the economy is overheated the best option to restore internal balance is to tighten fiscal policy. The fiscal tightening will cause aggregate demand to fall, thereby lowering output. In addition, imports will decline, reducing the current account deficit. As the domestic interest rate falls, there will also be large capital outflows, a loss of foreign exchange reserves, and a decline in the money supply. The monetary contraction will reinforce the fiscal contraction. In this case, the current account improves, so if the economy was not at external balance, then the fiscal contraction helps both internal and external balance.

More generally, how can policymakers improve the current account to restore external balance? If the exchange rate is fixed and a devaluation is out of the question, the only option is to follow demand-reducing policies. In addition, monetary policy is ineffective, so a fiscal contraction is necessary. With high capital mobility, a smaller "dose of the medicine" will work compared to the case of low capital mobility.

What if the exchange rate is floating? A fiscal contraction would reduce aggregate demand, which would improve the current account. With high capital mobility, there would also be a large capital outflow, and depreciation, which would further improve the current account. On the other hand, with low capital mobility, there would be a balance of payments surplus and an appreciation, which would offset part of the initial current account improvement. Thus, a stronger fiscal contraction is needed with low capital mobility.

If the economy has a negative output gap, then demand-reducing policies improve external balance but at the cost of worsening internal imbalances. To counter this effect, the policy package could include a devaluation of the exchange rate, which would improve the current account and stimulate output (expenditure switching policy). Many IMF-supported stabilization programs in countries experiencing balance of payments problem indeed include a mixture of expenditure-reducing and expenditure-switching policies, as is discussed in more detail in Chapter 15 below.

Limits of the *IS-LM-BP* framework

The *IS-LM-BP* model offers a simple and yet rich framework in which to analyze macroeconomic policy in the short run that can be very useful in deciding the mix of monetary, fiscal, and exchange rate policy to use in developing a policy scenario. As all models, it is a highly simplified description of reality. It is important to be aware of the limitation of the model to make sure that key effects are not overlooked.

One important simplifying assumption is that the fiscal deficit is always financed by issuing domestic bonds rather than through money creation or foreign borrowing. This may not be possible in practice, depending on the country's circumstances. In addition, the model ignores the possibility that a fiscal expansion financed through deficit creation may cause the private sector to increase its savings rate, in anticipation that the deficit will have to be covered through future taxation. The increase in private savings will reduce the expansionary impact of fiscal policy.[154]

A second key assumption is that a depreciation of the exchange rate is always expansionary. If the banking, corporate, or government sector is exposed to foreign exchange risk, however, a depreciation may have balance-sheet effects that will tend to offset the favorable effect through the real exchange rate.

A third key assumption in one-period versions of the open economy *IS-LM* model is that expectations of economic agents are ignored. Yet, agents base their behavior not only on current conditions, but on their views of what the future will bring. Furthermore, changes in policies are likely to affect expectations about the exchange rate, the interest rate, capital flows, and so on. In practice, policymakers need to be aware of how policies affect expectations, and how expectations might affect the response of consumers, investors, and other economic agents to policy changes.

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[154] This effect is called the Ricardian equivalence proposition. Barro (1974) showed that, under certain conditions, bond-financed tax cuts do not give rise to conventional expansionary effects. If consumers are far-sighted and liquidity constraints are not important, they will react to a temporary increase in their disposable income by raising private saving. This exactly offsets the decline in public savings, leaving interest rates and all other macroeconomic variables unchanged.

XII. CHAPTER TWELVE: MONETARY AND EXCHANGE RATE POLICY

As discussed in Chapter 11, monetary and exchange rate policies can be used to help achieve internal or external balance. The options available to the central bank and the effectiveness of any policy action depend on the framework within which monetary and exchange rate policy operate. A key step in developing a policy scenario is to determine whether the existing policy framework is appropriate, or whether it needs to be changed. In this chapter, we provide an overview of the frameworks for monetary and exchange rate policy and their advantages and disadvantages. We also discuss the choice of the operational target and instruments of monetary policy, since these are the tools necessary to implement the desired monetary policy. In addition, we provide a description of a stylized monetary "transmission mechanism," which explains the channels through which monetary policy affects the economy and the time frame within which the effects will likely become manifest. Finally, to conclude we will discuss the choice of appropriate monetary policy in two particular sets of circumstances: when the country is faced with a speculative attack against the exchange rate, and when it experiences a surge in capital inflows.

12.1 Frameworks for Monetary Policy

For most central banks, the primary objective of monetary policy is price stability.[155] The monetary policy framework clarifies the institutional arrangements that are in place to help the central bank meet this objective. In some countries, central banks do not explicitly commit to a specific target for inflation, money growth, or the exchange rate, and allow themselves a large amount of discretion in deciding what price stability is and how to pursue it.[156] In other countries, central banks have found it useful to limit their discretion by committing to explicit targets for the exchange rate, monetary aggregates, or the rate of inflation. This type of commitment, if credible, helps anchor inflation expectations among the public, making it easier to achieve and maintain low inflation.

With an exchange rate anchor, the monetary authority stands ready to buy/sell foreign exchange at given quoted rates to maintain the exchange rate at its pre-announced level or range; the exchange rate serves as the nominal anchor or intermediate target of monetary policy. As discussed in Chapter 3, this type of regime covers exchange rate regimes with no separate legal tender; currency board arrangements; fixed pegs with and without bands; and crawling pegs with or without bands.

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[155] Output stabilization, exchange rate stability, and financial sector stability may be additional, secondary objectives in some countries. The case for giving primacy to price stability is supported by wide recognition that price instability hurts growth and exchange rate stability.
[156] The United States, Japan, and the euro area are examples of economies with discretionary monetary regimes. Even though they have wide discretion, the monetary authorities in these economies are nonetheless accountable for achieving price stability and place a great emphasis on explaining monetary policy decisions to the public.

An exchange rate anchor has a number of advantages. First, it is a simple framework, relatively easy to implement and explain to the public. Second, it results in a stable and predictable exchange rate vis-à-vis the anchor currency. If the anchor currency is the currency of denomination of many external transactions, then the fixed exchange rate will remove an important source of uncertainty in those transactions and foster international trade and financial integration. Third, pegging to a low inflation currency can help reduce domestic inflation. If relative purchasing power parity holds, then credibly fixing the exchange rate results in domestic inflation being equal to inflation in the anchor country.[157] In practice, however, relative purchasing power parity does not hold in the short run in most countries, but it tends to hold in the long run, so that fixing to a low inflation currency can help bring down inflation over time. A credible fix to a low-inflation currency can also be a powerful signal that policymakers intend to follow a prudent monetary policy, and can thus help lower inflation expectations.

The main drawback of adopting a fixed exchange rate is that the country gives up its monetary policy autonomy. As shown in Chapter 11, under a fixed exchange rate an attempt to tighten the money supply by raising domestic interest rates leads to higher capital inflows, which puts upward pressure on the exchange rate and can force the central bank to sell domestic currency in order to prevent the exchange rate from moving outside its fluctuation margins. This raises the domestic money supply and undercuts the initial monetary contraction. The central bank can try to offset the increase in the money supply by selling securities to domestic residents—an open market operation which would "sterilize" the foreign exchange market intervention (see Chapter 6, Box 6.3). However, if the capital account is very open, this would push up domestic interest rates, encouraging more capital inflows, and creating the need for further intervention. In addition, sterilized intervention can entail large quasi-fiscal costs because the central bank issues domestic bonds and acquires foreign exchange reserves. The net cost to the central bank is the difference between the domestic and foreign interest rate, which is positive and often sizable in the case of developing countries. With prolonged sterilized intervention, these costs can become very large. Thus, while sterilization may be useful to deal with temporary upward pressures on the exchange rate, it does not ensure that an independent monetary policy can be pursued in countries with high capital mobility.

In countries that want to stabilize inflation, loss of monetary independence may be viewed as a minor cost if fixing the exchange rate provides a credible commitment to disinflation.

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[157] Relative purchasing parity says that a change in the domestic price level is equal to the sum of the change in the exchange rate and the change in the foreign price level. With a fixed exchange rate, the change in the exchange rate is zero, and domestic inflation is equal to foreign inflation.

Fixing the exchange rate may thus be desirable for a limited time while pursuing disinflation. Alternative strategies to stabilize inflation are discussed in more detail in Chapter 15 below.

Another drawback of exchange rate anchors is that they may encourage excessive growth in financial liabilities denominated in the anchor currency, as the public perceives that there is little exchange rate risk. As pointed out in Chapter 5, if a devaluation becomes inevitable down the road, then foreign exchange exposures greatly raise the stakes in a balance of payments crisis. And even if a crisis does not occur, these exposures may make it harder for the country to exit the fixed exchange rate regime, and exit may thus be delayed. (See Box 5.1 for more details on fixed exchange rates.)

It is important to be aware that in many countries that do not explicitly adopt an exchange rate anchor, monetary authorities often act, sometimes quite aggressively, to limit exchange rate fluctuations (tightly managed floating regimes). Also in these cases, monetary policy flexibility is subordinated to the exchange rate objective.[158]

Targeting of monetary aggregates under a floating exchange rate regime can be used as an alternative framework for monetary policy. In this case, the monetary authority uses its instruments to achieve a target growth rate for a monetary aggregate, such as reserve money, M1, or M2, and the targeted aggregate becomes the nominal anchor or intermediate target of monetary policy. This framework is consistent with maintaining an independent monetary policy even in countries with full capital mobility. However, in recent decades financial innovation has made the relationship between monetary aggregates and inflation very unstable in many countries (see Chapter 6). These developments meant that the targeting of monetary aggregates could no longer deliver the ultimate objective of containing inflation within the desired range, forcing central banks to seek alternative monetary frameworks.

Starting with New Zealand in the late 1980s, explicit inflation targeting (IT) has become an increasingly popular framework for monetary policy around the world. Within this framework, the government, in consultation with the central bank, chooses an explicit numerical target (or range) for inflation, which is publicly announced. The central bank is made legally responsible for achieving the agreed inflation target and is given operational independence to use its short-term policy interest rate to achieve this target. Operationally, IT requires the central bank to develop a methodology to predict future inflation. Then whenever predicted future inflation departs from the announced target, the central bank undertakes to change the interest rate, which is the operational target. The forecast horizon can vary, but it is generally long enough to take into account the lags with which monetary policy affects inflation. For instance, if it takes twelve months for an increase in interest rates to lower inflation, then the central bank might choose to monitor its twelve-month-ahead

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[158] For a discussion of why many countries display "fear of floating," see Calvo and Reinhart (2002).

inflation forecast, and change interest rates whenever this forecast differs from the desired inflation target.[159] Additional key features of inflation targeting include increased communication and accountability of the central bank for attaining its inflation objectives. Through these means, the IT framework strives to enhance the credibility of monetary policy and entrench expectations of low inflation.

12.2   Direct and Indirect Instruments of Monetary Policy

In designing a policy scenario, you will have to choose which instruments to use to implement a given monetary policy target. Central bank instruments are classified as being either direct or indirect.[160] Direct instruments set limits on either the balance sheets of commercial banks or the terms at which these banks can attract deposits or make loans. By contrast, indirect instruments operate by influencing underlying supply or demand conditions in the money market, but allowing the market to determine prices (interest rates) and quantities. Direct instruments focus on the balance sheets of the commercial banks. By contrast, the initial effects of indirect instruments are on the balance sheet of the central bank.

Depending on the specific institutional set up of the country, a different set of instruments may be available or desirable to implement monetary policy.

Direct instruments

The main direct instruments are interest rate controls, credit ceilings, and directed lending policies.

Interest rate controls involve ceilings or other constraints on bank interest rates or spreads between lending and deposit interest rates and are frequently used when the authorities cannot affect interest rates in the market through other means. Interest rate controls can discourage financial intermediation and may distort the allocation of credit. They tend to become less effective as financial markets develop and new intermediaries and financial products are created to bypass the controls.[161] Access to foreign financial markets also undermines the effectiveness of interest rate controls.

Credit ceilings are restrictions on the quantity rather than the price of bank credit. Their design can incorporate secondary interbank trading of unused quotas. Credit ceilings can deliver effective control over bank credit but they can distort the allocation of bank resources

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[159] For a simple, forward-looking macroeconomic model that can be used to formulate monetary policy, see Appendix B.
[160] For more information, see Alexander, Baliño, and Enoch (1995).
[161] Ceilings on nominal interest rates become particularly ineffective and lead to disintermediation when the rate of inflation is close to the ceiling, so that the real interest rate is very low or negative.

and are difficult to implement in the presence of many banks and/or capital inflows. Like interest rate controls, credit ceilings can lead to disintermediation. Frequently, such controls can lead to a buildup of excess reserves, which creates an incentive for evasion.

A third direct instrument is a ***directed lending policy*** which requires banks to allocate credit to specific sectors. Its main advantage is the greater availability of credit to specific sectors, which is not a monetary policy objective, and may not be the most efficient allocation of resources.

In general, direct instruments can be an effective means of controlling interest rates or money supply on a temporary basis. They could offer a practical approach in countries with underdeveloped financial markets. However, they are not without their costs. Bank-by-bank controls prevent competition and limit the expansion of more efficient banks, impeding the development of the banking system and encouraging the development of a "grey" market. In addition, direct controls distort the market, imposing potentially large, but hard to quantify, costs. As countries' financial systems develop, they need to rely increasingly on market-based, or indirect, instruments in conducting monetary policy.

Indirect instruments

When the central bank uses indirect instruments, it controls the price or volume of its own liabilities—reserve money—which in turn affects interest rates and volume of credit throughout the banking system. Examples of indirect instruments include reserve requirements, open market operations, and standing facilities.

Legal ***reserve requirements*** oblige commercial banks to hold a given fraction of their liabilities as reserves of high-powered money at the central bank. These required reserves are often either unremunerated or are remunerated at less than market interest rates, so they impose a cost on the banking system. While historically reserve requirements were developed as a prudential instrument, they can also play a role in monetary policy. There are two aspects to this role. By changing reserve requirements, the central bank changes the money multiplier and thus the money supply. The second role is more subtle: when reserves are less than fully remunerated, a higher reserve requirement ratio implies that banks are less likely to hold excess reserves and are, therefore, more likely to need to borrow overnight. This increases the sensitivity of commercial interest rates to changes in the central bank instrument interest rate (but will have a negative impact on the profitability of the banking system and could hinder its development). In terms of their usefulness as a monetary policy instrument, there is a high degree of uncertainty about the impact of changes in the reserve requirement ratio on broad money demand, and it is cumbersome to change these requirements either often or quickly. Therefore, in most developed countries, changes in reserve requirement ratios are not often used as a monetary policy instrument.

Open market operations involve the purchase or sale of securities by the central bank. Open market purchases of securities raise bank reserves, net domestic assets, and the monetary base; open market sales have the opposite effect. When the central bank uses the interest rate as an operating target, it needs to stand ready to conduct regular open market operations to keep the interest rate at the target rate.[162]

Central banks can also inject liquidity in the money market using ***repurchase operations*** (or repos). In a repo, the central bank buys securities (such a government bonds) from a market participant, who agrees to buy back the security at a pre-specified time at a higher price. In practice, with a repo the central bank makes a short-term loan to a market participant, and the security acts as collateral for the loan. In a reverse repo the central bank sell securities to the market and agrees to buy them back later, thus temporarily withdrawing liquidity from the market.[163]

The ***discount window*** is a facility through which commercial banks can obtain very short-term, emergency loans from the central bank, typically collateralized and at rates above the market rate. The discount window assists with liquidity management and can also play an important role in the central bank's communication strategy. Its effectiveness as a monetary policy tool is limited by that the fact that the discount window is used only occasionally, when banks need emergency liquidity from the central bank.

12.3   The Choice of Operational Targets for Monetary Policy

A second key element in implementing monetary policy is the choice of the operational target, namely the first step in the transmission of changes to the monetary policy stance. The central bank can use either the quantity of money or the interest rate as its operational target. In practice interest rate targets are often preferred, primarily due to the uncertainty and instability of the demand for money, as the following example illustrates.

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[162] In open market operations, the transaction is accounted for under net claims on the government (NCG*), claims on other depository corporations (CODC*), or claims on other sectors (CORS*) depending on the security involved.

[163] Repurchase operations (repos) are recorded as other loans in the claims on other depository corporations to reflect that these are secured advances rather than security holdings.

**Figure 12.1 Money Demand Shocks and the Choice Between Money
and the Interest Rate as the Operational Target**
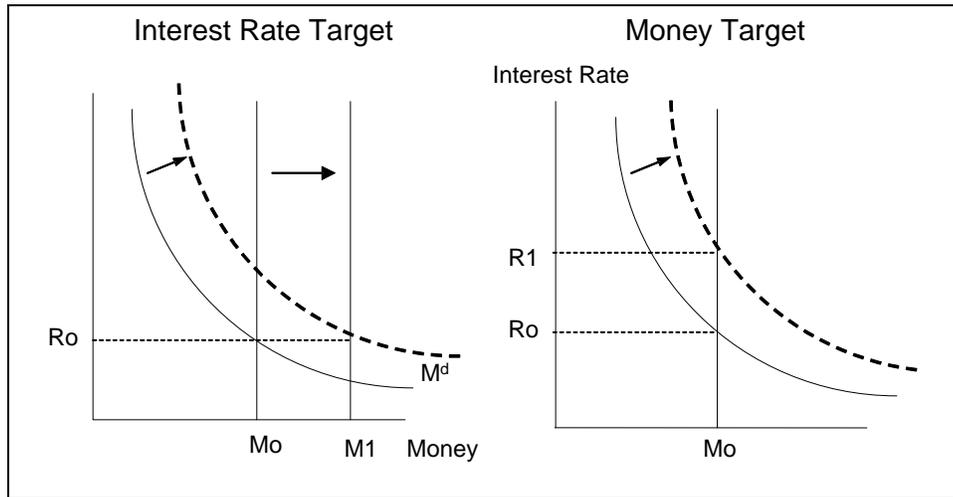
Suppose that the economy is operating at potential output but the demand for money is
unstable and increases more strongly than potential output over a period of several months.
This can be represented as a shock that shifts the demand for money upwards (Figure 12.1).

- If the central bank has set the quantity of money as the operational target, there is
  no change in the supply of money, and as a result of the increased demand, interest
  rates rise from *Ro* to *R1* in the diagram above. This will have a contractionary effect
  on the economy, which is not desirable given that the economy has been operating
  at its potential level.

- On the other hand, when the interest rate is the operational target, the central bank
  responds to an increase in the demand for money by increasing supply (from *Mo*
  to *M1*). As a result, there is no change in the interest rate and thus no real effects
  on the economy.

In many countries, money demand has become much more volatile as a result of financial
innovation, and thus by using the interest rate as the operating target, the central bank can
shield the macro economy and the financial system from these shocks. Using the interest rate
as the operating target offers an additional advantage—because interest rates are more readily
observable than quantities of money, short-term interest rates provide a more transparent
signal of the monetary policy stance than measures of money supply.

12.4   The Monetary Transmission Mechanism

How much interest rates must change when inflation deviates from the desired level, and how quickly the central bank can hope to achieve its objective depends on the nature of the monetary transmission mechanism. This is the set of channels through which monetary policy affects the economy and, ultimately, the inflation rate. A clear understanding of the quantitative parameters of the transmission mechanism is important in trying to decide the "right dosage of the medicine," and helps avoid overshooting or undershooting the desired level of inflation.

Figure 12.2 illustrates a stylized version of the monetary transmission mechanism. As is the case in an increasing number of countries, it is assumed that a short-term interest rate is the operating target. As much of the literature on monetary transmission refers to the interest rate as an instrument rather than operating target, we will also use that terminology here.

The immediate impact of any change in the policy interest rate is on expectations of future variables (for example, expected inflation, the expected exchange rate, long-term interest rates). If the change in monetary policy is anticipated by market participants, however, its impact on expectations may be small. The impact on expectations is frequently uncertain, which contributes to the uncertainty associated with policy changes. For this reason, we observe increased efforts by modern central banks to manage expectations through greater transparency and increased communication.

Figure 12.2 A Flow Chart on the Monetary Transmission Mechanism
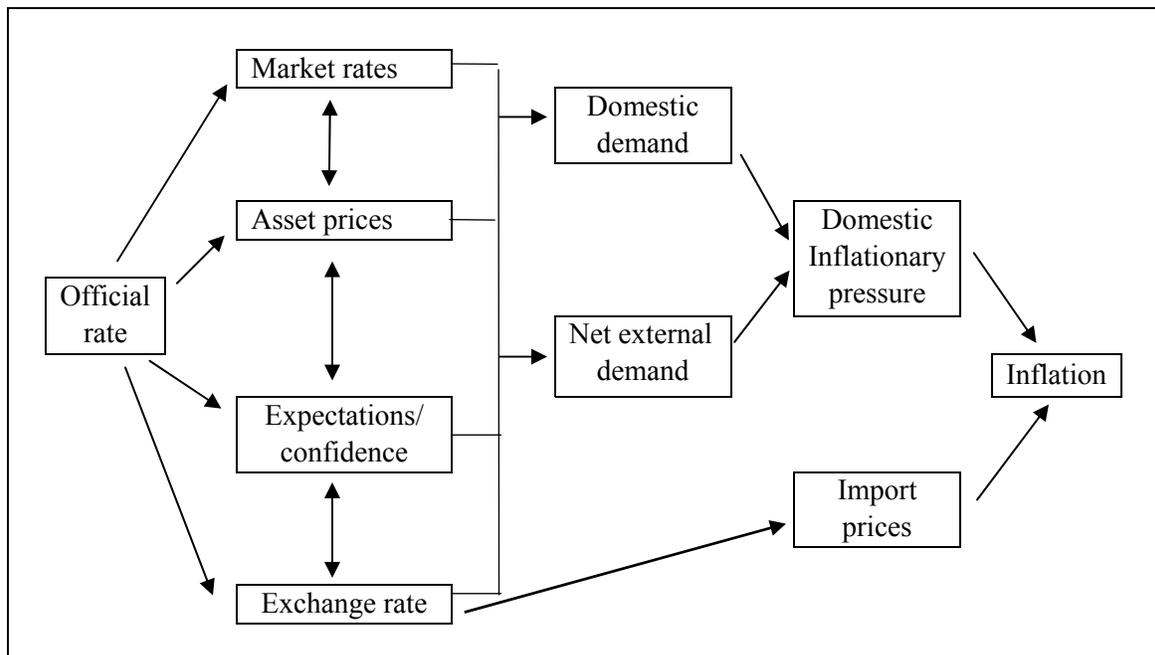
The first step in the transmission is from the central bank's instrument interest rate to other short-term interest rates (which will change in the same direction as the change in the instrument interest rate). In well-developed financial markets, changes in other interest rates, such as bank interest rates on short-term lending and deposits, can be expected to happen quickly.

The contemporaneous impact on long-term interest rates can be more difficult to predict. The long-term interest rate is determined by both current and future short-term rates. While a higher short-term rate today tends to increase long-term interest rates, it may also lead to lower inflation expectations, and, through that, lower expected future short-term interest rates. Thus, the net effect of a monetary tightening on long-term interest rates is ambiguous.

Changes in the central bank's short-term interest rate will also have an impact on asset prices, namely the prices of financial assets (stocks and bonds) and housing. There is an inverse relationship between the prices of financial assets and the interest rate. Other things equal, higher long-term interest rates lower securities prices because expected future returns are discounted by a larger factor, so the present value of any given future income stream falls.

Housing is another important asset in the economy. When the central bank tightens monetary policy, mortgage interest rates rise. Any changes in mortgage interest rates will in turn impact house prices. An increase in mortgage interest rates implies that the cost of buying a house increases; this lowers the demand for house purchases, and, as a result, house prices fall (or their rate of increase slows).

Recent crises have focused policymakers' attention on the impact of changes in interest rates and the exchange rate on the health of the corporate and banking sectors. Increases in interest rates can have negative effects on the corporate and banking sectors beyond the standard contractionary effect (see Section 12.5 for a discussion on the impact of interest rate changes through the exchange rate). For a highly leveraged corporate sector, especially when a large portion of loans are either of short maturity or have variable interest rates, sharp increases interest rates can cause financial distress, leading to a reduction of output and investment. Corporate financial distress, in turn, might lead to financial distress in the banking sector and cutbacks in credit availability even to healthy firms.

A further link in the transmission mechanism is from interest rates and asset prices to aggregate demand. Looking first at private consumption expenditure, we need to consider the impact of changes in both interest rates and asset prices. Higher interest rates will depress private consumption expenditure because there is now a greater incentive to save rather than to consume, that is, to trade-off consumption today in return for a higher level of consumption in the future. There is also an effect on private consumption through the wealth

effect—changes in asset prices (especially housing) change how much wealth people have (or perceive that they have). As discussed in Chapter 2, consumption is increasing in wealth. Thus higher interest rates which tend to lead to lower asset prices will imply a reduction in private consumption expenditure.

Private investment expenditure is also influenced by interest rates and asset prices. Higher interest payments increase the cost of borrowing, and since investment is typically financed by borrowing, this decreases investment. In addition, with falling stock prices, the value of collateral declines, and banks become less willing to lend. Aside from limiting or changing the availability of financing, higher interest rates reduce the present discounted values of the returns from investment projects, and as a result many projects are no longer profitable and will not be carried out.

Consider how changes in aggregate demand resulting from the change in monetary policy affect the inflation rate. Lower aggregate demand means firms must lower prices to sell products (lower inflation) or cut production. If firms cut production, there will be less employment, lower pressures on wages, lower cost of production, and lower inflation. This is the Phillips curve relationship between inflation and output that was discussed in Chapter 3.

Thus far we have discussed the 'interest rate channel' of monetary policy, that is, how changes in the short-term interest rate affect aggregate demand and the inflation rate. A second key channel is the "exchange rate channel." In an open economy with capital mobility, domestic interest rates play a key role in the determination of the exchange rate. Changes in domestic interest rates affect the relative returns of domestic and foreign assets, changing the demand for domestic currency and thereby the exchange rate. For example, if the central bank increases domestic interest rates, assets denominated in domestic currency become relatively more attractive, increasing the demand for domestic currency and leading to an appreciation of the domestic currency. The appreciation has a negative effect on the demand for domestic output, reinforcing the direct effect of the higher interest rates on aggregate demand. However, the monetary policy change also affects expectations about future economic developments which in turn affect the exchange rate. Because of these complex interconnections, in practice there is some uncertainty as to the magnitude of the exchange rate appreciation following an increase in interest rates. As we will discuss later in this chapter, some economists have argued that there are certain circumstances, namely during a speculative attack, where higher domestic interest rates are associated with depreciations of the exchange rate.

When the exchange rate changes, the price of imported goods may also change, and since the consumption basket includes imported goods, there is a direct effect on inflation which is separate from the effect of changes in aggregate demand. If the monetary contraction appreciates the exchange rate, then this effect will help reduce inflation and vice versa. The

impact of changes in the exchange rate on domestic prices is referred to as "exchange rate pass-through" and this channel magnifies (and works faster than) the interest rate channel.

Figure 12.3 summarizes the timing of the monetary transmission mechanism. The pass-through takes place at different speeds in different countries (within a few months or one-to-two years) and is generally faster in emerging market economies.

Figure 12.3 Time Line for the Impact of Changes in the Monetary Policy Instrument on the Macro economy
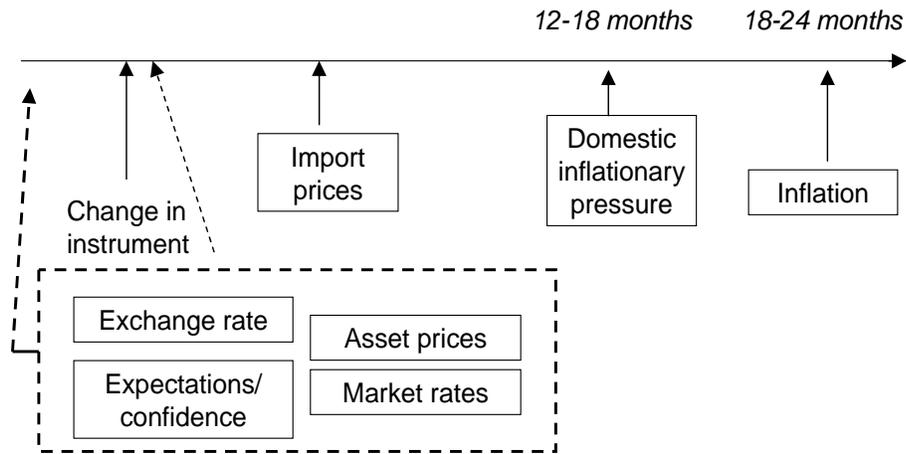
Breakdowns in the transmission mechanism can occur at any stage along the way, and the relative strength, speed and predictability of the channels depends on the monetary framework and institutional aspects. For example, the strength of the exchange rate channel will depend on the degree of openness of the economy, both in terms of capital and current account openness. With an open capital account, changes in the domestic interest rate have an immediate impact on the exchange rate. The impact of exchange rate changes on inflation depends on how quickly the price of imported goods in domestic currency is changed and also on the share of imported goods in the consumption basket that comprises the CPI.

12.5   Monetary Policy and Balance of Payment Crises

What should the central bank do when faced with a speculative attack against the exchange rate? And what is the appropriate monetary policy stance in a post-crisis situation? This section reviews the options for monetary policy and their effectiveness in these two situations.

When faced with a speculative attack against a pegged exchange rate, the first decision will be whether or not to defend the fixed peg. The policymaker will need to consider the costs of

defending the peg and the associated probability of success, compared with the certain costs of an exchange rate devaluation or forced exit from a peg. An immediate devaluation or exit from a fixed exchange rate regime involves both reputational costs and the economic costs of a sudden change of the exchange rate. Abandonment of the exchange rate peg can tarnish the reputation of the central bank, and low credibility limits the options for the monetary policy framework and the effectiveness of monetary policy. On the other hand, if the central bank opts to abandon the peg, it may find itself with a higher level of reserves and more options for monetary policy after the crisis subsides than a central bank that attempts to defend the peg but does not succeed.

If a decision is made to defend the peg, then there is the question of how to do it. The conventional approach is to sharply increase interest rates and a second approach is to impose capital controls on outflows.

The basis for the conventional approach is that higher interest rates increase the opportunity cost of speculation and also provide a signal to the markets of the strength of the government's commitment to the fixed exchange rate. Consider the interest parity equation:

$$1+i_t = (1+i_t^*)\frac{E_t}{E_{t+1,t}} + \rho_t, \qquad\qquad (12.1)$$

where i_t and i_t^* are the domestic and foreign interest rates, respectively, E_t is the current spot exchange rate, $E_{t+1,t}$ is the expected future exchange rate at time t, and ρ_t is a risk premium. When E_t is kept fixed by the central bank, a speculative attack on the currency can be characterized either as an increase in ρ_t, or as a decrease in $E_{t+1,t}$, and the interest rate defense (ignoring, for the moment, the signaling effect) can be seen then as an increase in i_t in order to offset the speculative pressures and leave E_t unchanged.[164] In addition, tight monetary policy in the face of a speculative attack "signals" the strength of the commitment to the fixed exchange rate, with the aim of inducing speculators to temper their expectations of a devaluation. These two effects combine to strengthen the domestic currency and defend against the attack.

The willingness of the government to pursue an interest rate defense will depend on the economic circumstances at the time of the speculative attack. First, a government may be less willing to increase interest rates sharply if the economy is already in a recession. Another consideration is the impact of short-term interest rate on the cost of borrowing. For instance,

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[164] Note that if the devaluation is expected immediately, this relation implies that interest rates need to be increased by an extremely large amount to make speculation unprofitable (see Furman and Stiglitz, 1998). This makes clear the importance of the "signaling" effect in defending against a speculative attack.

if mortgage interest rates are tied to the short-term market rate, as is the case in some countries like the United Kingdom, a sharp increase in market rates will negatively affect household balance sheets. Third, higher interest rates increase the cost of financing government borrowing—the larger the stock of domestic debt and the shorter the maturity of the debt, the more acute is the impact of this cost.[165] Fourth, high interest rates have a negative effect on the banking sector, as they reduce borrowers' profitability and increase non-performing loans. Thus, if the banking sector is already weak and poorly capitalized, the potential cost of an interest rate defense is higher because it can lead to bank insolvencies.

The outcome of any attempted interest rate defense is very uncertain, primarily because it is difficult to predict how expectations will respond to an increase in interest rates. Although it is probable that higher interest rates will dampen expectations of a devaluation, recent theoretical work has identified some circumstances that could increase the probability of a perverse response in some cases and even hasten the collapse of the fixed exchange rate regime. For example, the high interest rates could be interpreted either positively as a signal of the government's ability and willingness to defend against a speculative attack, or negatively as a factor that weakens the economy.[166] Empirical research has been unable to settle the issue, with some studies finding little relationship between the monetary policy response and the probability of whether the defense of the speculative attack will succeed.[167]

An alternative policy response in the face of a speculative attack is to impose capital controls, particularly on outflows—Malaysia in 1997 provides an example. Here policymakers potentially trade off a short-term gain for longer-term costs. In the short run, controls on capital outflows can help the central bank stabilize short-term capital flows and regain monetary policy independence. These benefits are generally short lived as market participants find ways to evade the controls; however, the controls might provide time for market participants to assess the economic situation and for the authorities to take stabilization measures or implement other crisis-management policies, such as voluntary agreements among major bank creditors to maintain credit lines for some time (as in Korea in late December 1997 or Brazil in January 1999). For an economy that has already opened up

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[165] In a number of countries longer maturity debt carries an interest rate indexed to short-term market rates. The cost of this type of debt would also be directly affected by a sharp increase in short-term rates.

[166] See, for example, Drazen (2000). Drazen and Masson (1994) argue that high interest rates would cause the fundamentals to deteriorate and the expected future exchange rate to change as a result. Lahiri and Vegh (2003) show that if the speculative attack reflects a weak fiscal position and resulting possible monetization, then higher interest rates only increase the likelihood of monetization. Furman and Stiglitz (1998) and Radelet and Sachs (1998) focus on the impact on the banking system especially in the case of an already fragile financial sector—in this case, higher interest rates increase the likelihood that the fixed exchange rate will need to be abandoned. Furman and Stiglitz (1998) also consider the default risk which they argue is increasing in interest rates and may even be larger in the post-crisis environment.

[167] See Kraay (2003). Drazen and Hubrich (2006) find that raising the overnight interest rate strengthens the exchange rate over the short term, but also leads to an expected depreciation at a horizon of one year or longer and an increase in the risk premium. This result is consistent with the argument that an interest rate defense weakens the economy—down the road.

its capital markets, controls that are perceived as more than a short-term stop gap measure can significantly weaken investor confidence with long lasting effects.

Next, consider the case of a country that has just abandoned the fixed exchange rate as a result of a speculative attack. In a post-crisis situation, what is the appropriate monetary policy? The conventional advice is to tighten monetary policy as part of the overall policy mix for domestic demand management. This advice is based on two concerns. Tight monetary policy would mitigate the effects of any depreciation that had already occurred on domestic inflation, and would also ensure that any real appreciation necessary to correct overshooting occurred through a nominal appreciation rather than through higher inflation. In this way a depreciation-inflation spiral could be avoided. In addition, a continued slide in the exchange rate would further weaken the corporate and banking sectors if there were large unhedged foreign currency liabilities.

The drawbacks of tightening monetary policy following a crisis are that higher interest rates are likely to have a recessionary impact through a reduction in aggregate demand, which may exacerbate the effects of the adverse shocks that triggered the crisis in the first place. In addition, higher interest rates hurt the balance sheets of the government, banking, and corporate sectors, which may have already been weakened by the depreciation. In general, whether policymakers should be more concerned about the impact on the government, banking, and corporate sector of an increase in interest rate or of a further depreciation of the exchange rate (very damaging when there are large unhedged foreign currency borrowings) would depend on the size and structure of the exposures at that point in time.

12.6   How Should Monetary Policy Respond to Surges in Capital Inflows?

As more countries open up their economies to international financial flows, managing the increasingly widespread surge in capital inflows presents a challenge to macroeconomic stabilization policy. [168] On the one hand, capital inflows ease the external financing constraint and can potentially increase investment and long-run growth. On the other hand, large capital inflows can lead to overheating of the domestic economy, threatening macroeconomic stability. They can also cause an appreciation of the real exchange rate that hurts competitiveness and undermines the development of the export sector. Large increases in capital inflows can be driven by changes in domestic policies that improve the investment climate, a tightening of domestic monetary policy, and changes in the external environment, such as lower world interest rates.

If the country has a flexible exchange rate, then the central bank could allow the nominal exchange rate to appreciate. If the pass-through from the exchange rate to prices is strong,

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[168] For a discussion of capital inflows, see, for instance, Calvo, Leiderman, and Reinhart (1994).

this would contribute to keeping inflation under control. In addition, by making domestic assets more expensive, the appreciation would tend to curb capital inflows. The drawback of this strategy is that the nominal (and real) appreciation hurts exporters, and may lead to an excessive widening of the current account deficit. To what extent this is a source of concern depends on the size of external debt outstanding and, more generally, on external vulnerability.

Of course, if the country has an exchange rate anchor, the scope for a nominal appreciation may be small or nonexistent. The central bank can use sterilized intervention to prevent capital inflows from causing a nominal exchange rate appreciation while, at the same time, avoiding an excessive expansion of domestic monetary aggregates. While this policy is often effective for a short time, its prolonged use is generally inappropriate, in part, because by propping up domestic interest rates, sterilized intervention maintains the incentives for continued inflows and, in part, because the quasi-fiscal costs become increasingly large.

Controls on capital inflows have been implemented in a number of countries, for example, Chile, in an attempt to manage the inflows. There is mixed evidence that Chilean-style capital controls on inflows succeed in the short run (less than one year). Over longer horizons the effectiveness of these measures clearly declines. As a short-run measure, capital controls might be an effective way to deal with a temporary surge in inflows or to provide room to implement needed reforms and macroeconomic policy adjustments.[169] Even with short-term use, capital controls are not without costs: there is the potential to limit both desired and undesirable transactions; there are enforcement and administrative costs; there are possible adverse impacts on reputation and corruption; and there is the potential to delay policy reform.

In addition to monetary policy and regardless of the cause of the surge in capital inflows, tighter fiscal policy can play a key role in ensuring macroeconomic stability by offsetting the expansion in aggregate demand caused by the inflows, restraining inflationary pressures and minimizing the real appreciation. While tight fiscal policy is appropriate from a demand management perspective, in practice its implementation may be problematic. One concern is that public investment may be cut, which might undermine the development of essential infrastructure. Second, the political viability of a sustained fiscal contraction when financing is abundant may also be limited.

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[169] See Reinhart and Smith (2002).

12.7   Appendix B. A Simple Forward-Looking Model for Monetary Policy Analysis

In this appendix, we present a simple, forward-looking macroeconomic model that is similar to the ones currently in use in a number of central banks to forecast inflation and analyze the effects of monetary policy on prices and output.[170] This model can be used to guide decisions on how to set interest rates to achieve the desired level of inflation. It is appropriate for countries with flexible exchange rate systems and using an interest rate as the operational target or instrument of monetary policy.

The point of departure is a central bank that is responsible for price stability and, perhaps, also for stabilizing output fluctuations. The central bank's policy instrument is a short-term interest rate. The central bank supplies the quantity of high-powered money needed to ensure that the policy interest rate takes on its desired value. Thus, while the model is monetary in nature, the money market equilibrium condition is left in the background.

The model consists of four relations, three describing the structure of the economy and one describing the central bank's setting of its policy interest rate. The first relation is a goods market equilibrium equation similar to an IS curve. This equation states that the output gap is a function of the real interest rate, the real exchange rate, the past output gap, and the expected future output gap: [171]

$$y_t = bE_t y_{t+1} + (1-b)y_{t-1} - \beta_1[i_{t-1} - E_{t-1}\pi_t] - \gamma_2 q_{t-1} + e_{y,t}. \qquad (B.1)$$

The following notation is used in equation (B.1): y_t is the output gap in percent, i.e., $y_t = (Y_t - Y^*_t)/ Y^*_t$, where Y_t is the level of output in period t (taken to be a quarter); and Y^*_t is potential, or full employment, output.[172] $E_t y_{t+1}$ denotes the private sector's expectation, held at time t, of the output gap at $t+1$. Equation (B.1) posits that the output gap has a backward- and a forward-looking component. The backward looking term, y_{t-1}, captures the tendency of output fluctuations to be persistent, i.e., to continue over time. The strength of output persistence is indicated by the parameter $1- b$. The forward-looking term $E_t y_{t+1}$ captures the desire of forward-looking economic agents to smooth consumption over time, as indicated by the permanent income theory of consumption (see Chapter 2). Higher expected future income leads to higher aggregate demand and output today. The term $i_{t-1} - E_{t-1}\pi_t$ is the real interest rate private agents based their decisions on in period $t-1$: i_{t-1} is the nominal interest rate in

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[170] For the theoretical foundations of this model, see Svensson (1997), Clarida, Gali, and Gertler (1999), and McCallum (2001).

[171] For a detailed discussion of the output gap, see Chapter 2.

[172] In practice, we use the approximation $x = \ln(1+x)$, which works if x is small, to write the output gap as $y_t = log(Y_t/Y^*_t)$.

period t-1 and $E_{t-1}\pi_t$ is the inflation rate expected between t-1 and t. [173] Assuming equation (B.1) refers to quarterly data, a higher expected real interest rate lowers domestic output with a one-quarter lag, i.e., $\beta_1 > 0$. [174]

Equation (B.1) incorporates open economy influences on demand for domestic output. Specifically, q_{t-1} is the log real exchange rate, defined as the relative price of domestic output in terms of foreign goods. An increase in q is a real exchange rate appreciation that lowers demand for domestically produced goods, again with a one-period lag. The magnitude of this effect is given by the elasticity parameter γ_2, which is usually positive but less than one; finally, $e_{y,t}$ is a stochastic disturbance to the *IS* relation.

The second relationship in the model describes the evolution of inflation in terms of its own past and future and the output gap. This is a more elaborate version of the Phillips curve presented in Chapter 3. More specifically, CPI inflation π_t is now assumed to also depend on changes in the prices of imported goods, which, in turn, are sensitive to changes in the real exchange rate. [175] Inflation also has a high degree of persistence, so past inflation affects current inflation. Finally, as in the standard Phillips curve, inflation is also influenced by inflation expectations and the output gap. The inflation equation is thus:

$$\pi_t = aE_t\pi_{t+1} + (1-a)\pi_{t-1} + \gamma_1 y_t - \gamma_2[q_t - q_{t-1}] + e_{\pi,t}, \tag{B.2}$$

where $e_{\pi,t}$ is a stochastic shock to inflation.

The third relationship in the model arises from the financial links between the domestic economy and the rest of the world. One approach is to assume perfect capital mobility, so that uncovered interest parity holds. As discussed earlier in Chapter 12, uncovered interest parity requires that the differential between the domestic and foreign rate of interest must be equal to the expected rate of depreciation of the nominal exchange rate. There are other ways to link financial markets in the domestic economy with those in the rest of the world. For example, Ball (1998), postulates imperfect asset substitutability and simply assumes that tighter monetary policy at home leads to capital inflows, which appreciates the real exchange rate, other things equal.

These three relationships can be used to identify the response of inflation, the output gap, and the real exchange rate to changes in the policy interest rate for given expectations. The model

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[173] In practice, the spending decisions of private household and firms depend on market interest rates, not the policy interest rate. As explained in the overview of the monetary transmission mechanism, market interest rates tend to move in the same direction as the policy interest rate, especially the short-term ones.

[174] In practice, monetary policy affects aggregate demand and the output gap with a distributed lag, but for purposes of simplification, the model collapses the spread-out effects into a one-quarter lag.

[175] The change in the real exchange rate measures the change in the home currency price of domestically produced goods relative to the exogenous foreign currency price of imported goods, so changes in the real exchange rate add to the inflationary pressure that comes from domestic sources.

is usually augmented by an equation that determines the "optimal" path for the interest rate given the preferences of the central bank over the trade-off between price stability and output stabilization. This fourth relationship is similar to the Taylor rule described in Box 6.5. If the central bank cares mostly about price stability, then it will be more inclined to increase the interest rate when expected inflation rises above its target level, even if this means contributing to output volatility by creating a larger output gap.

To become operational, a model like the one described here has to be estimated or calibrated using parameters that track the characteristics of the country in question.[176] A key issue in solving forward-looking macroeconomic models is how to measure expectations of future inflation and the output gap. One common approach is to assume that expectations are rational or model consistent, which is to say that the private sector understands the structure of the economy and the interest rate response of the central bank to deviations of inflation from the target.

In practice, central banks generally do not set interest rates mechanically on the basis of a model's Taylor rule. Their decisions are made by combining many types of objective and subjective information. In addition to the forecasts generated by macroeconomic models, surveys of private-sector price and output expectations and other indicators are useful inputs to monetary policy committees. In any case, if the model and other information indicate strongly that inflation is higher than desired, the central bank will need to generate a negative output gap (a recession) to lower it. From equation (B.1), to generate an output gap the central bank must raise the nominal interest rate by enough so that the real interest rate rises. Tighter monetary policy will also appreciate the real exchange rate (through the uncovered interest parity condition or through capital inflows), which has a direct calming effect on inflation. The real appreciation, in turn, helps to widen the output gap, which contributes to lowering inflation.

In conducting monetary policy, central banks typically tend to avoid sharp changes in interest rates that could result in large output contractions. This partly reflects the fact that macroeconomic data are received in a continuous stream, and it is usually wise to react to new data cautiously until the information content of the data is verified by subsequent data. Another consideration is that monetary policy works with a lag. This implies that policy sometimes needs to be relatively tight for a while and then relatively easy to address a negative output gap after inflation has come down. Good monetary policy is forward-looking and should react to changes in the forecast for the economy (e.g., to offset any anticipated lagged effects of current shocks on future output).

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[176] See Clarida, Gali, and Gertler (2000).

XIII.   CHAPTER THIRTEEN: FISCAL POLICY

Fiscal policy can play a role in short-term macroeconomic management. Most traditionally, fiscal adjustment can help tackle cyclicality (recurrent recessions and booms), large external current account imbalances, and inflation problems. During crises, fiscal adjustment can restore confidence, ease financing constraints, and support growth. How should fiscal adjustment be implemented? What changes can be made to tax and expenditure policies in the short run? How can one ensure that these fit in with the long-term economic objectives? What structural changes are required? This chapter aims to address these questions.

13.1   Fiscal Policy and Cyclical Stabilization

In most countries, fiscal deficits naturally tend to expand during economic contractions and shrink during economic expansions because of the presence of "automatic stabilizers." These are revenue provisions or types of expenditure that, in response to changes in the business cycle, produce counter-cyclical changes in revenue or expenditure without any intervention by policymakers. For example, receipts from progressive income taxes tend to grow faster than output, leading to a decline in the fiscal deficit as a proportion of GDP during expansions. Unemployment benefit payments grow when unemployment rises, pushing up expenditures and the deficit during contractions.

Should policymakers offset or amplify the workings of automatic stabilizers through discretionary policy measures? As shown in Chapter 11, standard Keynesian theory suggests that fiscal policy can stabilize the business cycle, with fiscal deficits declining when the economy is operating above potential and increasing during economic downturns. This typically requires strengthening the automatic stabilizers by adopting countercyclical discretionary measures. On the other hand, according to the neoclassical paradigm, which assumes flexible prices and wages, fiscal policy should remain neutral over the business cycle and tax rates should be kept stable over time to minimize distortionary effects.

What is the evidence about the behavior of fiscal policy over the business cycle? In advanced countries, movements in the ratio of the overall fiscal balance to GDP have been mildly countercyclical (Mélitz, 2002). In developing countries the fiscal balance tends to be insensitive to the economic cycle, although there are considerable differences across regions, with sensitivity being the lowest in Latin America (IMF, 2003). In both groups of countries, the cyclical sensitivity of the fiscal balance is lower than would be expected based on the effect of automatic stabilizers alone, suggesting that policy makers take measures to offset some of the impact of automatic stabilizers (Daniel and others, 2005; Manasse, 2006). Hence, in practice discretionary fiscal policy seems to be procyclical, in contrast with the recommendations of both Keynesian and neoclassical economic theory.

There is also evidence for both advanced and developing countries that discretionary policy is asymmetric, with procyclicality mainly occurring in good times. For instance, in European Union countries during 1970–2000, deficits increased in downturns, but did not fall in periods of high growth, with the countries offsetting the effects of automatic stabilizers via tax cuts or, more often, expenditure increases (see European Commission, 2001). The procyclicality of fiscal policy in good times has also been observed in emerging markets and, specifically, in Latin America (Kaminsky, Reinhard, and Vegh, 2004; Gavin and Perotti, 1997; Budnevich, 2002). In these countries, economic cycles are accompanied by cycles in foreign capital inflows.

There are four explanations as to why government spending is procyclical, especially in developing countries. First, there are few automatic stabilizers built into developing country budgets. Indeed, Latin American countries spend much less on transfers and subsidies than do richer OECD economies (24 percent of total government expenditures, compared with 42 percent in the industrial countries) (Gavin and Perotti, 1997). In addition, because governments in advanced countries tend to be larger, the impact of fiscal cyclicality on the economy is stronger (Braun, 2001).

Another possible explanation for procyclicality is that policymakers find it difficult to accurately gauge the stage of the cycle. These difficulties are then compounded by lags in the implementation of policy, so that, for instance, policy tightening may occur when the economy is already beginning to contract.[177]

A third explanation is related to the precarious nature of access to international financial markets during downturns, particularly by emerging market economies. Often external funding becomes less available during downturns, when investors lose confidence, so an expansionary fiscal policy cannot be financed. This means that oftentimes countries end up having to implement strong contractionary policies in the midst of recessions, deepening the downturn and further weakening the fiscal position. Such a response, although destabilizing, may be the only way to avoid a default or inflationary financing.

Last but not least, political economy considerations can also explain procyclical fiscal policy, particularly the tendency to overspend temporary increases in fiscal revenues during expansions (Velasco, 1993; Perotti, 1996; and Tornell and Lane, 1998 and 1999). When during a favorable cyclical phase fiscal resources become available—albeit temporarily—to finance more spending, fiscal authorities may not be able to resist pressures from various

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[177] Policymakers may also mistake structural changes in the economy for temporary shocks and respond with countercyclical policies that end up being counterproductive. For example, policies in advanced countries in the 1970s were too expansionary and led to persistent inflation because policymakers did not understand that part of the deceleration in potential growth was permanent, not temporary.

interest groups.[178] As a result, new spending programs may be enacted, public sector workers may receive generous increases, and taxes may be reduced. This tendency not only exacerbates the business cycle, but it might jeopardize long-run fiscal sustainability, because permanent spending programs or tax cuts are being financed by temporary revenue increases.

Some countries have tried to contain the misuse of fiscal policy owing to political economy mechanisms by adopting fiscal rules, such as legislation mandating the government budget to be always balanced (Box 13.1). Fiscal rules differ from fiscal targets in that they are intended to shape policy design and be long lasting, and therefore are usually enshrined in constitutional or legal provisions. Fiscal rules can make fiscal discipline more credible, but they limit policymakers' discretion in designing and implementing fiscal policy, reducing their ability to respond to economic shocks and exceptional economic and social needs. From a political economy perspective, democratic legitimacy is also often seen to require that discretionary fiscal policy instruments are available to elected representatives. However, because discretion can be misused and lead to excessive spending and borrowing, fiscal rules have become increasingly popular.[179]

13.2 Fiscal Policy in the Context of Crises

In the previous section, we have discussed the stance of fiscal policy over the business cycle. A related question is what should be fiscal policy in countries that are experiencing a financial crisis. To answer this question, it is important to identify the source of the crisis.

Consider first a situation in which large fiscal imbalances are a direct source of excess demand pressures, leading to a traditional financial crisis. There are several recent examples of such crises (Tables 13.1 and 13.2). In these cases, large deficits and unsustainable public debt dynamics give rise to concerns about government long-term solvency and short-term liquidity, leading to a reversal of foreign financial flows, capital flight, and pressures on the exchange rate.

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[178] A more fragmented political system is sometimes seen as aggravating this tendency. For example, Stein, Talvi, and Grisanti (1999) find that government consumption is more procyclical in countries with a large number of representatives elected per district, a large number of effective parties represented in the legislature, and weak support for the governing party in the legislature. Braun (2001) finds that political competition among powerful groups is stabilizing in OECD countries, but destabilizing in developing countries.

[179] Kopits and Symansky (1998) discuss the desirable characteristics of fiscal rules; Dabán and others (2003) examine rules in some European countries and survey fiscal rules around the world; and Kopits (2004) addresses rules in emerging market economies.

Box 13.1 Fiscal Rules

Various fiscal rules have been adopted around the world: balanced budget rules or limits to the overall deficit are simple to explain and implement, but they are inherently procyclical, in that adhering to them requires expansionary fiscal policy in good times and contractionary fiscal policy in bad times. Other types of rules put ceilings on public debt, directly addressing concerns about debt sustainability. Expenditure rules cap total government spending or specific categories of spending, and can be useful when fiscal positions tend to be in deficit and the main problem is thought to be spending pressures.

The experience with fiscal rules in industrial countries suggests that they can be useful, but are not a panacea. Some empirical studies show that fiscal rules have been effective, in conjunction with market discipline, in the U.S. states and in Swiss cantons (see Feld and Kirchgässner, 2005). There is also some evidence that the Maastricht deficit and debt limits contributed to improved fiscal performance in a number of European Union countries but not in others. Elsewhere, the evidence is mixed. Fiscal consolidation in the second half of the 1990s occurred in countries with fiscal rules, as well as in countries without them, as did the subsequent deterioration. Expenditure rules also appear to have contributed to fiscal consolidation in some European countries, and were a key provision of the 1990 Budget Enforcement Act in the United States, although they have not in all cases had a durable impact.

The main lesson that emerges is that the effectiveness of fiscal rules crucially depends on there being genuine political commitment to fiscal discipline. Moreover, public finance management systems should be sufficiently developed to credibly implement and enforce them, and it should be recognized that numerical rules are not in themselves the solution to structural fiscal problems.

Table 13.1 Overall Fiscal Balance Before, During, and After Crises
(In percent of GDP)

Country (Crisis Year = T)	T-2	T-1	T	T+1	T+2
Argentina (2001)	-4.1	-3.7	-6.8	-10.4	-7.4
Brazil (1998)	-5.9	-6.1	-8.0	-10.0	-4.6
Mexico (1995)	-2.5	-3.9	-3.9	-5.3	-5.9
Russia (1998)	-8.9	-7.9	-8.0	-3.1	3.6
Turkey (2001)	-22.9	-19.1	-21.2	-11.4	-9.8
Ukraine (1999)	-5.4	-2.8	-2.4	-1.3	-1.6
Average overall balance	**-8.3**	**-7.3**	**-8.4**	**-6.9**	**-4.3**

Source: IMF staff estimates and projections

Table 13.2 Public Debt Before, During, and After Crises
(In percent of GDP)

Country (Crisis Year = T)	T-2	T-1	T	T+1	T+2
Argentina (2001)	47.6	51.1	64.4	129.0	131.0
Brazil (1998)	34.4	35.2	43.4	49.4	49.3
Mexico (1995)	27.6	32.7	48.9	49.8	46.6
Russia (1998)	52.5	51.2	68.7	92.7	62.0
Turkey (2001)	61.0	57.7	92.8	82.1	75.2
Ukraine (1999)	29.9	38.5	50.9	45.3	37.3
Average overall balance	**42.2**	**44.4**	**61.5**	**74.7**	**66.9**

Source: IMF staff estimates and projections

According to the standard Keynesian model, a fiscal tightening during a crisis will deepen the recession which usually accompanies the crisis. Although this is true, a powerful argument in favor of fiscal tightening is that, when the crisis stems primarily from fiscal profligacy, the immediate priority is to restore fiscal discipline and bring the government finances back to a sustainable path. Fiscal tightening also helps improve the current account by reducing aggregate demand and causing the real exchange rate to depreciate. In some cases, a financial crisis is caused by excessive money creation owing to deficit financing, so fiscal consolidation is necessary to make room for a monetary tightening, which helps the balance of payments. All in all, the net effect of a fiscal tightening during a crisis may not be so negative if it improves market confidence, reduces interest rates, and helps restore market access.

Financial crises have also occurred in countries where the initial fiscal position was relatively sound. For example, in Argentina in 1995, the Czech Republic in 1997, and Mexico in 1994, fiscal deficits and public debt contributed to, but were not the main cause of, crises. In Thailand, Korea, Indonesia, Malaysia, and the Philippines in 1997, fiscal positions were initially sound, and the crisis mainly reflected financial and corporate sector weaknesses.

In these cases, fiscal tightening is not always warranted and may in fact be counter-productive, as the dampening effect on aggregate demand may exacerbate financial difficulties in the banking and corporate sector (Ghosh and others, 2002). Moreover, to the extent that weakening activity is a concern to investors, too tight a fiscal stance might erode, rather than enhance, confidence. In such cases it may be appropriate to let automatic stabilizers work in full, or even introduce a discretionary fiscal stimulus as confidence and credibility in policies are restored.

13.3   The Quality of Fiscal Adjustment

Deciding on the overall fiscal stance is only the first step in setting fiscal policy. If the deficit has to shrink, should it be done through cuts in spending or through increased revenue? Which expenditures should be cut or which revenues should be raised? There are many options, all with different welfare implications. The history of "fiscal consolidation," as cutting the deficit is often called, is, unfortunately, littered with mistakes. Often capital expenditures are cut first, at the expense of future growth. Sometimes repairs to roads and buildings are postponed for too long, and vital infrastructure falls into disrepair. Sometimes workers are kept on the state payroll, but the materials and supplies they need are eliminated.[180]

Political and institutional constraints frequently entail a trade-off between the speed and quality of fiscal adjustment. The need to act quickly at the peak of a crisis sometimes makes it inevitable to resort to low quality fiscal adjustment measures. But protracted reliance on distortionary tax and expenditure measures, or ad-hoc measures that are not likely to be durable, makes it difficult to restore credibility. Thus, it is important to try to implement high-quality fiscal measures also in crisis situations.

An important aspect of the quality of fiscal adjustment is the social costs involved. In addition to humanitarian and moral concerns, high social costs might undermine the political sustainability of the adjustment effort and result in difficulties in restoring market credibility. Protecting efficient social spending and key infrastructure investments also improves the prospects for sustainable growth over the long term (Box 13.2).

Revenue measures

Table 13.3 shows the share of revenues from various sources by region. Some of the noticeable features are the heavy reliance on international trade taxes in countries with a limited tax base, non-tax revenue in oil-producing countries, and income and profit taxes in OECD countries.

In developing short-term tax policy packages, particular consideration needs to be given to the revenue productivity of proposed measures, their administrative feasibility, and their likely consistency with the desired direction of more fundamental tax reform. On the basis of such criteria, the most promising short-term measures often involve increasing the rates of indirect taxes (particularly broad-based sales taxes and excises) and expansion of the tax base by eliminating exemptions.

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[180]   For further discussion on the quality and durability of fiscal adjustment, see Daniel and others (2006).

Box 13.2 Social Safety Nets

Social safety nets (SSNs) are a combination of measures aimed at protecting individuals from the adverse consequences of economic shocks and structural reforms, and helping the poor develop the means to escape poverty. Typically, the major components of SSNs include: cash transfers to selected groups, subsidies to certain commodities, fee waivers, enhanced unemployment benefits, severance pay, and public works schemes.

Making sure that SSNs are well targeted and do not create adverse incentives are key issues in the design of SSNs. In many poor countries sophisticated means testing of benefit recipients is generally not possible because of lack of administrative capacity. Many countries rely instead on categorical targeting, such as limiting benefits to children or pensioners, or to households in certain especially poor regions. Another form of targeting which requires little administrative capacity is to limit subsidies to goods consumed disproportionately by the poor or to limit the quantity that each household can consume, for example, via coupons. The fiscal cost of the SSN is reduced the more targeted the benefits are to the poor. However, if these benefits are large enough, they could adversely affect work incentives of beneficiaries, thus having negative effects on labor supply and potential growth.

Table 13.3 Share of Revenues from Various Sources
Regional Averages 1997–2001

	Income and Profits	Social Security	Domestic Goods and Services	International Trade	Non-Tax Revenue
OECD Countries	35.7	29.3	29.6	1.1	1.1
Africa	22.9	2.4	22.9	32.4	17.6
Non-OECD Asia	23.8		28.6		25.9
Non OECD, non BRO Europe	19.2	25.2		4.8	13.8
Baltic's, Russia and CIS	11.9	28.4	42.7	5.0	11.9
Middle East, excluding Israel	20.2	4.1	16.0	12.8	43.2
Non-OECD Western Hemisphere	18.6	11.3	35.3	15.2	16.2

Source: IMF, Fiscal Affairs Department.

More generally, revenue measures should attempt to be consistent with the following criteria for best practices in tax design:

The *sales tax/value-added tax* (VAT) should be broadly based on final domestic consumption, but not on intermediate consumption or exports, and does not differentiate by source (foreign or domestic) of production (see Ebrill and others, 2001). Because of its efficiency (in not affecting business use of inputs) and revenue security (through collecting revenue at all stages in the production chain, not just at final sale), the ideal instrument to achieve this objective is usually a tax on value added (VAT) levied at a single rate, between 10 to 20 percent.

Excises. Imposing excises on a limited number of commodities can be a good tax handle when the demand for the commodities is inelastic and the commodities can be easily monitored. They are appropriate for dealing with negative externalities (e.g., a gasoline tax to reduce pollution) or reducing consumption of "harmful" items (e.g., alcohol and tobacco). Excises should be levied on an ad valorem basis, equally on domestic production and imports, with a few exceptions.

Custom duties. There should be a simple structure of import taxes set at a low uniform rate on all imports, with no ad hoc exemptions and little reliance on export taxes. In particular, a low across-the-board tariff may be justified for revenue reasons in countries where other (and preferable) taxes may prove difficult to administer.

Income taxes. A basic personal income exemption should be set high enough to exclude the very poor, and sufficient progressivity can be achieved with only a few income tax brackets. Tax brackets should be adjusted periodically in situations of high inflation to avoid the tendency for "bracket creep," and supply-side considerations argue for keeping rates as low as possible. Ideally, income taxes should be levied on a globalized income tax base (including all forms of income).

Profit taxes. A tax on profits should ideally be levied at a single rate comparable to the top marginal rate of personal income tax. This minimizes the likelihood of tax-induced shifts between personal income, partnerships, and corporations. Deductions, allowances, and credits are best applied neutrally across sectors and assets to foster efficiency. Tax incentives (such as investment allowances and, particularly, tax holidays), if used at all, should be strictly limited in terms of coverage and duration (Box 13.3).

Weak revenue (tax and customs) administration can be an obstacle to implementing fiscal measures (Silvani and Baer, 1997). Unfortunately, reforms to improve a deficient revenue administration often take considerable time. Modern revenue administrations rely on the principle of voluntary compliance, where taxpayers and traders are expected to comply with their obligations with little intervention from revenue officials. Modern revenue administrations are based on: clear and simple laws; efficient collection systems and procedures; service orientation; verification programs based on risk analysis; a function-based organizational structure; a high level of automation; and differentiated treatment of taxpayers by their revenue potential.

Expenditure measures

Table 13.4 shows central government expenditures by region as a share of GDP and total expenditures. Some of the noticeable features are the relatively high wage bill and interest payments in middle-income countries, the relatively high capital spending in low-income countries, and the relatively high subsidies and transfers in high-income countries.

Box 13.3 The Dangers of Tax Holidays

Tax holidays—exemptions from tax, sometimes for many years—are a particularly ill-designed form of investment incentives:

- They attract the most footloose forms of business, since they can easily move elsewhere at the end of the holiday—and these are the firms least likely to offer spillovers to the wider economy in terms of training or deep linkages with the domestic economy.
- They are open to abuse, undermining tax revenue not only directly but indirectly, by providing entrepreneurs with an incentive to use transfer pricing and financial arrangements that shift taxable income into holiday companies from companies in which it would otherwise be taxed.
- They are relatively inefficient at encouraging employment (often the claimed objective) since, like other investment-based incentives, they encourage the use of capital, not labor.
- Developing countries have felt compelled to offer such incentives because of tax competition with each other, and this appears to be one of the reasons for the reduction in corporate tax revenues in many countries. But tax holidays do nothing to address the underlying problems that may deter foreign investment (such as instability of the tax system, ineffective judicial system, arbitrariness in administration and red tape, and foreign exchange restrictions).

There are better options to stimulate investment, such as accelerated depreciation and capital allowances. Maintaining a reasonably broad base for the corporate income tax makes it easier to set a reasonably low corporate tax rate, which in itself is likely to protect the revenue base and provide a supportive environment for investment. Realizing this, a number of countries have scaled back tax holidays and other tax incentives for investment. Sometimes, however, countries feel pressure to retain or expand such incentives to compete with those available elsewhere, leading to a mutually damaging form of tax competition between them. In such cases, regional agreements can offer a useful way forward—along the lines, for example, of a code of conduct on business taxation adopted by the European Union.

Table 13.4 Central Government Expenditure by Regions, 1990–99

	High Income		Middle Income		Low Income	
	% GDP	% Total Expenditures	% GDP	% Total Expenditures	% GDP	% Total Expenditures
Expenditure by economic type	31.4	100.0	26.6	100.0	21.6	100.0
Current expenditure	29.1	92.9	20.9	79.0	14.0	64.7
Goods and services	8.4	26.9	8.8	33.3	5.4	25.1
Wages	3.7	11.9	5.5	21.1	2.5	11.5
Other goods and services	4.7	15.0	3.2	12.2	2.9	13.6
Interest	3.6	11.5	5.0	18.6	3.0	14.0
Subsidies and transfers	17.1	54.5	7.2	27.1	5.5	25.2
Capital Expenditure	1.8	5.7	3.8	14.5	4.3	19.9
Lending minus repayment	0.4	1.3	2.3	8.0	3.3	15.2
Expenditure by function	30.9	100.0	24.3	100.0	18.4	100.0
Defense	4.4	14.2	2.0	8.2	2.8	15.3
Education	1.6	5.0	2.8	11.4	1.0	5.4
Health	3.7	12.0	1.2	5.0	0.4	2.2
Social security and welfare	10.6	34.4	3.6	14.9	0.1	0.8
Housing	0.7	2.2	0.6	2.4	0.7	3.8
Economic services	2.8	8.9	4.8	19.6	4.6	25.0
Other government services	3.8	12.2	4.4	18.1	5.7	30.8
Interest	3.4	11.1	5.0	20.2	3.0	16.3

Source: IMF, Fiscal Affairs Department

In the context of fiscal adjustment, expenditure measures have to be pragmatic, adequate to achieve the intended stabilization, but nonetheless economically, politically, and socially feasible. There are no hard and fast rules about how public expenditure should be cut in the short term, when needed. This will depend partly on the factors driving the growth in spending (for example, wages and salaries or the capital program), as well as on the social and political constraints facing policymakers. However, experience suggests some guidelines:

- ***Protect core programs.*** While consolidation in the short-run may require lower overall expenditure, it is still possible to safeguard most, if not all, core productive expenditures, as well as to protect the poor through well-targeted social safety nets.

- ***Identify specific program reductions.*** Many programs can and should be dropped, pruned, or consolidated, as economies develop and priorities change. Program elimination usually leads to effective savings, because it requires governments to redefine their priorities and is a first step toward the more fundamental expenditure review, and preserves the efficiency of operations elsewhere in the public sector.

- ***Cut the public sector wage bill.*** Wage restraint and hiring freezes can be a major source of savings in the short run, but are politically difficult to sustain and not necessarily desirable from an efficiency point of view. Thus, while effective in the short term, they should be seen as interim substitutes for structural reform with a deeper review of employment and pay policies and program staffing needs.

- ***Target social programs narrowly.*** General subsidies could be eliminated and transfers made more efficient by targeting eligibility and by reducing income replacement rates (Gupta and others, 2000). Where possible, multiple programs for social protection should be consolidated into more global schemes of income transfers, because there can be significant overlap in entitlements provided by uncoordinated agencies.

- ***Review the capital program.*** Postponement of projects not yet begun can save resources with relatively little disruption of day-to-day government operations, but may come at the cost of lower growth and development. Capital programs are best cut in the context of an overall public investment review—often possible only as part of a medium-term strategy.

- ***Raise fees and charges.*** Governments are often reluctant to take action that will reduce volumes or standards of delivery in high-priority areas like education and health. Savings in these areas may best be achieved by raising cost recovery through an increase in the fees and charges for services, while protecting the poor.

- ***Change public enterprise tariffs and subsidies.*** If public enterprises are in deficit, their pricing structures could be adjusted and subsidies eliminated. The scope of their activities may also need to be redefined, their employment policy adjusted, and their capital program rationalized.

Public expenditures should be judged on the basis of their impact on growth and investment as well as on poverty and equity. Apart from core government functions, market failures—positive externalities, public goods, and imperfect credit markets—are a main justification for public sector activity. Public expenditures also play a redistributive role, in particular, when targeted to the poor. Productive expenditures are those that have a large social rate of return. Social rates of return are difficult to measure, but at the functional level, are often highest in infrastructure, primary education, preventive and primary health, and in basic public services. In terms of their impact on poverty, programs in primary education, basic health care, water and sanitation, roads, rural development, agriculture, judicial systems, and anti-corruption appear to have the largest impact. Expenditure composition in many countries suggests that there is great scope for improvement (Box 13.4).

A government's ability to identify and execute expenditure cuts will depend on the quality of its budget—the primary instrument of expenditure management—and of its treasury department, which is responsible for the financial management of government operations. Budget design, preparation, and execution are all important elements of expenditure control.

Box 13.4 Key Indicators of Unproductive Expenditures

White elephants. These are highly unproductive public investment projects, where political considerations often determined resource allocation rather than a cost benefit analysis.

Proximate indicators of misallocation. These identify mismatches between stated policy goals and actual spending allocations. For example, one could look at actual literacy rates, mortality rates, and miles of usable roads and then compare these with spending on primary education, health and road maintenance.

Sectoral expenditure imbalances. One should look at whether there is an adequate input mix in order to deliver the intended services. For example, some countries will have a relatively high teacher/pupil ratio, but inadequate teaching supplies. In other cases there are hospitals without medicines, etc. Spending on operations should be enough to maintain normal scope of operations, and spending on maintenance should be adequate to preserve well-functioning infrastructure. Unfortunately, in many cases it is politically easier to cut operations and maintenance spending when compared to wages or new investment projects.

Identifying allocative inefficiency. For example, although generalized subsidies aim to redistribute income, they are typically poorly targeted and may exacerbate inequality since, in most cases, the high income group benefits the most.

XIV. CHAPTER FOURTEEN: STRUCTURAL POLICIES

The previous chapters focused on how monetary, fiscal, and exchange rate policies can be used to stabilize economic fluctuations and address macroeconomic vulnerabilities. In this chapter, we will discuss policies that aim at changing in a more fundamental way how the economy works, and how such policies are decided and implemented. These policies, often referred to as structural policies, involve changes in policy processes, legislation, regulation, and institutions. Structural policies aim at improving the efficiency of resource allocation, increasing the long-run growth potential of the economy, reducing financial sector fragility, fiscal reforms, and improving the quality of policy-making.

The need to complement short-term stabilization policies with structural policies became particularly evident in the 1990s in transition countries that were moving away from central planning. Also in low income countries, where deep-rooted problems were holding back growth and creating the need for repeated stabilization, structural policies have become a key element of macroeconomic policy. In emerging markets hit by financial crises in the second half of the 1990s, major structural reforms were necessary to remove financial sector distortions and vulnerabilities.

Unlike in the case of macroeconomic policies, substantial time is typically needed for structural policies to show results. Their impact is often uncertain or difficult to measure and may depend on far-reaching improvements in accompanying policies and institutions, such as governance, transparency, property rights, and so on. It is often necessary to introduce structural reforms in a package and follow an appropriate sequencing for such reforms to be effective. For example, a country should liberalize capital flows only after substantial improvements in banking supervision have been achieved.

Structural reforms to improve resource allocation and long-term growth

For markets to allocate resources to their most efficient use, the price mechanism must be allowed to operate freely and competition must be safeguarded. Structural reforms usually take the form of eliminating price controls, reducing distortionary taxes and subsidies, liberating trade restrictions, privatizing state-owned firms, and increasing competition.

In many cases, *price controls, trade barriers, and distortionary taxes and subsidies* were put in place a long time ago with some development goal in mind. For example, some countries hoped that shielding domestic manufacturing from foreign competition through so-called import substitution policies (overvalued domestic currency, tariff and nontariff import barriers, and so on) would generate a thriving industrial sector. In other cases, distortionary policies have been used to shelter vulnerable groups in the absence of an adequate social

safety net (as is the case with energy or food subsidies in some countries), or to protect well-organized and influential constituencies (for instance, agricultural subsidies in some advanced countries).

The efficiency argument for structural reforms aimed at giving more space to the market mechanism is often powerful, but so may be the opposition to them, especially if the benefits from the reforms are spread widely across a large number of individuals (for example, when all consumers benefit from lower prices), while the cost are concentrated among a few individuals (for instance, when a few domestic producers are driven out of business by foreign competition). While for each individual beneficiary the gains from reforms are small and may not be worth fighting for, for the damaged parties there are strong incentives to organize an opposition. Also, some reforms have adverse fiscal implications which must be offset through expenditure cuts or tax increases.[181] Deciding on these offsetting measures may be contentious and slow down reforms.

Reform and *privatization of state enterprises* is also often included in structural reform packages (Davies and others, 2000). While there are cases of state enterprises that operate efficiently and in the best interest of consumers, in many cases the experience has been that replacing market discipline with state control on productive activities has hurt consumers by delivering poor quality products and services and stifling innovation. Some state enterprises have also become tools of political patronage, generating large losses that had to be covered with fiscal resources. In other cases, state enterprises enjoyed a monopolistic position that hurt consumers and constituted a hidden and distortionary form of taxation.[182]

In addition to structural reforms in fiscal and trade policy, *liberalization of the financial sector* may lead to a more efficient allocation of capital and higher savings and growth. Historically, many countries engaged in various degrees of financial repression through the use of centralized credit allocation directives, interest rate controls, liquidity requirements, entry restrictions, state ownership of banks, foreign exchange controls, and other restrictions on international capital flows. Countries engaged in these policies for various reasons, including to direct credit to particular economic sectors (e.g., agriculture), to mobilize capital for large investment projects, to raise fiscal revenues in an undeveloped financial system, to compensate for a lack of adequate regulation and oversight, and, in some cases, to accommodate the desire of existing banks to limit competition. While some of these motives appear reasonable, the effects of financial repression include underdeveloped financial

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[181] Fiscal reforms advocated by IMF staff often include a shift from trade and direct taxes toward indirect taxes, especially those based on taxing the value added in each stage of production (see also Chapter 13 on fiscal policy). (IMF, 2005).

[182] The desirability of privatization is less clear in the case of *natural monopolies*, i.e., sectors in which for technological reasons it is efficient for just one firm to operate. In these cases, the first best would be to privatize and regulate, but effective regulation is complex and may be beyond the capacity of the country authorities.

systems, low levels of market innovation, disintermediation of funds from the formal financial system into the informal sector, inefficient allocation of investment, and capital shortages (Williamson and Mahar, 1998).

Consequently, many structural adjustment programs supported by the IMF have included measures to liberalize the financial system and promote a market-based system of credit allocation. Financial liberalization involves the government permitting free entry and exit in and out of the financial system so long as the entrant can satisfy appropriate prudential criteria, giving each institution sufficient autonomy to make its own decisions, privatizing state-owned and operated institutions, and lifting some or all of the controls on international capital movements.

There is evidence that financial liberalization has led to financial deepening and faster growth. However, in some cases it has also led to increased financial fragility, as prudential regulation and supervision of the financial sector was not upgraded quickly enough. Reforms to reduce financial fragility are discussed in the next section.

Another potential benefit of financial liberalization is that, by leading to higher real interest rates and wider access to financial products, it might increase financial savings. This link has been proven hard to identify in empirical studies, perhaps because financial liberalization also leads to the development of mortgage and consumer credit markets, reducing the need to save to make large purchases.

Policies to reduce financial sector fragility

While financial liberalization implies more reliance on private sector decision-making, it does not necessarily eliminate the role of the public sector in financial market activity. The main rationale for public sector involvement in financial sector supervision and regulation is the presence of *asymmetric information*.[183]

Banks exist to perform risk and maturity transformation: they borrow short-term by issuing safe assets (bank deposits) and lend, usually at longer maturity, to finance risky ventures. Banks can do this because they can diversify risk by lending to many borrowers and because they have expertise in screening and monitoring loan applicants. Hence, by necessity, depositors know much less about the risk of the bank loan portfolio than bankers do, the problem of asymmetric information. Asymmetric information becomes a problem especially when losses start to build up in a bank portfolio because of bad management or bad luck. Bank capital can be exhausted relatively quickly, before losses are recognized in the bank's

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[183] Information is asymmetric when one party to an economic relationship or transaction has less information about it than the other party or parties.

accounts. From that point on, bank owners (or managers acting on their behalf) have nothing more to lose and will be tempted to use whatever resources the bank still has to gamble, i.e., to take on high risk/high return investments in the hope that a stroke of luck will return the bank to solvency. These gambles are not in the interest of depositors, who will bear the losses in the likely case in which the gamble will fail, but depositors are unlikely to have enough information to stop bankers. In this example, asymmetric information leads to *moral hazard.*

If depositors fear that their bank is becoming insolvent, they may panic and withdraw their deposits, making the bank illiquid and possibly triggering insolvency (a bank run). Because banks have exposures to one another, a run on a bank may spread to other banks in the system, and possibly lead to a generalized panic. This may happen even if the bank was healthy in the first place. In this case, asymmetric information can lead to undesirable *bank runs*.[184]

By giving banks more freedom to operate by setting interest rates, choosing their portfolio composition, and engaging in a broader range of financial activities, financial liberalization may also increase the potential for excessive risk taking. The elimination of restrictions on international capital flows can also lead to strong capital inflows. When these inflows are intermediated by the banking system, and the banking system is weak and poorly regulated, capital account liberalization can magnify moral hazard problems, leading to a full-fledged financial crisis.

To address these problems, countries that liberalize their financial systems also need to strengthen prudential regulation and supervision (Sundararajan, 1999). Prudential *regulation* of the banking system aims at protecting depositors and the integrity of the banking system in several ways. It requires banks to hold sufficient levels of capital and provisions against future losses, and create loan classification schemes, so that losses are quickly recognized in the banks accounts. It limits a bank's exposure to individual borrowers or sectors, or to foreign exchange or interest rate risk, so that these risks are sufficiently diversified. It establishes procedures to regulate licensing of banks and bank managers to ensure that they are trustworthy individuals. Prudential regulation also introduces reporting and auditing standards that improve the transparency of bank reporting. The enforcement and application of prudential regulation is the objective of prudential *supervision*, a task that is usually assigned either to the central bank or to a dedicated supervisory government agency. The IMF and the World Bank help countries assess and improve their financial sector regulation and supervision through the Financial Sector Assessment Program (FSAP).

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[184] To protect the banking system against runs, many countries have adopted explicit deposit insurance schemes, by which banks purchase insurance on behalf of their depositors from a deposit insurance agency, usually a government agency. Because insurance premia usually do not increase when bank's portfolios become riskier, deposit insurance rewards riskier banks and can aggravate moral hazard.

Fiscal reforms

Also in the area of government activity there is often need for deeper structural reforms that go beyond short-term deficit reduction to make public finances sustainable in the long run. Fundamental structural reform requires consideration of basic questions on the need for different government activities, the appropriateness of their provision in the public sector, the importance of their provision by public institutions (as opposed to contracting out), and the possibility of introducing a market framework for their provision, even when public institutions are responsible for delivery.

Areas of structural fiscal reforms include: the tax system; expenditure prioritization and public expenditure management; privatization and public enterprise governance; the civil service and pensions; intergovernmental relations; and improving governance, which includes the process of formulating, approving, and monitoring the budget. All of these are longer-term reforms that require adequate planning and thoughtful design before they can be effective. Ideally, they should be implemented in the context of a medium-term fiscal framework. This would allow governments to assess the availability of financing over the medium term and in that context prioritize their spending and the structural reforms that have expenditure implications based on their macroeconomic and social objectives. In low-income countries, this process is taking place in the context of countries' poverty reduction strategy papers (PRSPs).

Policies to improve the quality of policy-making

Making policymakers more transparent and accountable should help improve economic performance. Recent initiatives to promote more transparency and accountability on the part of the IMF and other international organizations include the publication of Reports on the Observance of Standards and Codes (ROSCs).

Finally, a key aspect of fiscal management is fiscal transparency (Farhan, 2005). More generally, good governance is of central importance for achieving macroeconomic stability and high-quality growth, and fiscal transparency is a key aspect of good governance. A transparent fiscal system would likely result in stronger, more credible fiscal policies that should attract the support of a well-informed public, allow for more favorable access to domestic and international capital markets, and reduce the incidence and severity of crises. The IMF Code of Good Practices on Fiscal Transparency is summarized in Box 14.1.

Box 14.1 Best Practice in Fiscal Transparency

The IMF's Code of Good Practices on Fiscal Transparency and accompanying manual (IMF, 2001) present a standard of fiscal transparency to provide assurances to the public, to donors, and to markets that a sufficiently complete picture of the structure and finances of government is available to allow the soundness of a country's fiscal position to be reliably assessed. The code is a set of good practices that can be implemented by most countries over the medium- to longer-term and is based on four general principles.

- The principle of clarity of roles and responsibilities requires specifying the structure and functions of government, responsibilities within government, and relations between government and the rest of the economy.

- Public availability of information emphasizes the importance of publishing comprehensive fiscal information at clearly specified times.

- Open budget preparation, execution, and reporting covers the type of information made available about the budget process. Budget documentation should specify fiscal policy objectives, the macroeconomic framework, a clear description of new policies, and identifiable major fiscal risks.

- Assurances of integrity stress the quality of fiscal data and the need for independent scrutiny of fiscal information. This includes external audit by a national audit body and assessment by independent experts of fiscal forecasts, the macroeconomic forecasts on which they are built, and all underlying assumptions.

XV. CHAPTER FIFTEEN: DESIGNING AN ADJUSTMENT PROGRAM

This chapter concludes the discussion of macroeconomic stabilization by considering four important issues that arise in the course of designing adjustment programs: the choice of the exchange rate regime, the role of demand management policies and the appropriate choice of adjustment and financing, and the balance between ambition and realism in setting program targets.

15.1   Disinflation and the Choice of a Nominal Anchor

In designing an adjustment program, one of the first key decisions is that of the appropriate monetary framework. Is the current framework serving the country well? Can it be continued? Would macroeconomic adjustment be facilitated by a switch to a new framework? As discussed in Chapter 12, the advantages and disadvantages of alternative frameworks depend both on the state of the economy and on the institutional characteristics of the country.

Consider, for instance, a country where inflation has been high for some time and needs to be brought down. Policymakers can choose to rely on the targeting of monetary aggregates, inflation targeting, or an exchange rate anchor. The deterioration in recent decades of the inflation-money relationship in many countries has prompted central banks around the world to move away from money targeting. If policymakers choose to pursue inflation targeting with a floating exchange rate, to make their disinflation efforts credible they may have to raise real interest rates aggressively. This may open up a large output gap and cause levels of unemployment and loss of output that are socially and politically unacceptable. Alternatively, a sharp increase in interest rates may attract short-term capital inflows, causing the exchange rate to appreciate. While this would help the disinflation effort, it might weaken exports and worsen the current account, threatening external balance. The central bank may have to intervene to stem the appreciation and sterilize intervention to avoid a monetary expansion. The difficulties with sterilized intervention have been discussed in Chapter 6.

An alternative approach is to rely on a hard exchange rate peg to stabilize inflation. With a pegged currency, inflation will tend to fall to that of the anchor currency even in the absence of a sharp increase in the interest rate and an economic contraction. In the early 1990s, hard pegs were successfully used to break hyper- and high inflation in some countries, but were associated with currency crises in others. Typically, inflation declined rapidly but did not reach the level of the trading partners for some time, resulting in gradual loss of external competitiveness and deterioration in the current account. The influx of large quantities of foreign capital also fueled rapid growth in consumption and investment, contributing to the current account deterioration. While some countries were able to finance their external

imbalances and eventually reverse them, others ended up experiencing a currency crisis, followed by an output contraction and a flare up of inflation (Rebelo and Végh, 1996). A possible remedy to the real appreciation problem is to initially fix the exchange rate at a rate well below the prevailing market rate, so that exporters are protected from the erosion of price competitiveness during the disinflation period. Some Central European transition countries successfully followed this strategy in the early 1990s.

The initial choice of the regime need not be binding for the medium term. Policymakers may decide to start the adjustment program with a fixed exchange rate regime in order to bring inflation down quickly; they may then float the currency after a few years in order to benefit from the shock-absorbing role of a flexible regime. However, appropriately timing the exit so as to avoid sharp exchange rate changes may be difficult in practice.

Another key consideration in the choice of the monetary framework is the extent to which monetary policy is independent from fiscal policy. If there is "fiscal dominance" and monetary authorities will likely have to subordinate monetary objectives to the need to finance the fiscal deficit, then an explicit commitment to a tight exchange rate peg or an ambitious inflation target will not be feasible, and will only undermine the credibility of the monetary authorities. In these cases, it may be advisable to set a higher but more realistic inflation objective, accompanied with policies to improve fiscal imbalances and grant more independence to the monetary authorities over time.[185]

To sum up, in deciding the country's appropriate monetary framework, policymakers need to be clear about the nature of the most pressing short- and medium-term issues: has inflation been too high and has the central bank failed to stabilize it? Does the central bank have monetary independence? Has the exchange rate been too high and volatile, constraining investment and expansion of tradable industries? What are public perceptions about the relative importance of inflation and exchange rate stability? Will there be political support for a disinflation if it is accompanied by higher unemployment initially?

15.2   External Shocks and the Choice of Financing vs. Adjustment

When faced with an adverse external shock and a mounting current account deficit, policymakers need to decide on the optimal combination of external financing and adjustment. Once the size of the adjustment effort is determined, the next step is to decide on

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[185] The adverse consequences of fiscal dominance for price stability and pegged exchange rate regimes, respectively, are well documented in classic papers by Sargent and Wallace (1981) and Krugman (1979). In recent years, proponents of fiscal theories of the price level have likewise cautioned about the limits of inflation targeting in countries in which monetary dominance—subordinating fiscal objectives to price or exchange rate stability—have not been cemented (see, e.g., Sims (2003)).

the appropriate mix of expenditure-reducing and expenditure-switching policies to implement that adjustment.

To examine this issue, it is useful to recall the two basic identities of national income accounting and the balance of payments:

$$CAB + FI = \Delta R \tag{15.1}$$

$$GNDI - A = CAB \tag{15.2}$$

where:

> $GNDI$ = gross national disposable income,
> A = domestic absorption (domestic consumption and investment expenditures)
> CAB = external current account balance,
> FI = net capital inflows, and
> ΔR = the change in official international reserves.

Equation (15.1) underscores that the required current account adjustment will depend on the nature of the economic shocks and the availability of external financing. If not enough external financing is expected to be available from the private sector (FI), then financing the external shock will require either a drawdown of the country's international reserves (ΔR) or borrowing from international financial institutions.

Even if financing is available or official reserves are relatively abundant, policymakers might decide not to finance the external shock and that current account adjustment is an optimal response instead. According to economic theory, if the external shock is long lasting, such as would be the case from a permanent adverse terms-of-trade shock, then the country should optimally reduce absorption (A) and bring it in line with the lower level of permanent national income or wealth ($GNDI$). If, on the other hand, the income shortfall is temporary, and is due to cyclical, seasonal, or other short-lived factors, then financing would be desirable. With perfectly functioning world capital markets, countries should be able to finance a temporary imbalance from private creditors, but because markets are imperfect this is not always the case. Countries that carry low or moderate external debt loads and that have built sufficient international reserves and fiscal cushions find it easier to obtain foreign financing at reasonable cost. Not facing a funding crisis and not being constrained by high costs of foreign financing, these countries can consider the option of financing imbalances that appear to be short lived.

In practice, it may be very hard for the country and its potential creditors to ascertain ex ante whether a particular external disturbance will prove to be temporary or permanent. This means that policies need to react cautiously to shocks. Some adjustment may be needed even if the shock is believed to be temporary, and the policy response should be proactive and forward-looking.

But how should the current account adjustment be accomplished? Equation (15.2) states that an improvement in the current account balance requires either an increase in a country's

output or a reduction in its expenditure. As illustrated in the context of the *IS-LM-BP* model in Chapter 11, *demand management policies* can be used to curb domestic demand and reduce an external current account deficit. These include primarily monetary, fiscal, and policies, but other measures, such as incomes policies, price liberalization and exchange rate changes, may have expenditure-constraining elements. In many instances, the source of excess domestic demand is a fiscal imbalance. A combination of a reduction in public sector outlays and an increase in revenues may be called for.

Many adjustment programs seek to complement reductions in aggregate demand by *expenditure-switching measures* and, in particular, by using exchange rate policy. As discussed in Chapter 11, exchange rate devaluation changes the relative price of foreign and domestic goods—from a resident's perspective, the price of a country's exports and imports increase relative to the price of home goods. This increases the global demand for domestic goods and services while reducing residents' foreign expenditure by discouraging imports. On the supply side, devaluation strengthens incentives to produce goods for export or goods that compete with imports. By redirecting production towards exports and import-competing industries devaluation accomplishes current account adjustment while lessening demand restraint.

The magnitude and duration of adjustment depends on the urgency of the imbalance as indicated by pressures on the exchange rate, debt, and other macroeconomic indicators. Before the advent of large-scale portfolio flows, balance of payments imbalances typically took time to develop. Real exchange rate appreciations tended to unfold slowly over time under the influence of expansionary domestic fiscal and monetary policies, and the current account deficit widened but could, in many instances, be financed as long as external and public deficits and debts were modest. Policymakers who became aware of these adverse developments at a relatively early stage had the opportunity to undertake gradual adjustment.

With more integrated global financial markets, however, financial flows react more swiftly to changing economic conditions or even, sometimes, to changes in *expectations* about future economic conditions. This reality means that reaction times of policymakers are shorter than in the past. Thus, in economies very open to international capital flows, there is a more urgent need to identify economic and financial vulnerabilities at an early stage and adopt a package of strong policies to deal with them head on before they reach boiling point.[186]

The level of a country's external debt and the cost of external financing are important considerations in deciding the appropriate mix of adjustment and financing. Adjustment should be sufficient to ensure *debt sustainability* under plausible stress tests of assumptions about economic growth, growth of exports, and real interest and exchange rates. It seems that, in developing and emerging countries, external debt thresholds beyond which crises are

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[186] Experience demonstrates that needed policy measures are not always taken promptly. The absence of a looming crisis seems to dull policymakers' incentives to implement adjustment and reform.

observed occur at debt levels of around 40 percent of GDP.[187] Countries that start with debt levels near their debt tolerance thresholds need to do more adjustment and over a longer period. The pace of adjustment may be dictated by lack of short-term external financing and could be excessive, as was the case in some capital account crises in the 1990s.

15.3   Ambition and Realism in Adjustment Programs

The willingness of markets and official donors and creditors to provide external financing to a country facing a balance of payments problem rests on the strength of its policy package. Strong adjustment programs must combine ambition with realism in setting objectives while also remaining flexible to address the many unexpected developments that unfold during their implementation. Ambition means tackling macro-critical economic imbalances decisively and may require *front-loaded policies*. If, for example, inflation reduction is a principal program objective, policies will need to make a good start during the first year in achieving this objective. Tight-money policies may be required, but program success will also depend on making sufficient progress in tackling fiscal imbalances. Fiscal efforts that are deemed insufficient may be interpreted as a signal of flagging political will and could be reflected in continued high real interest rates and a failure to restore market confidence. *Strong political backing* by top government officials (the president or prime minister) is critical to the implementation of ambitious policies. A good macroeconomic team is also essential to ensure the program is well designed and free of inconsistencies and logical contradictions. Avoidance of logical and technical errors, such as improper sequencing of policy actions, can help improve implementation of adjustment and the credibility of policies and policymakers.

While an ambitious package of fiscal and monetary policies sends a strong signal about the country's intent to tackle its imbalances, policies must be firmly grounded in reality if they are to stand a good chance of being implemented. Realism requires programs to be formulated consistently, using a coherent macroeconomic framework. Projections of growth, inflation, and other macroeconomic variables need to be conservative and crosschecked using different forecasting methodologies. Realism also requires that programs not shy away from facing macro-critical imbalances head on. Failure to deal effectively with the root causes of major imbalances hurts the credibility of policies and only serves to postpone the day of reckoning. In the past, fiscal programs have been the Achilles heel of adjustment programs in Argentina, Russia, Turkey, and some other countries. This makes it all the more important to scrutinize the assumptions underpinning national budgets to ensure that planned revenues can be collected and planned expenditures can be executed, and that the fiscal envelope is consistent with medium-term fiscal sustainability.

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[187] Safe external debt thresholds may be even lower, around 20 percent of GDP, in some developing countries with histories of financial and macroeconomic mismanagement, as evidenced by serial external debt defaults and persistently high inflation. See Savastano, Reinhart and Rogoff (2003). Debt-intolerant countries tend to have weak fiscal structures and weak financial systems. Default often exacerbates these problems, making these same countries more prone to future default.

Realism in program design also means making conservative assumptions about the external environment and the country's prospects for external financing. Developments in world economic conditions—the outlook for foreign interest rates, energy prices, and prices of other key export and import commodities—must be projected conservatively and taking into account historical patterns which show significant volatility over time. For countries that rely on short-term flows, rollover rates in crisis or near-crisis times may be much lower than those in normal times. These developments, along with the possibility of contagion due to trade or financial links, all affect the availability and affordability of external funds. For example, rising interest rates or contagion can create debt-servicing difficulties, as can maturity and currency mismatches. Confidence effects are another important consideration in the design of adjustment programs in emerging market countries with open capital accounts. Such effects did not always emerge as planned in some past adjustment programs. The implementation of planned adjustment fell short of what was envisaged, commitments of official assistance did not always materialize, private capital outflows continued, and actual adjustment exceeded program expectations and the requirements of sustainability. Last but not least, adjustment programs must be tailored to the country's economic, political, and social realities.[188] This is a difficult task as it involves complex issues involving domestic redistribution and political economy, and income and welfare trade-offs between international creditors and domestic debtors and the tax-paying public.

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[188] Empirically, domestic political economy considerations are dominant among the factors explaining the implementation of adjustment and reform programs. See Ivanova and others (2005), and Dollar and Svensson (2000).

XVI. Chapter Sixteen: Macroeconomic Stabilization, IMF-Supported Programs, and Conditionality

The creation of the IMF following the Bretton Woods conference of 1944 filled a vacuum in the international institutional architecture that had become painfully obvious in the two decades prior to the start of World War II. During this period, economic and financial instability led to a worldwide depression and massive unemployment. Many countries resorted to currency devaluations, tariffs, and other unilateral actions in desperate attempts to preserve domestic jobs and incomes. Such "beggar-thy-neighbor" policies were inappropriate from a global point of view, merely exporting economic difficulties in one country to its trading partners and triggering retaliatory action from them, with terrible economic and political consequences for all.[189]

One of the IMF's principal functions is to extend emergency loans to countries experiencing balance of payments problems so that they will not resort to inefficient, protectionist policies. The Articles of Agreement (the IMF's legal charter) authorize the IMF to make its financial resources "temporarily available" to member countries and only under "adequate safeguards." Accordingly, the IMF extends loans on the condition that countries develop and agree to follow policy programs that will adjust their balance of payments and enable repayment. Access to IMF financial resources gives countries breathing space to resolve their problems, allows them to take less drastic measures to correct external imbalances, and spreads the required adjustment more evenly over time.[190]

Over the years, the IMF developed specialized lending windows called *IMF facilities* to help its members meet different types of balance of payments need. Some facilities address "classic" balance of payments problems due to slowly evolving current account imbalances. Others are aimed at low-income countries that do not have access to private capital markets and face structural balance of payments needs. Still other facilities aim to help emerging market economies cope with sudden stops of foreign capital. Box 16.1 provides more details on IMF facilities.

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[189] The IMF's creation was part of a conscious attempt to establish a liberal, rules-based international economic system that also includes the World Bank and what eventually became the World Trade Organization.
[190] IMF loans are only part of the package, which the IMF, acting on behalf of the international community, brings to the table. In addition to lending, the IMF helps countries through surveillance and analytical and technical support to help to develop their economic institutions and train government officials.

Box 16.1 IMF Facilities

The Fund makes loans to members under a range of lending windows called facilities. The various facilities are tailored to meet different types of balance of payments need and differ according to the degree of conditionality they involve and the rate of interest charged to borrowers. The IMF makes its general resources—convertible currencies constituted from members' capital subscriptions, or quotas—available at market-related interest rates under several *nonconcessional facilities*. In addition, the IMF makes available concessional loans to low-income members under two *concessional facilities*, the Poverty Reduction and Growth Facility (PRGF) and the Exogenous Shocks Facility (ESF). The resources for concessional facilities come from the PRGF-ESF Trust Fund, which borrows from central banks, governments, and official institutions at market-related interest rates and lends them to PRGF-eligible countries. The difference between the market-related interest rate paid to PRGF-ESF Trust lenders and the rate of interest paid by the borrowing members come from contributions from bilateral donors and the IMF's own resources.

Nonconcessional Facilities

Stand-By Arrangement (SBA). SBAs help countries address short-term balance of payments problems and have provided the greatest amount of IMF resources. The length of a SBA is typically 12–24 months, and repayment is normally expected within 2¼–4 years from the dates of drawing. Surcharges apply to high access levels. Formally, a SBA is a decision of the IMF by which a member is assured that it will be able to make *purchases* from the *General Resources Account* up to a specified amount and during a specified period of time, usually one to two years, so long as the member observes the terms and conditions specified. Drawings under a Stand-By Arrangement are normally subject to *credit tranche policies*.

Extended Fund Facility (EFF). This facility was established in 1974 to help countries address longer-term balance of payments problems requiring fundamental economic reforms. Arrangements under the EFF are thus longer—usually 3 years. Typically, an economic program states the general objectives for the three-year period and the specific policies for the first year; policies for subsequent years are spelled out in program reviews. Repayment is normally expected within 4½–7 years. Surcharges apply to high levels of access.

Supplemental Reserve Facility (SRF). This facility was established in December 1997 to meet a need for very short-term financing on a large scale. The motivation for the SRF was the sudden loss of market confidence experienced by emerging market economies in the 1990s, which led to massive outflows of capital and required financing on a much larger scale than the IMF had previously provided. Countries are expected to repay loans within 2–2½ years but may request an extension of up to six months. All SRF loans carry a substantial surcharge of 3-5 percentage points.

Compensatory Financing Facility (CFF). The CFF was established in 1963 to assist countries experiencing either a sudden shortfall in export earnings or an increase in the cost of cereal imports, often caused by fluctuating world commodity prices. Financial terms are similar to those applying to the SBA, except that CFF loans carry no surcharge.

Emergency assistance. The IMF provides emergency assistance to countries that have experienced a natural disaster or are emerging from conflict. Emergency loans are subject to the basic rate of charge, although interest subsidies are available for PRGF-eligible countries, subject to availability. Loans must be repaid within 3¼–5 years.

Box 16.1 IMF Facilities (concluded)

Concessional Facilities

Poverty Reduction and Growth Facility (PRGF). This facility was established in 1987 to provide concessional financial support to low-income countries striving to achieve balance of payments sustainability, foster durable growth, and reduce poverty. It was originally called the *Enhanced Structural Adjustment Facility* but was enlarged and extended in 1994 and further strengthened in 1999. Loans are disbursed under three-year arrangements, subject to observance of performance criteria and the completion of program reviews. Loans carry an annual interest rate of 0.5 percent, with a 5½-year grace period and a 10-year maturity.

Exogenous Shocks Facility (ESF). This facility was established in 2005 to provide policy support and financial assistance to low-income countries facing events that have a significant negative impact on the economy and that are beyond the control of the government. These events include oil and other commodity price changes, natural disasters, and conflicts and crises in neighboring countries that disrupt trade. Loans under the ESF are available to countries eligible for the PRGF but that do not have a PRGF program in place. Financing terms are equivalent to a PRGF arrangement.

Policy Support Instrument (PSI). The PSI was introduced in 2005 to enable the IMF to support low-income countries that do not want—or need—Fund financial assistance. The PSI helps countries design effective economic programs that, once approved by the IMF's Executive Board, signal to donors, multilateral development banks, and markets the Fund's endorsement of a member's policies.

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  Source: International Monetary Fund.

The rules governing access to the IMF's financial resources apply uniformly to all member countries. The amount of access depends on the member's (i) need for IMF financing, which takes into account other sources of external financing and the desirability of building and maintaining a reasonable level of foreign exchange reserves; (ii) capacity to repay the IMF, which is required in order to preserve the revolving character of the IMF's pool of financial resources and which depends on the strength of the member's adjustment policies; and (iii) outstanding use of IMF credit and its record in using IMF resources.

The IMF extends financing under *IMF arrangements*. An arrangement is a decision of the IMF Executive Board stating that the IMF stands ready to provide foreign exchange during a specified period, if the country meets certain conditions. An IMF arrangement supports the member country's *adjustment program*.[191]

The size of each member's IMF loan is determined by its *quota* in the IMF. A country's quota takes into account its weight in the world economy, the degree of its trade openness, and the strength of its international payments position, as evidenced by its holdings of

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[191] A glossary of terms used in connection with IMF programs is in Box 16.2.

official international reserves.[192] Under the IMF's policy on regular access, a country cannot borrow more than 100 percent of its quota in any given year, and the cumulative credit it can draw from the Fund cannot exceed 300 percent of quota. However, the IMF may extend much larger loans under the so-called exceptional access rules that govern the Supplementary Reserve Facility (see Box 16.1). These rules were created to provide credit to emerging countries facing large reversals of foreign capital inflows in the 1990s.

16.1 Conditionality

IMF loans are disbursed in phases or tranches and are conditional on the implementation by the country of a program of macroeconomic adjustment and reform agreed with the IMF. Conditionality provides assurances to the IMF that borrowers will (i) use the IMF loan to resolve their economic difficulties in a manner consistent with the purposes for which the IMF was established,[193] and (ii) be able to repay the Fund promptly, so that the IMF's limited financial resources will be available to other member countries that may need support in the future. Conditionality also gives borrowers confidence that their access to Fund financing will be maintained if they meet the specified conditions. Thus, the IMF cannot arbitrarily stop disbursements once a financial arrangement is in place. Moreover, the IMF's procedures for reviewing progress under a program allow considerable flexibility to modify or waive unmet conditions, and it is standard practice to use such flexibility as long as national authorities pursue the objectives of their programs in good faith. At the same time, the conditions of the program must also take into account the social, economic, and political objectives, priorities and circumstances of members making use of IMF resources. Box 16.3 describes the evolution of conditionality over time.

The IMF uses a number of instruments to monitor a member country's policy program. *Prior actions* are policy measures that the country must implement before the IMF's Executive Board approves an IMF arrangement, completes a program review, or grants a waiver. Prior actions ensure the success of subsequent measures under the program, especially in cases in which there have been deviations from agreed targets in the past. Policy measures can become prior actions if they are discrete, are under the direct control of the authorities, and are monitorable by the IMF. Prior actions could include, for example, downward adjustment of overvalued exchange rates, elimination of fiscally costly and distorting price controls, or approval of a government budget consistent with the program's fiscal framework.

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[192] The quota determines not only a country's access to IMF financing but also its voting power in the IMF. Quotas are reviewed periodically and are revised as countries' relative economic strengths change.

[193] Article I of the Fund's legal charter states that the IMF aims to promote international monetary cooperation, facilitate international trade, and help countries achieve high income and employment without resorting to competitive depreciations or other measures "destructive of national or international prosperity."

Box 16.2 Glossary of Terms

An IMF-supported adjustment program is a detailed program of economic adjustment and reform supported by an IMF loan. Based on an analysis of the economic problems of the member country, the program specifies the monetary, fiscal, external, and structural policies the country will implement to achieve macroeconomic stabilization and set the basis for sustained economic growth.

An IMF Arrangement is a decision by the IMF that gives a member the assurance that it stands ready to provide foreign exchange or SDRs in accordance with the terms of the decision during a specified period. An IMF arrangement—which is not a legal contract—is approved by the Executive Board in support of an *adjustment program*.

Access Limits. The amount a country can borrow from the Fund is called its access limit. This limit varies depending on the type of loan but is typically a multiple of the country's IMF quota. In exceptional circumstances, some loans may exceed the access limits.

Interest Rates. Except for the PRGF and the ESF, all facilities are subject to the IMF's market-related interest rate, known as the *rate of charge*, and some carry a *surcharge*. The rate of charge is based on the *SDR interest rate*, which is revised weekly to take account of changes in short-term interest rates in major international money markets. Countries that borrow from the IMF's non-concessional facilities also pay service charges and refundable commitment fee. The IMF levies surcharges on large loans to discourage heavy use of IMF funds. Surcharges also apply to drawings under the SRF. Low-income countries borrowing under the Poverty Reduction and Growth Facility pay a concessional fixed interest rate of ½ percent a year.

Repayment Terms. IMF lending is temporary. Depending on the lending facility used, loans may be disbursed over periods as short as six months and as long as four years as described below. The repayment period ranges from 3¼–5 years for loans under Stand-By Arrangements and 4½–10 years for medium-term loans extended under Extended Arrangements to 10 years, with a 5½-year grace period on principal payments, for loans made under the PRGF.

Benchmarks are points of reference against which program progress may be monitored. Benchmarks are not necessarily quantitative and frequently relate to structural variables and policies. Some benchmarks may be converted to performance criteria, required to be observed in order to qualify for phased borrowings. In addition, quantitative benchmarks are set for the quarters for which there are no performance criteria and structural benchmarks may be set for any date. Structural benchmarks are used for measures that cannot be monitored objectively enough to be PCs, or for small steps in a critical reform process, that would not individually warrant an interruption of Fund financing.

Indicative Targets are used to supplement quantitative PCs. Indicative targets are often set for the later months of a program, and are then turned into PCs, with appropriate modifications, as economic trends firm up.

Phasing is the practice of making the IMF's resources available to its members in installments over the period of an *arrangement*. The pattern of phasing can be even, front-loaded, or back-loaded, depending on the financing needs and the speed of adjustment.

Performance Criteria (PCs) are conditions a member country must meet to qualify for purchases under an IMF arrangement. Performance criteria are quantitative or structural, and are set on a quarterly or six-month basis. *Quantitative PCs* typically refer to macroeconomic policy variables such as international reserves, monetary and credit aggregates, fiscal balances, or external borrowing. For example, a program might include a minimum level of net international reserves, a maximum level of central bank net domestic assets, or a maximum level of government borrowing. *Structural PCs* are used for structural measures that are critical to the success of the economic program. These vary across programs but could, for example, include specific measures to improve financial sector operations, reform social security systems, or restructure key sectors such as energy.

Prior actions are conditions that a country agrees to implement before the IMF's Executive Board approves a loan or completes a review. Prior actions are measures that ensure that the program has the necessary foundation to succeed, or is put back on track following deviations from the agreed policies. Prior actions could include, for example, adjustment of the exchange rate to a sustainable level, elimination of price controls, or formal approval of a government budget consistent with the program's fiscal framework.

Program Monitoring. Monitoring by the IMF, including through the conduct of *program reviews*, to determine whether the *performance criteria* specified and policy commitments made in the context of a concurrent *Stand-By* or an *Extended Arrangement* are being observed by the member receiving resources.

Program Reviews provide a framework to assess progress on policies that cannot easily be quantified or defined as *performance criteria* and to assess overall progress toward program objectives of macroeconomic adjustment and structural reform in the context of an IMF program. The completion of a review makes available the next installment for purchases under the arrangement. Program reviews are thus an important monitoring tool. They allow the IMF's Executive Board the opportunity to make a broad-based assessment of the country's progress toward meeting program objectives. Reviews are used to discuss policies and introduce changes to the program that may be necessary in light of new developments. In some cases, a country might request a waiver for a breached PC—for example, when its authorities have already taken measures to correct the deviation. Program reviews have become more important in recent years.

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Source: IMF (2001).

Box 16.3 The Evolution of IMF Conditionality

Until the 1970s, conditions in IMF-supported programs were primarily macroeconomic in nature. They focused on better management of aggregate demand through fiscal, monetary, and exchange rate policies to restore internal and external macroeconomic balance.

With the advent of the oil shocks of the 1970s—and especially in the aftermath of the debt crisis of the 1980s–the IMF started supplementing macroeconomic conditions with structural ones, such as liberalizing prices and trade and privatizing state enterprises. The objective was to boost the supply side of the economy, improve the efficiency of domestic economic institutions, and raise growth in developing countries. In addition to helping countries improve the efficiency of the economy and ignite economic growth, supply side conditions in IMF-supported programs also prevent situations where governments cut the wrong components of spending or followed other inefficient policies. In the 1990s, the IMF also used structural conditionality in its programs with a number of countries that were making the transition from central planning to a modern market economy. Structural conditionality also became an integral component of the international response to financial crises in emerging markets. Starting with Mexico in 1994–95, these crises revealed that the affected countries had insufficient cushions of international reserves, vulnerable public finances, and institutional weaknesses. In response, conditionality covered a range of financial and corporate structural issues.

The scope and complexity of IMF conditionality expanded significantly over the years, with some unintended consequences. Domestic ownership for reforms—defined as broad political commitment to reforms by the government and other stakeholders—was undermined as some cash-strapped governments agreed to IMF conditionality mainly to access IMF financing and obtain its seal of approval. Lack of ownership hindered policy implementation and spread the IMF thin as programs expanded beyond its core areas. The IMF's experience with financial crises in the late 1990s also demonstrated that imposing structural conditionality on a broad front—even when done for the right reasons—was not always effective in restoring market confidence.

These experiences subsequently led the IMF to give high priority in recent years to streamlining and focusing its conditionality and strengthening national ownership of IMF-supported programs.[1] The IMF's policies on conditionality were reviewed, and revised *Conditionality Guidelines* were issued in 2002 (IMF, 2002).

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[1] Lack of domestic capacity is another critical factor influencing program implementation. If programs are designed by foreign experts but local expertise is lacking, then implementation is likely to be lackluster.

Once an IMF arrangement has been approved, the continuation of IMF financing is subject to certain quantitative and structural *performance criteria* (PCs) and *program reviews* that the country must meet at each test date—typically quarterly or semiannually. PCs can be either macroeconomic or structural and are set on policy measures or economic outcomes that the authorities can *control* and the IMF can *monitor*. Quantitative PCs are typically set on macroeconomic policy variables such as international reserves, monetary and credit aggregates, the fiscal balance, or external borrowing. Structural PCs are used when microeconomic measures are an essential part of the economic program. These vary widely across programs; they include specific measures needed to restructure key sectors for the economy— energy production, banking system reform following a crisis, and reform of government administration or the public social security system.

The continuation of IMF financing is also subject to *program reviews*. Reviews allow the IMF to take stock and make a broad-based assessment of whether the program is making sufficient progress in

achieving its main objectives. Reviews are especially useful in assessing the implementation of measures that cannot be easily quantified or made into as performance criteria. Reviews are also used to discuss policies and introduce changes to the program that may be necessary in light of new developments. Program reviews have become more important in recent years.

Program conditionality typically also includes *indicative targets* and *benchmarks*. These are "softer" conditions that help the country and the Fund mark progress toward meeting critical program objectives—such as the restoration of external or fiscal viability—but are not by themselves sufficient to interrupt IMF financing. Indicative targets are variables that cannot be established as PCs because of uncertainty about economic trends and that are turned into PCs as uncertainty is reduced. Measures are specified as *structural benchmarks* to guide program reviews; they are individual steps in a reform process that is critical to the success of the program but whose non-implementation does not, by itself, warrant an interruption of IMF financing.

16.2   Policy Design in IMF-Supported Programs

Overview

This book has provided an overview of three complementary analytical frameworks that are commonly used in the development of IMF-supported adjustment programs.[194] First, the identities of *financial programming* ensure the accounting consistency of the flows of real resources and financing across sectors assumed in the program (see Appendix C). The program may identify fiscal or balance of payments gaps that will need to be closed through a combination of policy adjustment and foreign financing. IMF financing is used to shore up the country's level of international reserves while other donor and creditor financing, including from the World Bank and other multilateral and bilateral official creditors, supports orderly balance of payments adjustment. Second, *debt sustainability analysis* (DSA) is used to provide a longer-term, stock perspective on the size of the macroeconomic adjustment required under the program. DSAs ask whether, under existing policies, the accumulation of public and external debt stocks can be financed or whether an external or government funding crisis is likely to emerge in five to ten years (see Chapters 8–10). This analysis helps program design identify the extent of adjustment needed to ensure debt sustainability under plausible assumptions about the nature of external shocks. Third, *balance sheet analysis* helps the IMF assess macroeconomic risks emanating from stock imbalances in the financial or corporate sector and design appropriate policies to reduce or limit these vulnerabilities (see Chapter 7).

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[194] See Volume I and *IMF Occasional Paper 241* for an extended discussion of these frameworks.

Demand management and financing vs. adjustment revisited

The immediate objective of many Fund-supported programs is to restore external and internal balance in an economy that faces pressures on its balance of payments. As discussed in Chapter 4 and Chapters 11–15, the country's options regarding external financing and adjustment can be discussed using two identities:

$$GNDI - A = CAB \qquad (16.1)$$

$$CAB + FI = \Delta R \qquad (16.2)$$

These identities help us organize the discussion of financing vs. adjustment in the program. Equation (16.1) states that a current account deficit reflects an excess of domestic spending (or absorption) over domestic income. Equation (16.2) reminds us that a current account deficit can be financed either by capital inflows or by a drawdown in reserves. A country in need of balance of payments adjustment typically faces a reduction in spontaneous inflows of capital or even net capital outflows. If the country has stockpiled a large hoard of reserves, it may be tempted to respond to external pressures by maintaining the current account deficit. It could plug the hole created by the reduction in inflows by spending part of its reserves, in the hope that capital market conditions will improve soon. This is a risky strategy. If the shock proves to be long lived, it merely serves to postpone the adjustment that must inevitably come. Alternatively, and more commonly, a country seeking IMF support may start with a low level of reserves, perhaps because it has spent a significant fraction of its stockpile already. Financing the external imbalance with reserves is then no longer an option; the authorities must cut back the country's current account deficit in an orderly way and, in the extreme situation in which the country faces large capital outflows, they must convert the current account deficit into a surplus.

In the short run then, the program will aim for external adjustment that by necessity aims to lower domestic absorption and permit more domestic production to be exported. With domestic supply capacity fixed in the short run, the country must initially rely on management of domestic demand. Fiscal and monetary policies must be tightened to reduce domestic spending for a given level of domestic income. In addition, real exchange rate depreciation may be required to switch domestic spending away from imports and toward domestically made goods. Examples of expenditure-reducing policies are tax increases, cutbacks in government purchases, and tighter monetary policies. A nominal devaluation is the principal expenditure-switching policy. Over the medium term, of course, the program will aim to complement demand management policies by structural policies aimed at increasing the supply potential of the economy.

An important consideration in the design of IMF-supported adjustment programs concerns the need for nominal devaluation and the choice of nominal anchor. As discussed in Chapter 15, programs may use monetary aggregates, inflation targeting, or the exchange rate as nominal anchors, to stabilize inflation expectations and reduce inflation. The choice of the nominal anchor is a very important aspect of program design and no single monetary framework is suitable for all countries. Some IMF-supported programs have been with countries that relied on hard exchange rate pegs—such as a currency board and dollarization. Exchange rate-based stabilization programs may help bring inflation down quickly and with less output cost than orthodox money-based stabilizations. But a hard peg commits monetary policy to a single objective—maintaining the external value of the currency—so it is no longer

available to pursue domestic stabilization objectives. Moreover, the appeal of hard peg regimes is limited from a medium-term perspective. They often lead to real appreciations and loss of competitiveness over the medium term, and also lack an easy exit strategy to an alternative monetary framework.

Whatever the choice of the nominal anchor, the success of IMF-supported programs depends on the strength of the underlying macroeconomic policies supporting them. The required current account adjustment must be calibrated to the nature of the shocks, the level of international reserves, and the availability of IMF and other official and private external financing. The availability of such financing will, in turn, depend on the vigor of adjustment and its catalytic effects on private capital flows. The permanent income hypothesis is useful for thinking about the adjustment-financing choice. Long-lasting balance of payments shocks require adjustment; temporary shocks can be financed provided that the level of external debt and terms of external financing are such that the country's debt sustainability will not be endangered. IMF-supported programs will require more adjustment in countries that have accumulated relatively high levels of external or public debt. This is necessary in order to bring debt levels down to ones consistent with debt sustainability considerations. More adjustment may also be required in order to rebuild the country's reserves, if these have been very low to begin with.

These considerations underscore the need for prudent policies when times are good, to maintain low or moderate external debt levels, ample international reserves and other financial cushions, and ensure that external financing is not contracted unless its terms are consistent with debt sustainability. Caution is also warranted by the limited ability of macroeconomists and policymakers to distinguish temporary from permanent shocks. Policy needs to be proactive and forward-looking, adjusting to adverse external developments at an early stage while they face benign market conditions.

The strength of a country's IMF-supported policy program affects the willingness of markets and official donors and creditors to provide financing to a country. Strong adjustment programs must be ambitious yet realistic in their objectives and remain flexible to address unexpected developments. Ambition means tackling macro-critical economic imbalances decisively, front-loading policies, and coordinating fiscal, monetary, exchange rate, and structural policies. Program success also rests on a combination of resolute political backing by top officials and sound technical program design and implementation. This combination helps minimize policy errors and helps build and solidify the credibility of the program.

Realism in the design of IMF-supported programs requires, in the first instance, a consistent and coherent macroeconomic framework, and projections that are conservative and crosschecked using different forecasting methodologies. Realism in program design also means making conservative assumptions about the external environment and the country's prospects for external financing. Assumptions about possible catalytic effects—which are especially important for program design in countries with open capital accounts—should also be conservative. The program's assumptions about macroeconomic performance, fiscal or external adjustment, and foreign financing need to be scrutinized to ensure they are consistent with domestic and international historical experiences, and with the country's domestic economic, political, and social realities.

In recent decades, the scope of IMF-supported programs has extended beyond demand management to incorporate microeconomic measures that aim to restructure weak, unprofitable or bankrupt economic

sectors and increase efficiency. Structural reforms present unique challenges of their own for the design of IMF-supported programs. Substantial time must often pass before structural reforms show results, especially when they are complex and process-oriented in nature. These features of structural reforms create asymmetric information for the IMF and other international financial institutions monitoring progress of implementation of IMF-supported programs. Some IMF-supported programs have focused on banking and corporate restructuring, which led the IMF to build up its banking and financial sector expertise in recent years. Restructuring of banks is macro economically critical. On the one hand, the banks perform a crucial function in the payments system, in the intermediation of resources, and growth. On the other hand, their restructuring is essential for the restoration of confidence and to convince investors that their fresh funding will be put to productive use. These reforms extend well beyond macroeconomics and involve the creation of rules-based systems of supervision and regulation that entail demanding norms for corporate and public sector accountability and transparency (see Chapter 14).

IMF-supported programs must also make allowance for the fiscal cost of cleaning up weak banking or corporate sectors. While necessary to enable resumption of growth, these measures entail large costs to treasuries—reaching in some instances upwards of 20 or 30 percent of GDP. IMF-supported programs add realistic estimates of the cost of recapitalizing banks to the stock of public debt and trace the consequences of the increased public debt for fiscal policies going forward. The cost of carrying the additional government debt adds to the government's interest expenditures and requires that offsetting fiscal adjustments are made that limit fiscal flexibility and the ability of the government to spend on infrastructure, health, education, and other worthwhile reasons.

The reforms implemented as part of some IMF-supported programs may involve transitional output and employment losses as resources are reallocated across sectors. IMF-supported programs therefore take pains to assess the effects of IMF-supported programs on poverty and undertake social impact analysis of reforms. Such assessments help in the design of measures to shield those temporarily or permanently affected by structural reforms (see Box 13.2). Programs increasingly try to identify those affected adversely by reforms and incorporate the budgetary costs of mitigating measures in the budget envelope of IMF-supported programs. With the cooperation of the World Bank and other institutions, programs incorporate well designed (passive and active) programs for retraining and other help. Such safety nets enable society to be more flexible in the face of external shocks and could help maintain political support for reforms and increased openness.

Setting macroeconomic conditions

Beyond these general considerations about program design, there is the question of which actions will be elevated to specific policy conditions as part of an IMF-supported program. The financial programming model provides the basis for quantifying program floors and ceilings in a consistent manner. The framework relies on cash flow and balance sheet identities, along with a small number of behavioral relations from short-run macroeconomic theory. The identities ensure consistency between the real, monetary, fiscal, and external sector accounts, as described in Section I of this Volume.

In the typical situation, an IMF-supported program's immediate objectives are to restore external competitiveness, rebuild international reserves, reestablish monetary and fiscal discipline, and lower inflation. To meet the program's external objectives, upfront nominal exchange rate depreciation may

be required, which will, over time, reduce excessive current account imbalances. Typically, programs envisage a buildup of foreign exchange reserves. This is achieved by placing a lower limit, or floor, on the central bank's stock of net international reserves (NIR) at each test date. Formally, the authorities' stock of NIR is made into a performance criterion.

NIR floors serve two principal roles. First, they ensure that the country is making sufficient progress in achieving external viability, which is a key objective in program countries. Second, they also help safeguard the IMF's resources and ensure that the IMF meets its fiduciary responsibilities to its shareholders. Failure to meet an NIR floor sounds a warning bell that macroeconomic adjustment may not be proceeding as intended and triggers a reconsideration of the program. The authorities and IMF staff investigate the reasons behind the breach of the NIR target. The reassessment establishes the causes of the deviations from program understandings. It may turn out that macroeconomic policies were not sufficiently tight and the central bank continued to lose reserves. In these situations, the authorities agree with the Fund staff on policy adjustments to ensure that the program will meet its objectives and disbursements continue.

In addition to NIR floors, monetary objectives normally include upper limits, or ceilings, on the stock of net domestic assets (NDA) of the central bank at each test date. NDA ceilings guard against excessive domestic credit creation fueling monetary expansion and putting pressure on the balance of payments and inflation. The IMF staff and country authorities derive the NIR and NDA limits using the financial programming framework, taking account of the country's policy objectives (including for real growth and inflation and making an analysis of what is feasible given the country's economic situation and the financing that would be made available from the IMF and other sources.

The fiscal policy stance should be supportive of the program's external and monetary policy objectives. Most programs set *ceilings for the budget deficit* taking into consideration the foreign financing available to the government and the need to limit domestic credit to the budget in order to allow for sufficient expansion of private sector credit to support private investment and growth. To reach a consistency between fiscal, monetary, and external targets requires trade-offs.

Traditionally, the implementation of financial programming has relied heavily on the assumption of a stable money demand relationship and the understanding that monetary policy could focus on intermediate targets for reserve money and the net domestic assets of the central bank. In recent decades, however, the relationship between money and prices has become unstable in emerging markets and advanced economies, monetary aggregates have been abandoned as intermediate targets in most of these countries, and inflation targeting has become a popular monetary policy framework. These developments have prompted the IMF to reconsider its traditional NIR/NDA approach to monetary policy conditionality. We discuss the new approach in Box 16.4.

16.3   Program Inception, Negotiations, Approval, and Reviews

In many situations, the need for IMF-supported programs becomes apparent in the course of IMF bilateral surveillance. While the IMF can—and does—suggest the need for a program, it is the responsibility of the authorities to request financial assistance from the IMF. Once the country approaches the IMF, a staff mission travels to the country to update its database and assess the most recent developments, recalibrate its macroeconomic projections, and negotiate with the authorities specific, *quantified* objectives and policy measures of a program of adjustment and reforms that could be supported by IMF financing.

The program discussions between the authorities and IMF staff are often intense. In many cases, the urgency to put in place a program is acute and the parties quickly conclude their round-the-clock negotiations. In other situations, the initial positions of the authorities and the staff could diverge significantly and the need for adjustment may not be immediate. Negotiations could then go on for weeks or months.

Once the authorities and IMF staff reach an agreement in the field ("ad referendum") and reviewed and approved by IMF management, the program is then forwarded for discussion and approval by the IMF's Executive Board. Immediately following the Board's approval of the program, the country receives the first installment, or *tranche*, of the loan. Further disbursements occur following periodic *program reviews*. As already discussed, reviews afford the IMF an opportunity to assess policies and introduce changes to the program that may be necessary in light of new developments. In some cases, a country might request a waiver for a breached PC—for example, when its authorities have already taken measures to correct the deviation from program understandings. Programs and program conditions are flexible to reflect the fluidity of economic developments in countries implementing Fund-supported programs.

The IMF staff and the authorities monitor program implementation on a continuous basis to ensure the program's macroeconomic and structural content remains the most appropriate response to the challenges facing the country.

Box 16.4 Inflation Targeting and IMF-Supported Programs

Monetary policy conditionality has traditionally relied on two performance criteria—an NIR floor and an NDA ceiling—to meet program objectives. With the development of close substitutes for money holdings and the associated instability of the demand for money, central banks in advanced and emerging market countries have tended to downplay monetary aggregates as intermediate targets for the conduct of monetary policy. Central banks in many of these countries rely, instead, on active management of short-term interest rates to achieve explicit, publicly announced medium-term inflation targets. The central bank's forecasts of inflation over the medium term become the intermediate targets of monetary policy under inflation targeting.

The question that arose, in Brazil in 1999 and in other emerging market countries subsequently, is whether the IMF's NIR/NDA framework is consistent with the features of inflation targeting. One concern is whether the emphasis on NIR and NDA in IMF-supported programs might confuse the public in countries that focus on explicit and public inflation targets. A second question is whether exchange rate intervention—which is sometimes permitted under IMF-supported programs—is compatible with IT, which presupposes a flexible exchange rate.

In assessing these issues, it is worth recalling the relatively long lags in monetary policy, which are 18 months to two years in industrial countries and somewhat shorter in emerging markets. These lags preclude the IMF from using ex post inflation performance as the sole criterion for evaluating the stance of monetary policy. The IMF needs some ex ante indicators to guide its assessments of monetary policy in program contexts. The central bank's inflation forecast can serve as an important indicator. Inflation targeting is in essence inflation forecast targeting; it presupposes that the authorities and the IMF have a reasonably good understanding—although not necessarily a formal model— of the inflation process and the monetary transmission mechanism. Nevertheless, NIR/NDA framework continues to constitute a useful second-best set of indicators of monetary policy in situations in which our understanding of inflation is imperfect and in which inflation forecasts could be manipulated.

There is also a second, more fundamental reason for retaining traditional monetary policy conditionality, even in countries in which our understanding of the inflation process is very good. Regardless of the monetary framework, the NIR/NDA mechanism remains useful as a signaling device for protecting the IMF's loaned resources, which, under the Articles of Agreement, is a principal program objective. NIR ceilings and NDA floors provide warning bells that trigger a reassessment of inflation forecasts and monetary policy, especially following foreign exchange intervention. In theory, of course, inflation targeting presupposes a flexible exchange rate regime, the subordination of external objectives of monetary policy to the domestic inflation target, and the absence of prolonged or extensive one-sided foreign exchange intervention to support the exchange rate from depreciating. Downward pressure on a currency should elicit an interest rate response if it is not related to seasonal or other temporary factors. Rates would be cut if the pressure on the currency reflects an adverse terms of trade change, hiked if the disturbance originates in the capital account. The size of the interest rate response would depend on the extent to which the depreciation endangers the medium-term inflation target. In practice, emerging market countries do not follow a policy of benign neglect of the exchange rate, nor do they always limit intervention to the smoothing out of temporary fluctuations. There are many reasons why the authorities may sell reserves: to limit exchange rate depreciation from affecting inflation in the short run, and to guide inflation expectations and help safeguard the financial stability of dollarized financial systems. NIR floors help protect the IMF's resources by ensuring that the central bank does not waste its reserves in fruitless intervention. They also guard against monetary policy from being shortsighted and driven mainly by exchange rate objectives. Similarly, NDA ceilings help guard against excessive money growth and inflation following sterilization of large-scale sales of foreign exchange.

The reconsideration of monetary policy in the program triggered by a breach of an NIR floor and/or an NDA ceiling may reveals that monetary policy was appropriate. In this case, the IMF issues waivers for the breach of monetary policy performance criteria and the program continues on-track. If, on the other hand, the review indicates that monetary policy was not sufficiently tight, then disbursements of IMF financing stop until agreement can be reached on appropriate tightening of policy. Viewed in this light, traditional monetary policy conditionality is fully consistent with inflation targeting.

Based on these considerations, the IMF adopted a two-pillar approach to monetary policy conditionality in inflation-targeting countries in 2000. The first pillar is an NIR target together with constraints on sterilized intervention to ensure that the external objectives of the program are met. The second pillar consists of periodic IMF reviews that assess whether the central bank is achieving its inflation objectives. If inflation is projected to exceed the target, a review can only be completed if IMF staff and the authorities agree on the monetary policy response needed to bring inflation back on track. Monetary conditionality may also include benchmarks in countries where the preconditions for inflation targeting are not met and a reviews-based approach is not appropriate. The Fund may turn some or all of the preconditions that are not met into benchmarks. The aim is to help strengthen the country's inflation targeting framework and facilitate the use of reviews.

The IMF used this two-part approach—NIR targets and program reviews—to evaluate monetary policy in its program with Brazil after the authorities adopted inflation targeting in 1999. These reviews envisaged consultations between the authorities and IMF staff or Executive Board in case inflation exceeded program targets. The program established a band around the central inflation target at the start of the arrangement. Consultations with the staff (Executive Board) were to be triggered if inflation was outside the inner (outer) band at a test date. In practice, inflation initially exceeded the bands several times after several large shocks hit the Brazilian economy but eventually converged to the official target by 2004. The program limited sterilization. The authorities committed in the August 2002 program not to loosen monetary conditions and to consult with IMF staff if their accumulated intervention exceeded an agreed threshold on a rolling 30-day basis.

If the authorities' policy commitments are delayed leading to a breach of program conditions, IMF financing may be interrupted for a time in order to establish the cause. If the underlying thrust of government policies is consistent with program objectives, and the deviation from agreed targets is due to unforeseen events or incorrect assumptions about economic behavior and has a small impact on program objectives, IMF staff and management may recommend that the Executive Board issue a *waiver of noncompliance* that would allow IMF financing to continue. If the Executive Board agrees and grants a waiver, the program remains on-track, and IMF and other donor financing continues. The Board may grant a waiver if, for example, the authorities could not meet international reserves accumulation targets following an unexpected and unprogrammed increase in the price of imported energy products.

In other situations, failure to meet performance criteria reflects inadequate effort by the authorities. If negotiations between the IMF and the authorities do not conclude with an agreement on a modified program, the program goes off-track. A significant proportion of IMF arrangements are not fully disbursed, reflecting principally policies that deviate significantly from those agreed with the IMF.[195]

16.4 Concluding Remarks

The IMF's financial assistance is intended to help member countries facing balance of payments problems avoid excessive and/or inefficient adjustment measures that could harm the countries themselves, their trading partners, and the world economy. This assistance is extended on the condition that the country agrees with the IMF on the implementation of a program of macroeconomic and structural adjustment to address the country's problems. Quantitative macroeconomic conditions are set using the financial programming framework and bearing in mind the implications for medium-term fiscal and external sustainability and balance sheet vulnerabilities. The conditions attached to IMF loans are flexible and continue to evolve with members' emerging problems. In recent years, the IMF has streamlined and focused the conditions it attaches to its loans, making sure they are truly critical to the program's objectives and center on the IMF's core macroeconomic and financial sector competencies. Streamlined and focused conditions are less intrusive into countries' policy choices, and more likely to enhance country ownership of these programs. The IMF has also modified its approach to monetary policy conditionality to deal with countries that implement IMF-supported programs in the context of inflation targeting.

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[195] As discussed by Mussa and Savastano (1999, pp. 15–17), more than a third of Fund arrangements approved between 1973 and 1997 disbursed less than half of the initially agreed amount. In a few cases, programs were successful or economic conditions improved quickly and the member needed only a fraction of the initially agreed loan. However, the low disbursements were mainly due to programs that went off-track because, as Mussa and Savastano put it, "policies deviated significantly from those agreed with the IMF and subsequent negotiations failed to reach agreement on a modified program."

16.5 Appendix C. The Financial Programming Model

The financial programming model was originally developed by Polak (1957) and assumed fixed exchange rates, no capital mobility, and underdeveloped domestic financial markets, which limit domestic bond financing of budget deficits. The model usually assumes economic growth is exogenous and money demand is stable but can accommodate situations in which, for example, capital flows are exogenous and exert an independent influence on the balance of payments.

The model starts with the equation of exchange linking nominal GDP to velocity and broad money. Letting P denote the price level as expressed by the GDP deflator, Y denote real GDP, M_2 broad money and V the income velocity of broad money, the equation of exchange $M_2V=PY$ can be written in terms of the growth rates of the variables involved:

$$\left(1+\frac{\Delta M_2}{M_2}\right)\left(1+\frac{\Delta V}{V}\right) \equiv \left(1+\frac{\Delta P}{P}\right)\left(1+\frac{\Delta Y}{Y}\right) \tag{C.1}$$

This equation can be used to derive the rate of growth of broad money consistent with projected real output growth and inflation, under reasonable assumptions about velocity. Next, the model establishes a link between the monetary sector, external balance, and the government budget using various balance sheet and cash-flow identities. Recall that the monetary survey is the balance sheet of the *consolidated monetary sector* which includes the monetary authorities and deposit money banks. Recall the identities $M_2 \equiv NFA + NDA$ and $NDA \equiv DC + OIN$, we may write

$$\Delta M_2 \equiv \Delta DC + \Delta OIN^B + \Delta NFA. \tag{C.2}$$

Equation (C.2) states that monetary expansion depends on the increase in domestic credit, the change in Other Items Net, and the rate of growth of net foreign assets. The overall expansion of domestic credit is allocated to the government and the private sector, so $DC \equiv DC^G + DC^P$. Hence, we can write

$$\Delta DC \equiv \Delta DC^G + \Delta DC^P. \tag{C.3}$$

In a country with an underdeveloped capital market, the authorities finance their budget deficit, $G-T$, through borrowing from foreign sources and by placing securities with the domestic banking system.[196] Letting ΔNFB^G denote the net foreign financing of the budget, we may write

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[196] That is, we are ignoring changes in the holdings of Treasury securities by the non-bank public.

$$G - T \equiv \Delta NFB^G + \Delta DC^G, \tag{C.4}$$

The identities linking the fiscal and monetary sectors, equations (C.2), (C.3) and (C.4), expose some of the tradeoffs present in setting program targets. Balance of payments viability and macroeconomic stability require strengthening the banking system's net foreign assets. This necessitates setting an ambitious yet realistic objective for the accumulation of reserves. The program must also underpin private investment and growth by allowing for healthy expansion of private sector credit. Sufficient domestic credit must also be made available to finance the planned budget deficit. The identities make clear that these objectives are interdependent.

Financial programming is an iterative process. Preliminary projections are made of some endogenous variables and then accounting identities and the relationships of economic theory are used to project the remaining variables until consistency is achieved. One common starting point is preliminary projections for prices P and output Y using the techniques outlined in Chapters 2 and 3. These projections, along with a projection for velocity V and equation (C.1), help pin down the change in broad money, ΔM_2.[197] [198] The next step is to set a target for the accumulation of net international reserves under the program, which pins down ΔNFA. Next, the banking sector's *Other Items Net* (OIN^B) is projected, which captures changes in the net worth of the central bank and deposit money banks from profits and capital gains or losses from its holdings of foreign currencies and other assets and liabilities denominated in (or linked to) foreign currencies. Such *valuation adjustments* can be substantial, especially following large movements in nominal exchange rates (See Chapter 6 for a discussion of the identities and the projection of the valuation adjustment). From equation (C.2), one can then project the "allowable" level of domestic credit ΔDC the banking system can extend to the economy. The level of bank credit ΔDC^P the private sector needs to ensure that the growth objective is met can then be estimated.[199] The next step is to calculate bank credit to the budget, ΔDC^G, allowed under the program and compare it with the credit to government from equation (C.4), which takes into account the budget deficit, $G-T$, and the foreign financing of the budget, ΔNFB^G.

If it turns out that the government needs more bank credit to finance its deficit than allowed under the program, it must resort to one or more of the following options. First, it could cut

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[197] Projections of velocity are arrived at in one of two ways. In countries in which dollarization is not extensive, it is customary to make an assumption about average aggregate velocity, based on past trends and future policies. Alternatively, in countries with significant dollarization, separate projections are made regarding the average velocity of the domestic and foreign currency components of broad money. In this more refined projection, money velocity is the average of the velocities of domestic and foreign components of broad money.

[198] The approach just described produces a figure for the average value of broad money, denoted *Mav*, during the projection period (typically a year). In order to be inserted into the monetary accounts, this figure is combined with the value of broad money at the end of the previous year, denoted *Mt*, in order to derive the projection of broad money at the end of the projection year, *Mt*+1 using the formula $M \ Mav = [Mt + Mt+1]/2$.

[199] The historical relationship between private sector credit, investment, and economic growth can be used to calibrate this relation.

spending or raise taxes to reduce the deficit, bearing in mind the short-run effects of a fiscal contraction. Second, it could redirect bank credit from the private sector to the government, which may also slow down GDP growth. Third, the government could try to obtain additional external financing for the budget, which will have implications for the balance of payments and public and external debt sustainability. Fourth, it could increase domestic non-bank financing of the budget. If none of these options is sufficient, the authorities could raise bank credit to the government and accept higher inflation and deterioration in the balance of payments.

The balance of payments identity and the links between imports, the availability of external financing, and economic growth must also be examined for consistency. Start with the BOP identity, Equation (4.1): $CAB = -FI + \Delta R$. Let X denote exports of goods and services, T imports of goods and services, B^f net foreign debt, r the interest rate of foreign debt, and TR^f net current foreign transfers. Noting that we can write the current account balance as $CAB \equiv X - T - rB^f + TR^f$, the BOP identity becomes

$$CAB \equiv X - T - rB^f + TR^f = -FI + \Delta R. \tag{C.5}$$

Equation (C.5) helps us determine whether the target for net international reserves is consistent with the projections of foreign financing available to the country and the trade balance. Start by plugging into equation (C.5) the program projections for the change in net international reserves. Then forecast values for exports and capital flows using the techniques discussed in Chapter 4: exports depend primarily on world demand conditions and competitiveness while capital flows depend on interest rate differentials, confidence, and other factors. Finally, derive imports as a residual from equation (C.5) and compare this projection with the level obtained from the behavioral relationship linking imports and income at the level of prices, output, and real exchange rate projected by the program. This comparison may reveal, for example, that the demand for imports is greater than the value of imports derived residually. To achieve consistency requires one or more of the following adjustments. First, we could increase the foreign exchange available for imports, either by engineering real exchange rate depreciation or adopting other policies to raise export receipts, or by obtaining additional financing. Second, we could lower the target for net international reserves in order to allow a higher level of imports. Third, we could lower the demand for imports by reducing the projection for output.

A related consistency check comes from using the projection of foreign financing FI and the programmed target for reserve accumulation ΔR to obtain an estimate of the allowable current account deficit, CAB. Recall from Chapter 4 that domestic *absorption* is the sum of private and government consumption and investment, $A \equiv C + I$, and that the difference between domestic income and absorption equals the current account balance:

$$Y - A \equiv CAB \tag{C.6}$$

Use the projection of *CAB* from equation (C.5) and the preliminary projection of *Y* to calculate *A* from equation (C.6). This is the level of absorption consistent with the target for reserve accumulation and foreign financing available to the country. This projection can be compared to the value of *A* that is consistent with the behavioral relationships for *C* and *I*, that is, the consumption and investment functions.

In summary, the financial programming framework is a simple and flexible approach to projecting macroeconomic variables and constructing macroeconomic scenarios that are consistent with the accounting identities and behavioral relationships of economic theory. The framework has been widely used in the context of IMF-supported programs. The FPP approach leads to consistent sets of projections under the baseline scenario of unchanged and approved policies and under the alternative policy scenario. It is, nevertheless, worthwhile to be mindful of the strong assumptions it makes. The FPP approach relies on a stable money demand function to derive NIR floors and NDA ceilings that achieve the policy program's external and disinflation objectives. Experience has shown that although the money demand relationship may be useful in putting together the projections, it is not advisable for emerging markets and advanced economies to conduct their monetary policies on the basis of money growth targets.

The breakdown of the money-income-price relationships in many countries in recent decades and a bout of currency and financial crises in countries implementing pegged exchange rate regimes led to reconsideration of monetary policy around the world. Many emerging countries, including many making use of IMF loans, chose to pursue monetary policy in terms of explicit medium-term inflation targets. The IMF has reviewed and adapted its traditional monetary policy conditionality based on NIR floors and NDA ceilings. The IMF has retained this framework as it is useful for signaling when programs should be reviewed to make sure that IMF resources are being safeguarded. In applying this framework, the IMF is flexible in modifying programs or waiving breached performance criteria when assumptions about money velocity prove wrong.

XVII. CHAPTER SEVENTEEN: SOME PRACTICAL STEPS IN FORMULATING POLICY SCENARIOS

The financial programming exercise culminates in the formulation of two quantitative macroeconomic scenarios. In the *baseline scenario*, macroeconomic projections are made under the assumption that economic policies will remain broadly unchanged from current or recent trends. Chapter 7, Section 2, discussed some practical steps to follow in formulating baselines. These baselines are an important pillar of macroeconomic analysis. They identify the risks and vulnerabilities that must be corrected in the *program scenario*. This scenario must specify a set of *objectives* to improve economic performance along a number of dimensions. In addition, it must elaborate a package of supporting *policy measures* intended to achieve these objectives. This Chapter presents some practical suggestions on how to formulate policy scenarios.

17.1   Policy Scenario

The policy scenario consists of a set of objectives for macroeconomic and structural performance and of a package of supporting policies and appropriate foreign financing to achieve these objectives. Unlike the baseline, which seeks to map out the likely evolution of the macro economy assuming policies are on automatic pilot, the macroeconomic team must now *actively select* a set of desirable objectives for the main macroeconomic and structural variables and *design* policies to achieve and sustain these objectives. In an economy facing balance of payments difficulties and macroeconomic instability, the immediate objective of policies will be to restore external and internal balance. The program may also contain structural measures to help the country achieve broad-based economic growth, reduce poverty, and achieve other medium term objectives.

A policy scenario should aim to achieve internal consistency and deliver "good looking" time paths for output, inflation, and other macroeconomic variables. Program objectives need to be debated extensively to examine possible tradeoffs among different objectives and the advantages and disadvantages of using different instruments (see Box 17.1). As discussed in Chapter 15, program objectives should be ambitious yet achievable; supporting policies must be explicit, plausibly calibrated, consistent with informed common sense, and achieve the desired objectives at minimum economic and social cost. Given the linkages among the sectors, building up a desirable policy scenario usually requires several iterations. In each iteration, the forecasting team makes projections sector by sector, using the methods described in Volume I. Convergence to a desirable policy scenario is ensured when the three analytical frameworks point to accounting and economic consistency.

The package of measures underpinning the projections spans the fiscal, monetary, exchange rate and structural areas. The combination of external financing and adjustment assumed in the policy scenario should be consistent with the diagnosis of the main macroeconomic problems and with debt sustainability considerations. As discussed in Chapter 15, the macroeconomic response depends on whether external shortfalls are temporary or permanent.

Box 17.1 Trade-offs Among Policy Options

To be effective, policies need to be constructed and implemented in a mutually supportive manner. For example, a depreciation of the exchange rate, if not supported by demand restraint, may fail to redirect resources to the external sector while raising inflationary expectations in the economy. In designing the objectives of a policy package, account should be taken of trade–offs among different objectives and, thus, of the policies needed to achieve them. Some examples are:

- The removal of price controls is likely to raise inflation, at least initially, although such a policy is desirable from the viewpoint of improving resource allocation.

- A depreciation of the exchange rate, aimed at reducing the external current account deficit, will also raise the domestic currency costs of servicing the external debt. In the absence of other measures, this will raise the fiscal deficit.

- Measures to liberalize trade may result in an initial deterioration in the overall balance of payments position, as pent up demand for imports is released.

- Increases in domestic interest rates for the purposes of reducing growth in the monetary aggregates may induce capital inflows, which place upward pressure on the money supply.

If the problems are short lived, all that may be required is some bridge financing or a temporary drawdown of reserves. More deep-rooted imbalances would need to rely more heavily on the early implementation of a substantial package of adjustment measures. Beyond that, the sources of the external imbalance must also be discerned. If a large fiscal deficit is the likely cause, corrective measures will need to focus on this area. If the cause is external, for example a terms of trade deterioration, an exchange rate adjustment is more likely to be considered as part of a package to improve the current account.

The choice of nominal anchor in the economy—a monetary aggregate, the exchange rate, of inflation targeting—is another important strategic choice in formulating the policy scenario. In particular, adoption of a hard peg means that interest rate policy cannot be geared to pursue domestic objectives. It also affects the monetary projections because the central bank is unable to influence the level of net domestic assets. A second strategic choice is the mix of monetary and fiscal policies. The combination of monetary and fiscal restraint should contain enough expenditure reduction and expenditure switching to address the economy's external and internal disequilibrium. These policies should be checked that they work in a mutually reinforcing manner.

Policy programs must often go beyond short run management of domestic demand to incorporate measures to resolve insolvencies in the banking or corporate sectors, increase the economy's flexibility, and raise its supply potential. The cleanup of weak banks or corporate sectors is necessary to enable resumption of growth but entails large fiscal costs. As discussed in Chapter 15, the policy scenario needs to face this issue head on and include realistic estimates of the fiscal cost of resolving weak banks in the program's DSA. The program should contain an analysis of the implications of growing public debt for the size of the fiscal adjustment and the consequences of higher interest payments for the composition of public spending going.

Policies aimed to increase the flexibility of factor and goods markets are needed in order to create more jobs, especially for young people, increase competitiveness, and improve the balance of payments. However, structural reforms may result in transitional output and employment losses as resources are reallocated across sectors. The policy scenario should identify workers and other groups who are likely to be adversely affected by reforms. It should also aim to strengthen social insurance and social safety net institutions to deal with the consequences of reforms. These institutions help increase the economy's flexibility to deal with external shocks and to maintain political support for reforms.

17.2   Steps in Formulating the Policy Scenario

In formulating policy scenarios, it is useful to follow the best practices described in Chapter 7 of how to formulate baselines. Beyond that, to ensure consistency in program projections, the macroeconomic team can proceed in one of two ways. It can begin sorting out the fiscal accounts first, followed by a projection of the external and monetary sectors. Alternatively, it can start with the monetary projections and proceed to the external sector. The choice will be influenced by the program's choice of nominal anchor and by the extent of fiscal adjustment that is likely to be needed. If the primary concern is the fiscal position, and/or the exchange rate is the nominal anchor of choice, it will make sense to prepare fiscal and external projections first, leaving monetary projections for last. In contrast, if the primary concern is high inflation, and monetary aggregates serve as the nominal anchor, then it is best to prepare the monetary and external projections first, leaving the fiscal projections for last. In this case, the availability of financing from the monetary and external sectors will constrain the revenue and expenditure projections from "below the line."

Either way, the sectoral projections will need to be revisited to ensure that the accounts are consistent. If the team begins by making monetary projections, it will still need to work through the fiscal and debt sustainability analysis, as detailed below. Similarly, if it begins with the fiscal sector, say by estimating the primary balance required to stabilize the debt-to-GDP ratio, the team will still need to ensure that resulting real credit to the private sector (derived as a residual in the monetary accounts) is consistent with GDP growth objectives. Figure 17.1 below describes each method.

The mechanics: beginning with the fiscal sector

If the primary concern is the fiscal position, it might make sense to prepare the fiscal and external projections first. For example, if the worry in the baseline centers on fiscal sustainability, then it may make sense to begin the policy scenario by estimating the primary budget balance required to stabilize the debt-to-GDP ratio and then use this information, along with the reserve target, to complete the projections of the monetary sector. As another example, suppose fiscal sustainability is not a problem but there is need for fiscal stimulus for an economy in recession. In this case, a fiscal multiplier could be used to calculate how much fiscal stimulus would be required. The policy scenario could then be prepared by first projecting the fiscal accounts that reflect this stimulus. Finally, if the exchange rate is the

nominal anchor under the policy scenario, it may make sense to prepare the fiscal and external projections first, leaving the monetary projections as a "residual."

In practice, this method is similar to what you have done under the baseline scenario. Here are the steps you would take if you choose this method:

1.   Determine a fiscal objective under the policy scenario. For example, set the primary balance required to stabilize the debt-to-GDP ratio.[200]

2.   Take fiscal measures to achieve the desired fiscal target. This entails increasing revenue and/or reducing expenditures.

3.   Determine the overall fiscal balance and financing requirements as under the baseline scenario.

4.   Project the external accounts taking into account potential changes in investor sentiment following the adoption of fiscal policy changes. Determine the available external financing for the public sector in line with your NIR target. This will also determine Net Foreign Assets (NFA) in the monetary accounts.

5.   Make a projection of the domestic non-bank and bank financing to cover the rest of the public sector financing requirement.

6.   Estimate broad money in line with the inflation objective. Use the external projections to estimate NFA. Let Net Domestic Assets (NDA) be the difference between broad money and NFA. Then use the credit to the government determined in the fiscal accounts (a flow) and add it to the previous period's credit to the government.

7.   Estimate other items net (OIN) by calculating the valuation adjustment in the Balance of Payments. The size of this account will depend on the exchange rate regime, as it essentially captures the difference between the end-of-period and the average exchange rate.

8.   Let credit to the private sector be the difference between NDA, the new stock of credit to the public sector, and OIN.

9.   Check to ensure consistency between your GDP growth projections and the growth in real credit to the private sector.

The mechanics: begin with the monetary sector

This method is different from the approach followed in making baseline projections. The starting point is now an estimate of broad money that is consistent with GDP and inflation projections. The next step is to project the external sector, taking into account the target for

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[200] Refer to the discussion of Fiscal Sustainability in Chapter 8 for a detailed description of this method.

international reserves. Then one checks whether growth in credit to the private sector is consistent with assumed GDP growth. In this approach, credit to the public sector is a residual; the size of the government's adjustment is determined by the availability of domestic and external financing.

Here are the detailed steps that could be followed in this approach.

1. Determine broad money growth in line with the projections of inflation and growth under the policy scenario.

2. Select an appropriate NIR target and make external sector projections, taking into account any catalytic effects of a strong policy program. Determine the available external financing for the public sector in line with the NIR target. This will also determine NFA.

3. Set NDA as the difference between broad money and the NFA projection. Let credit to the private sector grow in line with the GDP growth projection.

4. Estimate other items net (OIN) by calculating the valuation adjustment in the Balance of Payments.

5. Let credit to the public sector be the difference between NDA, the new stock of credit to the private sector, and OIN.

6. Use the projections from the external and the monetary accounts to determine the amount of external and domestic financing available for the government.

7. Take fiscal measures above the line to ensure that the deficit is no greater than the available financing.

8. Check to ensure consistency between the inflation target, growth in the monetary aggregates, GDP growth projections, and credit to the private sector.

9. Check whether the resulting fiscal outcome meets the fiscal objectives. For example, does the resulting primary balance stabilize the debt-to-GDP ratio?

Figure 17.1 Working through a Program Scenario

| Begin with the Fiscal Accounts | → | **Determine the** fiscal target. | → | **Take fiscal measures above the line.** |

| Begin with the Monetary Accounts | → | Estimate Broad Money. | ⇄ | **Make external sector projections in line with NIR target. Determine external financing and NFA.** |

Let NDA = Broad Money - NFA.

Take credit to the government from the fiscal accounts.

Set credit to the private sector to be consistent with real private investment growth.

Calculate OIN.

Let credit to the PRIVATE sector = NDA - credit to the public sector - OIN.

Let credit to the PUBLIC sector = NDA - credit to the private sector - OIN.

Are the real GDP growth projections and real credit to the private sector consistent?

Use the projections from the external and monetary accounts to determine the available financing.

Take fiscal measures above the line to meet the external and domestic budget constraints

Do the resulting fiscal accounts meet fiscal objectives?

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