CHAPTER III

PUBLIC DEBT IN EMERGING MARKETS: IS IT TOO HIGH?

The potential risks associated with high public debt have long been a concern of economic policymakers around the globe. In the industrial countries, the need to strengthen fiscal positions and reduce public debt to accommodate the pressures that population aging will put on government budgets in the future has received considerable attention in recent years (see, for example, the May 2001 *World Economic Outlook;* Economic Policy Committee, 2001; and Turner and others, 1998). For emerging market economies, high public debt has often had more immediate consequences for economic performance, with debt crises—and the resulting painful periods of economic adjustment—having been a recurring feature of the histories of many of these countries.

Following a period of relative calm in the first half of the 1990s, during which public debt in many countries declined, recent developments have once again brought to the fore the issue of public debt in emerging market economies. Public debt has increased quite sharply in recent years across a broad range of emerging market economies; there have been high profile and costly debt defaults or distressed debt restructurings in Argentina, Ecuador, Pakistan, Russia, Ukraine, and Uruguay; and other countries—Turkey, for example—have experienced severe fiscal difficulties. These developments have led to the suggestion that—despite the currently benign environment in global financial markets—emerging market economies may once again be on the verge of serious public debt problems.

Discussions of the economic impact of public debt go back at least as far as the eighteenth century, when debt problems in France and Great Britain began to mount. More recently, the political economy aspects of public debt have also received increasing attention.[1] There are of course valid reasons why a government may choose to borrow and accumulate debt. The debt may be used to fund spending that contributes to broader economic and social objectives. Financing public investment—for example, by improving physical infrastructure—might raise the rate of return on private capital or provide something that the private sector would not provide because of externalities, while higher spending on education or health care may enhance a nation's human capital. Further, if government spending has to be temporarily high today because of, say, a war or a natural disaster, debt could be used as a buffer to limit the need to immediately raise taxes (see Barro, 1979). Financing countercyclical fiscal policy also has an important role in helping stabilize economies and smooth business cycles.

High public debt can, however, have a significant negative effect on economic activity. It requires high taxes to finance and puts upward pressure on real interest rates, "crowding out" private investment. When a government is no longer able to finance its deficits, it is forced to contract spending or raise revenues, often at a time when fiscal policy is needed to help stabilize the economy (fiscal policy becomes procyclical rather than countercyclical). When it cannot take these actions, a debt crisis ensues and the government is forced to default or inflate the debt away (an implicit default), both of which entail large economic and welfare costs.

Note: The main authors of this chapter are Tim Callen (lead), Marco Terrones, Xavier Debrun, James Daniel, and Celine Allard, with consultancy support from Enrique Mendoza. Nathalie Carcenac, Carolina Gutierrez, and Bennett Sutton provided able research assistance.

[1]In this literature, debt is seen in a strategic context where the government can use it to finance higher expenditures or tax cuts to boost its reelection prospects, or to try to constrain the actions of successor regimes (see Rogoff, 1990, and Persson and Svenson, 1989).

Box 3.1. Data on Public Debt in Emerging Market Economies

Obtaining reliable and comparable cross-country time-series data on public debt and its key components for emerging market economies is not an easy task. Indeed, the considerable difficulties indicate the need for concerted efforts to improve the quality of the data in this important area.

Some of the major issues that arise in putting together a data set on public debt in emerging market economies are as follows.

- *Data availability.* Many countries have only recently started producing reasonably comprehensive measures of public debt, and they have only a limited time series that typically does not go back beyond the early 1990s on a consistent basis. Sometimes a longer time series is available for a narrower definition of debt—usually central government—although this is not always the case. Information on external public debt is typically more readily available than that for domestic public debt. Data on other key aspects of public debt—including its foreign/local currency denomination and average maturity—are rare (although improving).
- *Coverage of the data.* For an analysis of fiscal sustainability, it is important to have as broad a coverage as possible of public sector liabilities. Preferably, in addition to the liabilities of the central government, the liabilities of subnational governments and public sector enterprises should be included, as well as the contingent liabilities of the government (which may include loan guarantees, public sector pension liabilities, and even the potential costs of bank recapitalization). In reality, however, it is not possible to put together data on contingent liabilities for a large sample of countries. Even obtaining a comprehensive measure of explicit debt is difficult. For example, some countries only have data available on a central or general government basis, while even when public sector data is available, its coverage varies between countries. Some countries include public sector banks and the central bank in the definition of the public sector; others do not. Coverage of extrabudgetary institutions also varies. For example, South Africa's data exclude extrabudgetary funds, while for Korea and Thailand the data include the debt of bank restructuring agencies. In general, data for Latin American countries tend to have the widest coverage of the public sector, and data for Middle Eastern countries the narrowest.
- *Other definitional issues.* Definitions, even for a given coverage, also vary greatly between countries. A major difference is in the use of gross or net data, and which assets are netted out. Brazil, because of its experience with high inflation, also uses a nonstandard ("valorized") definition of GDP, where adjustment for the effect of inflation on GDP is made. These adjustments can be substantial. For example, Brazil's general government debt at end-2002 was 55 percent of valorized GDP on a net basis, but 86 percent of standard GDP on a gross basis (with two-thirds of the increase due to the different GDP definition). Another related statistical issue is the comparability of public debt and fiscal data. While this is generally less of a problem when central or even general government debt data are used, when public sector debt is considered it is sometimes not possible to get fiscal revenues, expenditures, and balance data on a comparable basis. In such cases, inconsistencies between the debt and the fiscal flows data are inevitable.

Because of the limitations with currently available public debt data for emerging market economies, the approach that has been taken in this chapter is to construct two separate databases. Data on contingent liabilities, implicit debt, and arrears are not included for either industrialized or emerging market economies.

The first database focuses on obtaining the most comprehensive measure of public sector debt that is available, and contains data for 34 emerging market and 20 industrial countries covering the period 1990–2002 (although for some

Note: The main author of this box is James Daniel.

emerging market economies, data are not available for the whole period). The data for emerging market economies were collected from IMF staff reports and country economists. Of these 34 countries, 19 had data for the public sector, 10 for the general government, and 5 for the central government. For most countries, data are on a gross basis (i.e., financial assets are not netted out), with Brazil, Egypt, Jordan, Pakistan, and Turkey being exceptions. For the industrial countries, data are on a general government basis and are taken from the World Economic Outlook and OECD Analytical databases.

The second data set focuses on constructing a longer time series of data—which is essential for some of the econometric exercises and event analyses conducted in the chapter—for a broader sample of countries. This has data from 1970 to 2002 for 79 countries (20 industrial, 32 emerging market, and 27 other developing) and was constructed from the World Bank's Global Development Finance database, the IMF's Government Finance Statistics database, the OECD Analytical database, and country-specific sources. For industrial countries, data are again on a general government basis. For emerging market economies, total public debt is constructed as the sum of separately constructed series for external and domestic public debt. The external debt data are a comprehensive public sector debt measure, but the domestic debt data are on a central government basis.

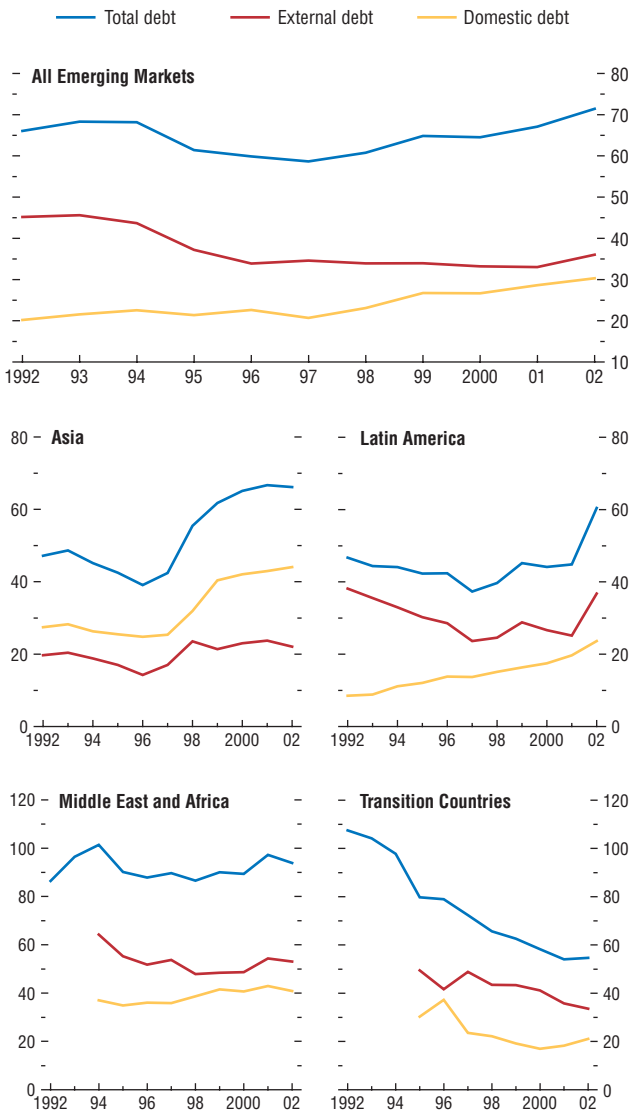
Given the recent rise in public debt in emerging market economies, two increasingly important questions are at what point does public debt become too high?[2] and what policy actions does a government need to take to ensure that its debt is sustainable? A recent paper by Reinhart, Rogoff, and Savastano (2003) has investigated the "intolerance" of some emerging market economies to external debt, and has examined episodes of large external debt reductions in these economies. To date, however, few studies have empirically examined *public* debt sustainability or large *public* debt reductions in emerging market economies, partly because of the difficulties in constructing a data set on public debt in these countries. This chapter seeks to address this gap, and build on the work of Reinhart, Rogoff, and Savastano. In particular, it compiles a comprehensive cross-country database on public debt in emerging market economies, and then applies a number of different approaches to assess sustainability and analyze past instances in which countries have undertaken large public debt reductions. Innovative aspects of the analysis include an investigation of how fiscal policy in emerging market economies responds to public debt, and the implications of the greater inherent volatility of emerging market economies for the sustainability of their public debt.

As already discussed, compiling a data set is a major challenge for any study of public debt in emerging market economies. The availability and coverage of public debt data vary considerably between countries, and there is no single source from which the data can be obtained. For the purposes of this chapter, two new data sets were constructed. They both focus on gross public sector debt, rather than net debt (i.e., where public sector assets are netted out) or the net present value of the debt, because of data limitations. The first data set contains a broad measure of public debt for the period 1990–2002, and the second a narrower definition of public debt, but over a longer time period (1970–2002). The reasons for creating two separate data sets, and the strengths and weaknesses of each, are discussed in Box 3.1.

[2]Economic theory provides little practical guidance on the optimum level of public debt as it is dependent on the specification of the model (see Aiyagari and McGrattan, 1998).

Figure 3.1. Public Debt in Emerging Market Economies[1]
(Percent of GDP)

Public debt has risen across a broad range of emerging market economies since the mid-1990s. This rise has been due to domestic debt, which now accounts for nearly one-half of total debt.



Source: IMF staff estimates.
[1]Unweighted averages. Only countries for which continuous data are available are included. For some countries, continuous data are available for total public debt, but not for the external and domestic subcomponents. Hence, external and domestic public debt do not always sum to total public debt.

Public Debt and Fiscal Policy in Emerging Market Economies

Public debt in emerging market economies has risen quite sharply since the mid-1990s, and currently averages about 70 percent of GDP (Figure 3.1).[3] This increase in debt has more than reversed the decline that took place in the first half of the 1990s, so that despite the Brady debt restructuring initiative and large-scale privatization programs in many countries, public debt in emerging markets is higher than it was at the beginning of the 1990s. This is not to say there have not been success stories—Bulgaria, for example, has reduced its public debt ratio from close to 160 percent of GDP in the early 1990s to less than 60 percent of GDP in 2002—but many other countries have experienced very large increases in their debt ratios. In Argentina, public debt has risen from 30 percent of GDP in the early 1990s to 150 percent of GDP at end-2002, while in Lebanon it has increased from 50 percent of GDP to close to 180 percent of GDP over the same period.

The increase in public debt in emerging market economies in recent years has been concentrated in Latin America and Asia, with the latter seeing the most notable rise owing to the impact of the financial crisis in the region in the late 1990s. In contrast, debt ratios in the transition countries in Europe have fallen sharply as a number of these economies have implemented significant economic and fiscal reforms while they move toward accession to the European Union. In the Middle East and Africa, debt has remained broadly unchanged, but at uncomfortably high levels. The rise in public debt has been accounted for by increased issuance of domestic debt, spurred by domestic financial liberalization, the decline in inflation (particularly in

[3]Emerging market economies are here defined as those that were in the EMBI global index at the beginning of 2002 plus Costa Rica, Indonesia, India, Israel, and Jordan. Data are for nonfinancial public sector debt (external and domestic) where available, or the broadest definition of public sector that is otherwise available. Average figures are unweighted and only include countries for which continuous data are available for the sample period.

Latin America), and bank restructuring debt.[4] In contrast, the share of external public debt has declined, and now accounts for about one-half of the total, compared to about two-thirds at the beginning of the 1990s.

The increase in public debt in emerging market economies stands in contrast to developments among the industrial countries, where debt ratios have generally declined in recent years (with the notable exception of Japan) (Figure 3.2). Strikingly, after being well below industrial country levels during the 1990s, the average public debt ratio in emerging market economies is now higher than the average ratio in industrial countries (and much higher as a percent of government revenues).[5] It is also noticeable that despite the decline in the share of external debt in total public debt to about 50 percent in emerging market economies, it still remains well above the 25 percent share in industrial countries. The difference in debt denominated in, or indexed to, foreign currency is even larger. Based on a limited sample of emerging market economies, the foreign currency component is about 60 percent of total debt because some domestic government debt is linked to foreign currencies.

What have been the main factors behind the increase in public debt in emerging markets since the mid-1990s? The rise appears to be largely accounted for by interest and exchange rate movements and the recognition of off-balance-sheet and contingent liabilities (all captured in the "other" item in Figure 3.3). In a number of countries, the costs of recapitalizing banking systems have been particularly high.[6] Growth, on the other hand, has acted to reduce the public debt ratio. The primary fiscal balance

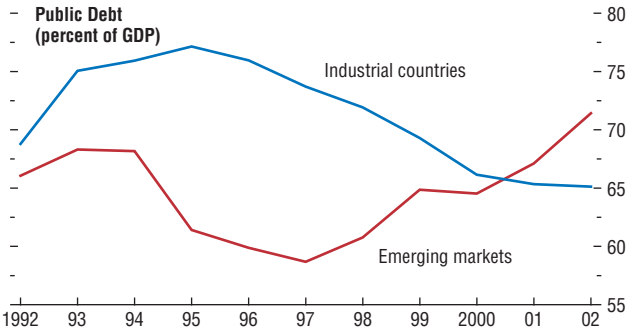
[4]Reinhart, Rogoff, and Savastano (2003) similarly note these trends, but across a much smaller subset of countries.

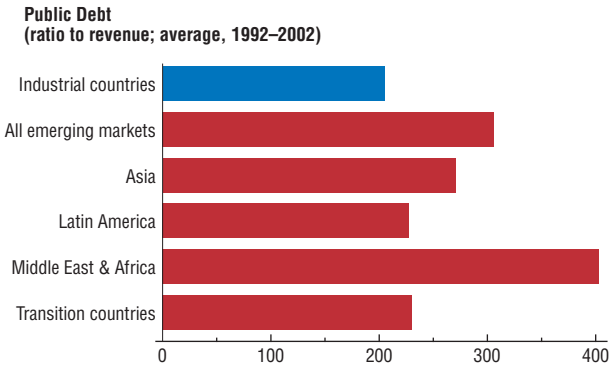
[5]The median public debt ratio is also higher in emerging market economies—66 percent in 2002 compared with 62 percent of GDP in industrial countries—and has shown the same upward trend since the mid-1990s.

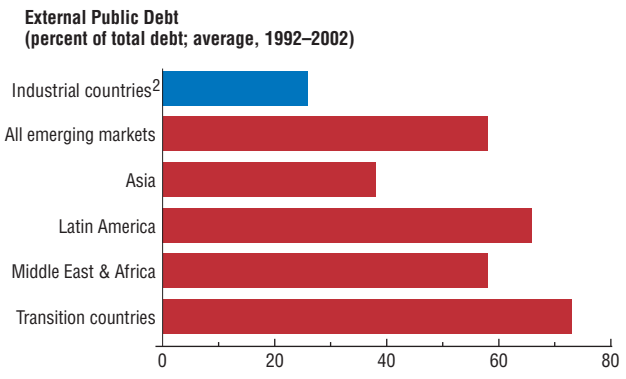
[6]Burnside, Eichenbaum, and Rebelo (2001) model the impact of contingent financial sector liabilities in the context of the Asian financial crisis.

Figure 3.2. Comparison of Public Debt Levels in Emerging Market and Industrial Economies[1]

Public debt in emerging market economies is now higher than in industrial countries when compared to GDP, and is significantly higher in relation to government revenues. External debt also accounts for a higher proportion of public debt in emerging markets.



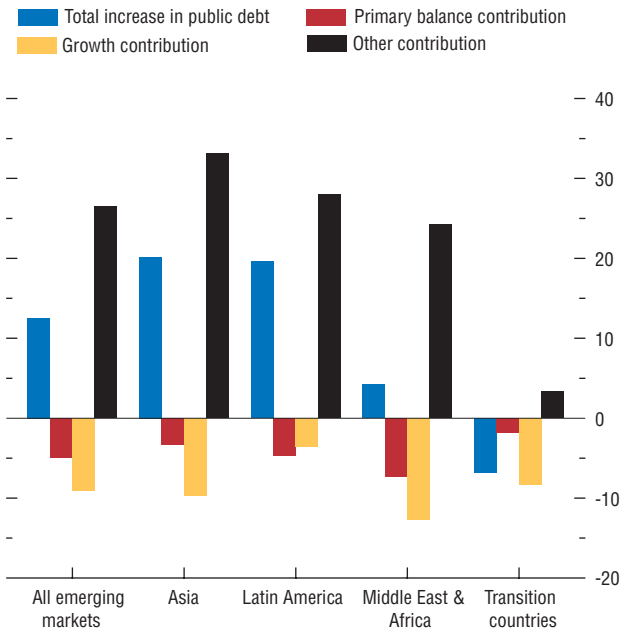




Source: IMF staff estimates.
[1]Unweighted averages.
[2]G-7 only.

Figure 3.3. Emerging Market Economies: Contributions to the Change in the Public Debt Stock Since 1997[1]
(Percent of GDP)

The recognition of contingent liabilities and interest and exchange rate developments—captured in the "other" category—have largely been responsible for the rise in public debt.



Source: IMF staff estimates.
[1]Unweighted averages.

(revenues less noninterest expenditures) has not itself added to the debt stock during this period, but it has not acted in any significant way to offset the increase in debt that has been caused by other factors. Indeed, primary fiscal balances have weakened somewhat since the mid-1990s in all regions except the Middle East and Africa at a time when a strong fiscal effort was needed (Figure 3.4).

The increase in public debt to high levels in many emerging market economies in recent years has once again raised concerns about debt sustainability and whether there could be a repeat of the 1980s debt crisis. The long history of debt crises in many emerging market economies suggests that such concerns are not unfounded. Indeed, the fact that some emerging market economies have a long history of defaulting on their sovereign debt raises the question of why international investors continue to lend to these countries. Evidence, however, suggests that investors may not have lost by investing in these economies, although the ex post risk premia earned on their investment has been small. For example, Klingen, Weder, and Zettelmeyer (2003) find that during 1970–2002 the rate of return on lending to emerging markets was the same as the return on U.S. government bonds. Over a more recent sample, the ex post risk premium was found to be small, but positive.

Casual observation of sovereign debt default episodes in emerging markets over the past 30 years indicates that while the level of public debt at the time of a default has varied substantially, in many cases it has been quite low. In 55 percent of the defaults recorded, public debt was below 60 percent of GDP—the benchmark established for European Union members in the Maastricht treaty—in the year before the default, and in 35 percent of the cases the default actually occurred at a debt ratio of less than 40 percent of GDP (Figure 3.5).[7] Indeed,

[7]Looking at external debt at the time of sovereign debt default over the same period, Reinhart, Rogoff, and Savastano (2003) find that external debt was less than 60 percent of GNP in 47 percent of cases, but less than

the median public debt-to-GDP ratio in the year before a default was about 50 percent of GDP. Governments in emerging markets have also defaulted on their domestic debt through high inflation, particularly in the 1980s and early 1990s when several of these economies had triple-digit annual inflation rates (and a few experienced hyperinflation).[8]

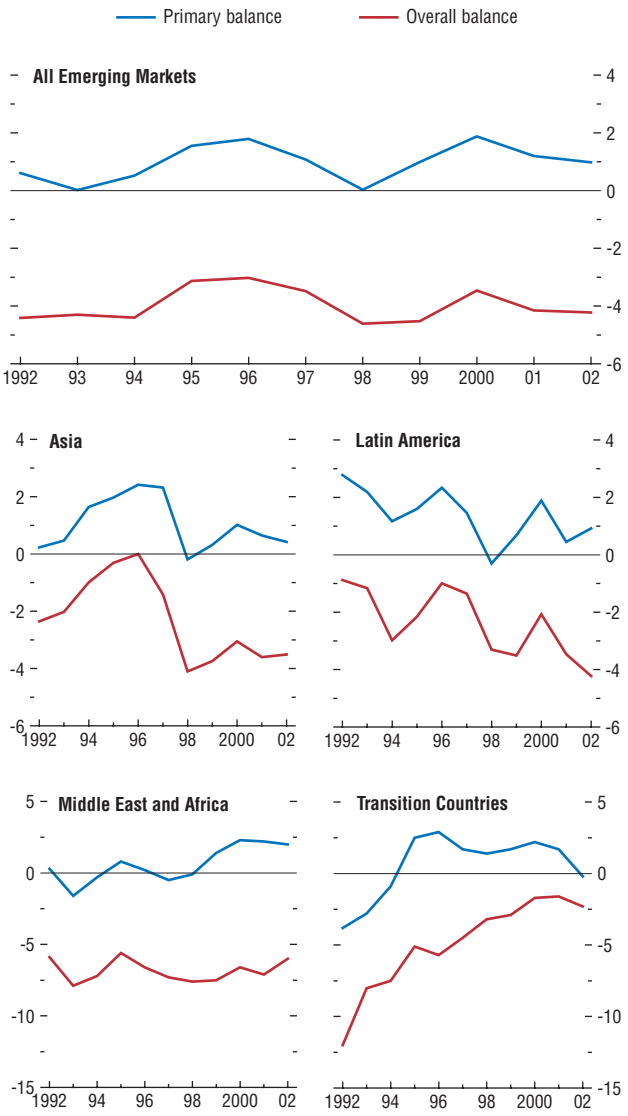
Not all emerging market economies, however, have experienced debt crises or very high inflation rates, indicating that it is difficult to make generalizations about these economies as a group. Indeed, a number of emerging market economies—such as India and Malaysia—have managed to maintain relatively high public debt for a long period without a default. A comparison between emerging market country defaulters (since 1998) and nondefaulters points to a number of noticeable differences between the two groups.[9] The countries that have defaulted have, on average, a higher ratio of public debt to GDP, a higher debt-to-revenue ratio, a higher proportion of external debt in total public debt, and a lower ratio of broad money to GDP than those that did not default (Figure 3.5).[10] Indeed, in a number of cases it bears noting that debt ratios prior to the crisis were held down by overvalued exchange rates, given the importance of foreign currency–denominated debt in such cases.

The default experience of many emerging market economies stands in stark contrast to that of industrial countries, where there has been no

Figure 3.4. Fiscal Balances in Emerging Market Economies[1]

(Percent of GDP)

Primary balances have weakened slightly since the mid-1990s, except in the Middle East and Africa.



Source: IMF staff estimates.
[1]Unweighted averages. Only countries for which continuous data are available are included.

40 percent of GNP in only 17 percent of cases. For the calculations reported here, the default data are taken from Standard & Poor's (2002b) and refer to default events on both external and domestic government debt. Default episodes were matched with available data on total public debt to generate the 38 defaults that underlie the chart. Periods of severe fiscal stress that do not result in default are not captured.

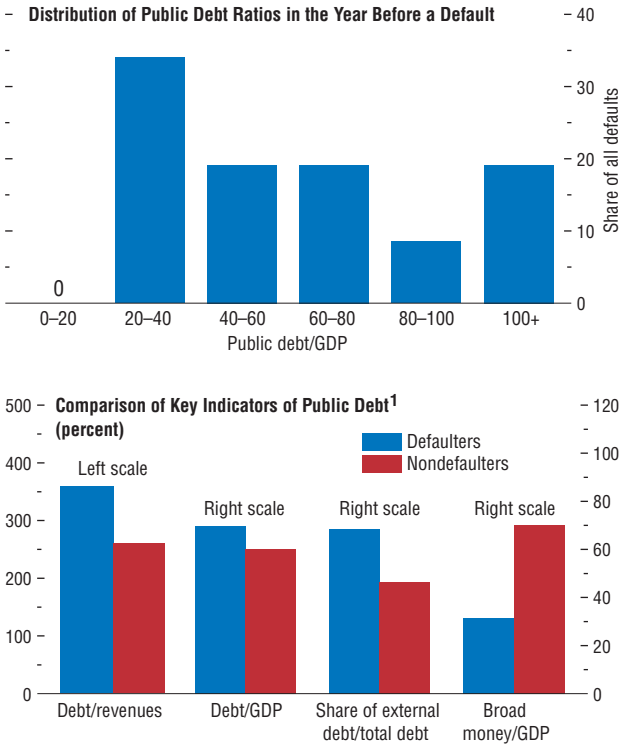
[8]See the May 2001 *World Economic Outlook*.

[9]Hemming, Kell, and Schimmelpfennig (2003) provide a detailed analysis of the role of fiscal policy in 11 recent crisis episodes in emerging market economies.

[10]There may of course be other differences between the defaulters and nondefaulters. In particular, differences in the maturity structure of the debt may also have played a role. Data limitations, however, precluded examining this issue in this chapter.

Figure 3.5. Debt Default and Public Debt Ratios

Public debt ratios are often quite low at the time of a default. There are, however, noticeable differences between defaulters and nondefaulters.



Source: IMF staff estimates.
[1]Data are an average of 1998–2002. Defaulters refer to countries that have defaulted since 1998.

explicit public debt default since World War II (although inflation in many industrial countries has eroded the real value of debt, particularly during the 1970s). These differences in default history have led to the view that because of the characteristics of emerging market economies—including their inherent volatility, weaker institutions, and poor credit history—the level of public debt that they can sustain is much lower than for industrial countries (see Reinhart, Rogoff, and Savastano, 2003, and IMF, 2002).

Certainly, there are a number of features of the fiscal structure in emerging market economies that have an important bearing on the level of public debt that they can sustain. These include the following.

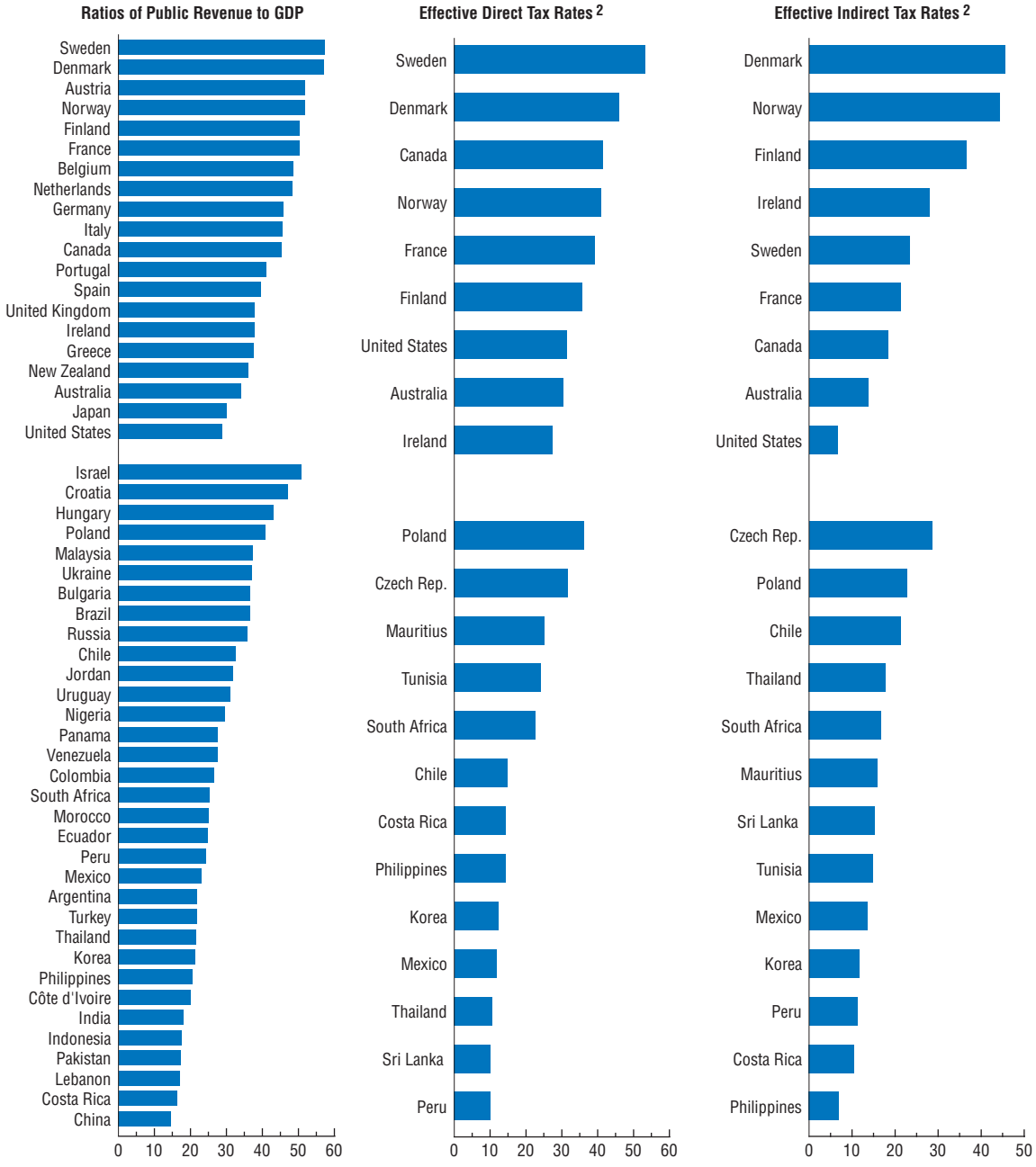
- *Revenue ratios in emerging market economies are low.* On average, the revenue-to-GDP ratio is about 27 percent of GDP, compared with 44 percent of GDP in industrial countries (Figure 3.6). There are, however, considerable differences among emerging market economies, with, for example, many of the transition economies and Israel having ratios on par with industrial countries. Effective tax rates in emerging market economies are generally much lower than in industrial countries.[11] The difference is particularly striking for direct tax rates, where industrial countries generally have effective direct tax rates of 30 percent or more and emerging markets outside eastern Europe, often only about 10 percent. This low effective tax rate is the result of inefficient tax systems, significant tax

[11]Estimates of effective direct and indirect tax rates were computed for a subset of industrial and emerging market economies for which data were available. Data were taken from the United Nations *National Accounts Statistics* and the IMF's *Government Finance Statistics*, and the calculations use a simplified version of the methodology proposed by Mendoza, Razin, and Tesar (1994). The length of the sample varied across countries depending on data availability. The effective direct tax rate was calculated as the ratio of total tax and nontax revenue net of domestic taxes on goods and services divided by the sum of compensation to employees and total operating surplus. The effective indirect tax rate was calculated as the ratio of all domestic taxes on goods and services divided by private consumption.

Figure 3.6. Revenue Ratios and Effective Tax Rates in Emerging Market and Industrial Economies[1]

(Percent)

Emerging market economies generally have lower revenue ratios and effective tax rates than industrial countries.



Source: IMF staff estimates.

[1]Calculations for the ratios of public revenue to GDP are generally for 1990–2002. Data for emerging market economies are on a nonfinancial public sector basis where available; otherwise, data are on the broadest basis available. For industrial countries, data are for the general government. Effective tax rate calculations are for country-specific periods for which detailed tax and national account data are available.

[2]To generate a larger sample of countries, Czech Republic, Sri Lanka, Mauritius, and Tunisia—which have detailed tax and national accounts data available—were included in the calculations.

exemptions, and a large informal sector. The difference in effective indirect tax rates between industrial and emerging market economies is also noticeable.

- *Revenues are volatile in emerging market economies.* The volatility of revenues—measured by the coefficient of variation—in emerging market economies is generally much higher than in industrial countries, although there are exceptions (Figure 3.7). This is partly due to the greater underlying volatility of the economy; income, consumption, and the terms of trade (which are often driven by the prices of a few commodities) are more volatile in emerging markets (see Kose, Prasad, and Terrones, 2003).[12] There is also a considerable difference in the volatility of effective tax rates (measured by the coefficient of variation).
- *Interest costs account for a high proportion of government expenditure in emerging market economies and are volatile.* At 5 percent of GDP, interest expenditures are almost twice as high in emerging market economies as in industrial countries, and account for an average of about 17 percent of expenditures (compared with 10 percent in industrial countries). Interest expenditures are also more volatile in emerging markets because of the structure of public debt. With a large proportion of debt either external or denominated in foreign currency, and revenues in domestic currency, high exchange rate volatility can result in large spikes in interest (and principal) payments relative to government income. Further, domestic debt is often of a short maturity, so interest costs are more sensitive to changes in the domestic interest rate environment.

These differences in the budget and public debt structures between emerging and industrial countries are striking and, as will be discussed in the next section, they have important implications for debt sustainability.

Assessing the Sustainability of Public Debt in Emerging Market Economies

Before proceeding, it is first necessary to define the related concepts of government solvency and public debt sustainability. A government is said to be solvent if it is expected to be able to generate sufficient future primary budget surpluses to be able to repay its outstanding debt (in more technical terms, the present discounted value of future primary fiscal surpluses must be at least equal to the value of the existing stock of public debt).[13] This criterion, however, is not very practical or demanding because, for example, it would permit a government to run large primary deficits for a period of time if it could commit to running primary surpluses of a sufficient size thereafter and so satisfy the solvency condition. In reality, a government cannot commit to such action—running large primary surpluses for a long period of time would be costly and politically very difficult.

So solvency needs to be viewed in relation to a fiscal adjustment path that is both economically and politically feasible, and a given debt level is usually thought of as being sustainable if it implies that the government's budget constraint (in present value terms) is satisfied without an unrealistically large future correction in the primary balance (see IMF, 2002). Liquidity conditions are also important. Even if a government satisfies its present value budget constraint, it may not have sufficient assets and financing available to meet or roll over its maturing liabilities. Unfortunately, there is no simple rule for determining whether, in practice, a government's debt is sustainable or not.[14] This section therefore

[12]The impact of commodity prices and commodity exports on government revenues is important even for those emerging market economies that have diversified their exports away from primary commodities. In Mexico, for example, oil exports are less than 15 percent of total exports, but oil-related revenues still account for about one-third of public sector revenue. Regression results reported in Appendix 3.1 confirm the importance of commodity price developments for the primary budget balance in emerging market economies.

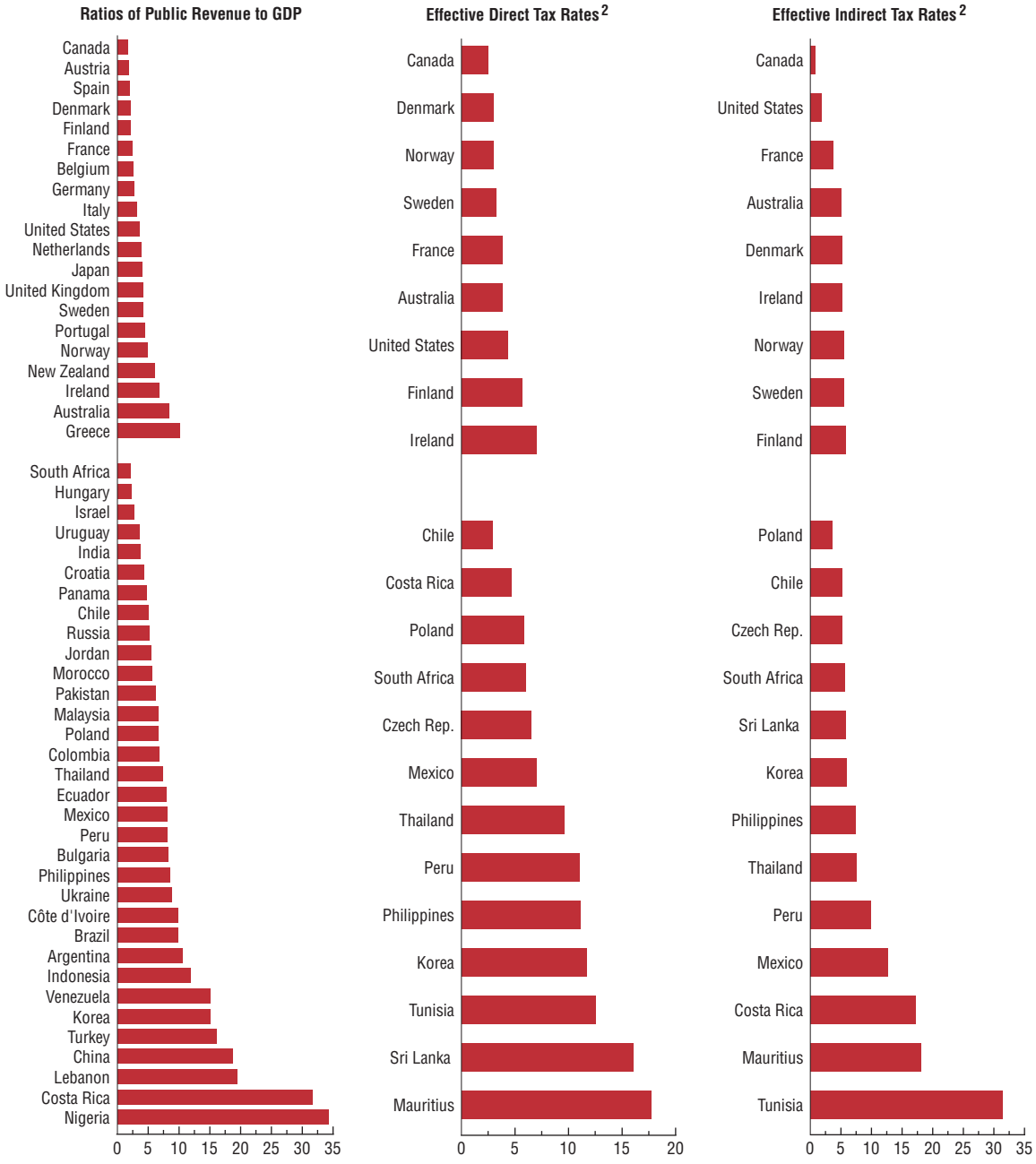
[13]Appendix 3.1 shows why the government's primary fiscal balance, rather than the overall fiscal balance, is the key for the analysis of public debt sustainability.

[14]See Chalk and Hemming (2000) for a survey of methods for assessing fiscal sustainability.

Figure 3.7. Volatility of Revenues and Effective Tax Rates in Emerging Market and Industrial Economies[1]

(Coefficient of variation)

Emerging market economies generally have more volatile revenue ratios and effective tax rates than industrial countries.



Source: IMF staff estimates.

[1]Calculations for the ratios of public revenue to GDP are generally for 1990–2002. Data for emerging market economies are on a nonfinancial public sector basis where available; otherwise, data are on the broadest basis available. For industrial countries, data are for the general government. Effective tax rate calculations are for country-specific periods for which detailed tax and national account data are available.

[2]To generate a larger sample of countries, Czech Republic, Sri Lanka, Mauritius, and Tunisia—which have detailed tax and national accounts data available—were included in the calculations.

applies a number of different approaches that have been developed in the economics literature to look at the issue of public debt sustainability in emerging market economies, and how the situation compares with industrial countries. The aim of the analysis is to look at trends across a broad range of countries, rather than to focus on the situation in any one country.

It should be noted up front that the following analysis does not take account of the risks that governments face from contingent and other off-balance-sheet liabilities. This is because of the difficulties in compiling cross-country data on such liabilities. The recent experience in many countries, however, has shown that the recognition of contingent or implicit liabilities—particularly those associated with the recapitalization of financial sectors—can add significantly to public debt, and in some cases push a situation that had previously appeared to be sustainable into one that is clearly not. Box 3.2 provides a discussion of the main contingent and other off-budget liabilities that are faced by governments in emerging and industrial countries, and the risks that these may present to the fiscal outlook. IMF (2003) also discusses contingent liabilities and public debt sustainability.

A Simple Approach to Public Debt Sustainability

Methods for assessing public debt sustainability usually start from the basic accounting identity that links public sector revenues and expenditures to the change in the debt stock. One commonly used approach is to view fiscal policy as sustainable if it delivers a ratio of public debt to GDP that is stable, and then to calculate the primary budget balance that would achieve that (known as the "debt stabilizing primary balance").[15] If the actual primary balance is less than the debt stabilizing balance, current fiscal policy implies an increasing ratio of public debt to GDP, and is therefore viewed as unsustainable. The difference between the actual and debt stabilizing primary balance indicates the degree of fiscal adjustment that is needed to achieve a constant debt-to-GDP ratio. A judgment can then be made as to whether such an adjustment is attainable in the political and economic environment of the country concerned.

Over the past few years, only a small number of emerging market economies (mainly in Asia) appear to have been running primary budget surpluses consistent with what is required to stabilize or reduce the ratio of public debt to GDP (Figure 3.8).[16] For others—particularly countries in Latin America—there has been a significant difference between the actual and debt stabilizing primary balance. Of course, a number of emerging market economies have recently made considerable efforts to increase their primary fiscal surpluses, and such actions, if sustained, could address such sustainability concerns. Further, were growth to be stronger or real interest rates lower than in the past, a smaller primary surplus would be needed to stabilize the debt ratio. Among the industrial countries, only Japan has had a large gap between its actual and debt stabilizing primary balance in recent years.

While these types of indicators of debt sustainability are useful because they are quite simple to construct and have a straightforward interpretation, their drawback is that they are based on an arbitrary definition of sustainability (i.e., stabilize the debt-to-GDP ratio). Incurring temporarily high deficits and debt levels, however,

[15]See Buiter (1985), Blanchard (1990), and Blanchard and others (1990). This method is based on long-run, perfect foresight considerations that transform the government's budget constraint into an equation that maps the long-run primary fiscal balance as a share of GDP into a "sustainable" debt-to-GDP ratio that remains constant over time. The debt stabilizing primary balance depends on the debt-to-GDP ratio, the real growth rate, and the real interest rate on government debt. The real interest rate on debt is in practice difficult to measure accurately, and requires, among other factors, a breakdown of debt and interest payments into local and foreign currency that is not always available. Here, an emerging market country's real interest rate is taken as the U.S. long-term real interest rate plus its average EMBI spread. For industrial countries, the real 10-year bond yield is used.

[16]The figure is based on the average primary balance and ratio of public debt to GDP for 2000–02, the average real interest rate for 1998–2002, and the average real growth rate for 1990–2002 (1997–2002 for transition economies).

may be appropriate in some circumstances, and it is certainly unlikely that a country should try and maintain a stable debt-to-GDP ratio at all times. Further, it may be of little practical policy use to know what is needed to stabilize the debt ratio when it is already at a high level and leaves a country vulnerable to shocks, such as a sudden stop in capital flows.

How Does Fiscal Policy Respond to Public Debt Accumulation?

A more flexible approach to assessing debt sustainability is to look at it within the context of the broader objectives and constraints of the fiscal policy decision-making process. One way to do this is to look at the relationship between fiscal policy instruments (the variables deemed to reflect the actions of policymakers) and the objectives of fiscal policy (such as stabilizing output fluctuations and maintaining debt sustainability). Such "reaction functions" or "policy rules" are well established in the analysis of monetary policy, but they are much less developed in studies of fiscal policy, and to date have not been applied to emerging market economies.[17]

Fiscal policy reaction functions were separately estimated for both industrial and emerging market economies, with the primary fiscal balance being considered the key operating target of the fiscal authorities. The primary fiscal balance is assumed to respond to public debt, but it is also affected by temporary factors such as the level of economic activity.[18] Within this

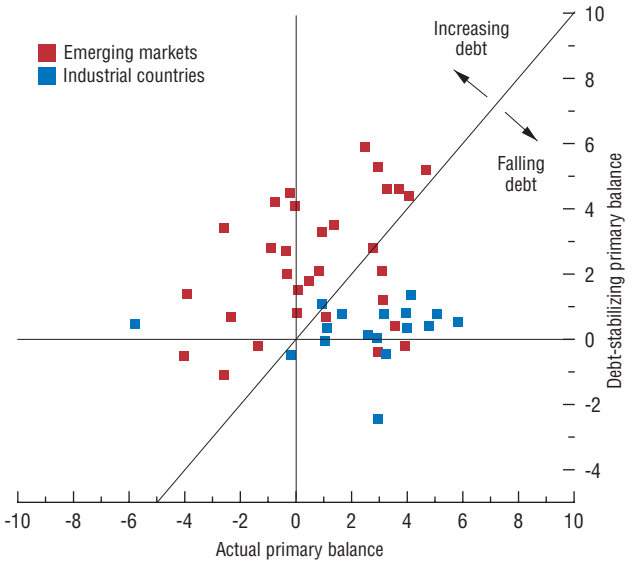
[17]Such fiscal policy studies for industrial countries include Bohn (1998) for the United States; Mélitz (1997) for OECD countries; Debrun and Wyplosz (1999) for euro area countries; and Gali and Perotti (2003) for European countries. Favero (2002) makes joint estimates of monetary and fiscal policy rules.

[18]For emerging market economies, four temporary factors that affect the primary balance were considered (all of which were found to significantly affect the primary surplus in the estimated fiscal policy reaction function): the business cycle, inflation, commodity prices, and debt restructuring or default. For industrial economies, the temporary factors considered were limited to the business cycle and inflation. Appendix 3.1 contains details of the sample selection and econometric methodology used in this section.

Figure 3.8. Emerging Market and Industrial Economies: Actual and Debt Stabilizing Primary Balances[1]

(Percent of GDP)

Primary balances in many emerging market economies have fallen short of what has been needed to stabilize the public debt ratio in recent years. This stands in contrast to most industrial countries.



Source: IMF staff estimates.

[1]Calculated using the average primary surplus and public debt during 2000–02, the average real interest rate during 1998–2002, and the average real growth rate during 1990–2002 (1997–2002 for transition countries).

Box 3.2. Fiscal Risk: Contingent Liabilities and Demographics

Conventional approaches to fiscal sustainability, such as those discussed in the main text, focus on obligations *explicitly* recognized as liabilities in the budgetary system—that is, in practice, the total public debt and the financing of present expenditures. These, however, make up only a fraction of a government's potential obligations. As has been clearly illustrated in recent years, the recognition of *off-budget* obligations can significantly alter a government's debt position. Therefore, sustainability analysis needs to pay due attention to the government's off-budget obligations, which consist of two main categories.

- First, governments face a moral or *implicit* commitment to provide public goods and services in the future.[1] These depend on a series of interrelated factors such as future potential growth, demography, and specific pressures on health expenditures, such as those related to HIV-AIDS.
- Second, governments face obligations that will only come due if a specific event occurs.[2] These *contingent* liabilities may be the result of contractual or legal commitments such as loan guarantees and state insurance schemes, or stem from implicit understandings that, for example, the government should provide relief in the event of natural disasters, that it should honor the financial commitments of institutions involved in quasi-fiscal activities, and that it should intervene beyond its explicit obligations under deposit insurance or other guarantees if the stability of the financial system is at risk.

Estimating off-budget items is subject to considerable uncertainty both because of the notorious unreliability of long-run projections and because of the very nature of contingent liabilities. As a consequence, implicit and contingent liabilities are generally interpreted as a source of risk affecting the "core" fiscal outlook resulting from conventional debt sustainability analysis. Of course, that fiscal risk comes in addition to the impact of macroeconomic risk—also discussed extensively in the main text. In recent years, events in a number of countries indicate that these two sources of risk can combine to produce full-blown financial and fiscal crises.

Among the many potential sources of fiscal risk, obligations related to adverse demographic trends—mainly population aging, but also the impact of HIV-AIDS on life expectancy in a number of developing countries—and implicit contingent liabilities—mainly associated with the preservation of financial system stability—stand out as the greatest threats to fiscal sustainability in both industrial and emerging market economies.

Impact of Aging

The consequences of population aging for fiscal sustainability are particularly significant in industrial economies, where demographic pressures combine with extensive social security systems. The problem is especially acute when pay-as-you-go (unfunded) pension systems and public health insurance prevail. A recent study by the European Commission (forthcoming) concluded that by 2050, age-related increases in pension and health care outlays would range between 2.6 percent of GDP in the United Kingdom and 11.8 percent of GDP in Greece, bearing "clear risks" to fiscal sustainability in at least six member states of the European Union. Other studies attempt to estimate the broad

Note: The main author of this box is Xavier Debrun. A recent and comprehensive coverage of fiscal risk can be found in Polackova Brixi and Schick (2002).

[1]If these implicit obligations exceed the future revenues implied by current tax policy (in net present value terms), the current policy amounts to shifting the payment of the government's bills to future generations. In a context of population aging, such intergenerational transfers raise particularly difficult issues—not discussed here—and have recently attracted a lot of attention (see Auerbach, Kotlikoff, and Leibfritz, 1999).

[2]Guidance on accounting treatment and disclosure of various kinds of contingent liabilities is provided in the *International Public Sector Accounting Standard* (IPSAS), paragraph 19, as released by the International Federation of Accountants in October 2002, and in paragraphs 62–66 of the IMF's *Manual on Fiscal Transparency*.

stock of implicit liabilities that would be implied by a continuation of current tax and expenditure policies, including unfunded pension liabilities and age-related increases in expenditures. For example, in a comparative analysis of 19 OECD countries, Frederiksen (2001) found that the stock of net implicit government liabilities varied between 84 percent of GDP in the United Kingdom and almost 400 percent of GDP in Spain, well above the respective public debt stocks in those countries. Such estimates are inevitably imprecise, and much higher numbers can be found elsewhere in the literature.

Implicit Contingent Liabilities

Although much harder to measure, contingent liabilities also constitute a significant risk to the fiscal outlook, with the implicit guarantees extended to the financial system and large nonfinancial enterprises being the most important sources of such liabilities. In recent years, a string of banking crises have dramatically illustrated the vulnerability of the fiscal position to contingent liabilities. Emerging market economies were particularly exposed, with an average estimated fiscal cost of almost 20 percent of GDP being incurred; in some cases this cost exceeded 50 percent of GDP (for example, Indonesia at the end of the 1990s). The realization of obligations vis-à-vis the financial sector has also affected industrial economies, although the average fiscal impact of banking crises has generally been much smaller than in emerging markets.

Today, a number of countries remain highly exposed to contingent financial sector obligations. Despite their inevitable imprecision, estimated ranges of financial sector liabilities suggest potentially very large fiscal costs in some countries in the event of future banking crises. For example, across a sample of 80 industrial and emerging market economies, Standard & Poor's (2002a) most conservative estimates of these liabilities range from 3 percent of GDP (Mexico) to 64 percent of GDP (China).

How to Deal With Fiscal Risk?

Contingent liabilities and the growing pressures on expenditures from population aging present significant fiscal risks in many countries. Consequently, it is essential for fiscal decision makers—and for those to whom they are accountable—to be fully aware of these risks and the alternative fiscal strategies that may be needed to deal with them. Awareness implies the need for realistic long-run projections—an aspect especially important for countries facing large age-related obligations—and the complete disclosure of explicit contingent liabilities.[3] Budget documents should also provide a detailed discussion of the risks such liabilities imply for fiscal sustainability. A better grasp of fiscal risk, as well as greater public awareness about it, would encourage governments to adopt more prudent fiscal policies, including lower medium-term public debt objectives (which require structurally stronger fiscal positions in the short to medium run), provisions for impending expenditure shocks, and, last but not least, reforms of pension systems, social security, and other entitlements. Along with measures to make labor and product markets more competitive, those reforms would also help boost productivity (see the April 2003 *World Economic Outlook*), with direct feedback effects on the speed and the credibility of the fiscal consolidation process.

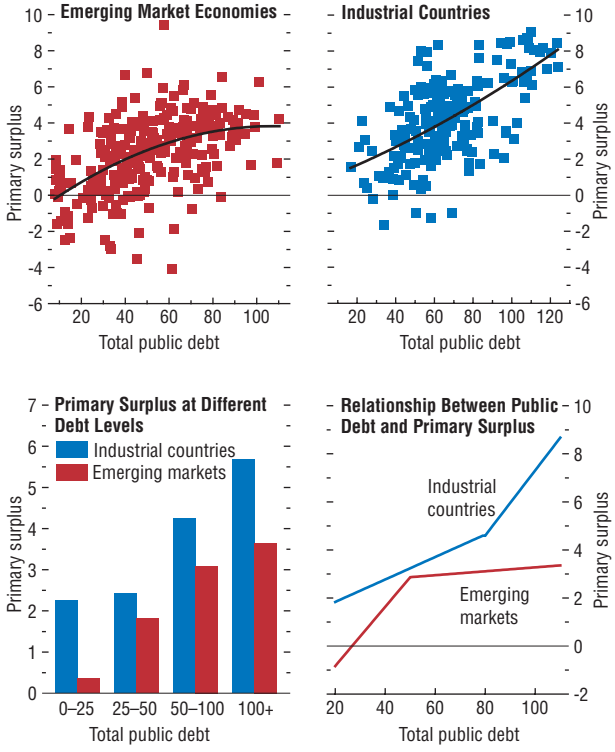
[3]It is understandably difficult to disclose implicit liabilities, if only because of the moral hazard problem such disclosure might create.

framework, the connection between policy actions and long-run debt sustainability—the key issue of interest here—lies in the fact that a positive response of the primary balance to public debt generally implies the consistency of fiscal policy with long-run solvency (see Bohn, 1998, for a formal demonstration, and Appendix 3.1). As discussed earlier, however, long-run solvency (satisfying the present-value budget constraint) is a relatively undemanding criterion as it only

Figure 3.9 Relationship Between Public Debt and the Primary Balance[1]

(Percent of GDP; 1990–2002)

Primary surpluses respond much more strongly to debt in industrial countries than in emerging market economies. Indeed, fiscal policy in emerging market economies stops responding to an increase in public debt when debt is above 50 percent of GDP. This stands in contrast to industrial countries, where fiscal policy responds more aggressively when debt is above 80 percent of GDP.



Source: IMF staff estimates.
[1]Primary balance adjusted for the impact of transitory shocks.

requires a commitment to adjust policy in the (possibly distant) future.

Two conclusions follow from examining the link between the adjusted primary balance (i.e., after the impact of temporary factors has been accounted for) and public debt.[19] First, emerging market economies as a group exhibit a lower average adjusted primary balance than industrial countries at any level of public debt (Figure 3.9). Second, the response of the primary surplus weakens as the debt-to-GDP ratio rises in emerging market economies, and this response stops altogether when debt exceeds 50 percent of GDP. This suggests that—on average—the conduct of fiscal policy in emerging market economies is not consistent with ensuring sustainability once public debt exceeds a threshold of 50 percent of GDP. In contrast, industrial countries respond strongly to rising debt when debt is at a high level. Indeed, when debt is above 80 percent of GDP, the estimated adjustment in the primary surplus is almost three times as large as that at lower debt levels. These estimates of course are for a large sample of emerging and industrial countries, and the reported results are an average for each sample. Therefore, this behavior is not true for every country in either the emerging market or industrial country group; some emerging market economies have acted quite strongly to maintain a sustainable debt position.

The analysis also indicates clear differences between emerging market and industrial countries in terms of the cyclicality of fiscal policy (Figure 3.10). While a 1 percentage point improvement in the output gap is estimated to result in an average improvement in the primary balance of only 0.04 percentage point of GDP in Latin America and 0.23 percentage point of GDP in non–Latin American emerging markets, it leads to a 0.87 percentage point of

[19]The figures and econometric results discussed in this section refer to the association between the primary surplus adjusted for the influence of temporary factors (as a percent of GDP) and the ratio of public debt to GDP observed at the end of the preceding year.

GDP improvement in industrial countries.[20] These differences are primarily driven by the behavior of expenditures, which, as a percent of GDP, are unreactive to cyclical fluctuations in emerging markets (in Latin American countries, expenditures actually appear to be slightly procyclical). In cyclical upswings, outlays expand at the same pace as economic activity (or faster in Latin America), but when economic growth weakens, revenues decline and lending conditions tighten, and outlays fall.[21] This behavior contrasts to that in industrial countries, where expenditures increase by less than economic growth in an upturn and fall by less than activity in a downturn, thus exerting a stabilizing influence on the economy. This behavior likely reflects the significant automatic stabilizers at work through the extensive social security systems in industrial countries, giving to government expenditure an insurance role against macroeconomic volatility (see Rodrik, 1998, and Fatàs and Mihov, forthcoming). Interestingly, better institutional quality is found to be associated with a more countercyclical policy in emerging market economies, suggesting that the ability to control expenditures (and raise revenues) is less of a problem in countries with better institutions (see Appendix 3.1).

These results are suggestive of a link between debt sustainability and the short-term conduct of fiscal policy. Because their behavior indicates a strong commitment to debt sustainability, industrial countries can run countercyclical fiscal policies without lenders becoming concerned about sustainability issues. In many emerging market economies, however, the ability to adjust fiscal

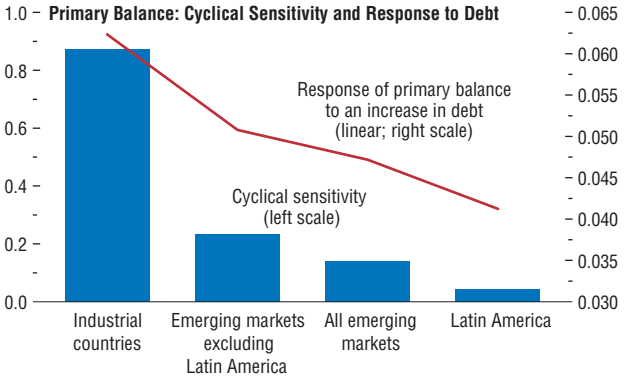
[20]A number of other studies have found evidence of procyclical fiscal policies. For example, Talvi and Végh (2000) argue that fiscal policy is procyclical in most countries outside the G-7, while the April 2002 *World Economic Outlook* found that fiscal policy was procyclical in a number of Latin American countries.

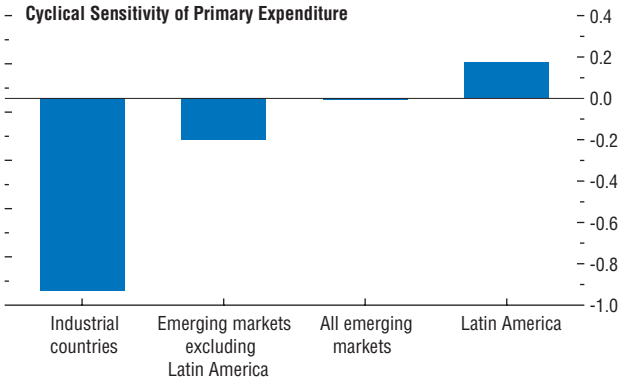
[21]Procyclical fiscal policy in Latin America has implications for social spending and the poor. Braun and Di Grescia (2003) find that social spending in the region is procyclical (although less so than total government spending), and that in crisis situations governments often reduce social spending, which adversely affects the poor.

Figure 3.10. Emerging Market and Industrial Economies: Sensitivity of Fiscal Policy to the Business Cycle[1]

(Percent of GDP; 1990–2002)

Fiscal policy is much more countercyclical in industrial countries than in emerging market economies. Most of the cyclical sensitivity of the primary balance is due to the cyclical response of primary expenditure.





Source: IMF staff estimates.
[1]Response, in percent of GDP, to a percentage point improvement in the output gap.

policy to maintain debt sustainability is often in doubt. Lenders therefore quickly become concerned when deficits widen, and the tight resource constraint forces governments to cut expenditures during a downturn, further adding to the economic weakness.

Do Governments in Emerging Market Economies Overborrow?

A third approach to assessing public debt sustainability is to see if a government is "overborrowing" in the sense of whether its debt stock exceeds the present discounted value of its expected future primary surpluses. To operationalize such a calculation, expected future primary balances are here approximated by the average primary balance achieved during the sample period, on the assumption that a government's fiscal policy track record is the best guide to what it can be expected to achieve in the future. A benchmark level of public debt (as a percent of GDP) is then calculated and compared with actual debt. The extent of over- or underborrowing is measured by the ratio of actual public debt to the benchmark level of debt, with a ratio greater than 1 suggesting that a government is overborrowing relative to what is justified by its fiscal policy track record.[22] The discount rate—the difference between the real interest rate and real output growth—is proxied by the difference between the real LIBOR interest rate plus a country-specific spread and the average real GDP growth.[23]

The benchmark debt-to-GDP ratio was calculated for 50 countries (14 industrial, 21 emerging market, and 15 developing) using data for the 1985–2002 period.[24] The median value of the ratio for industrial countries is estimated at 75 percent of GDP, three times higher than the 25 percent of GDP estimate for emerging market economies (Figure 3.11). Comparing the actual and benchmark public debt levels suggests that many emerging market economies have indeed been overborrowing as the typical (median) emerging market economy has a ratio of public debt to GDP that is 2½ times larger than its fiscal policy track record would suggest is warranted.[25] While this is lower than for the "other developing countries" group, it compares unfavorably with the typical industrial country, where the ratio is less than 1. There are differences, however, among emerging market regions. Asian countries have a similar ratio to industrial countries, while countries in Latin America and other regions have a ratio of 2½ and 6, respectively, suggesting significant overborrowing. Further, the typical emerging market economy with a default history has an overborrowing ratio of 3½, compared with a ratio of less than 1 for a nondefaulter. These results convey the same message as before: many emerging market economies need to generate larger primary surpluses than they have done in the past to be able to sustain their public debt levels.

The fact that many countries overborrow raises the question of whether there are any common features that help to explain this behavior. An econometric analysis suggests that

[22]This overborrowing ratio is closely related to the public debt sustainability measure discussed earlier, but it does not provide a quantitative estimate of the primary balance adjustment needed to stabilize the debt-to-GDP ratio. For a country that has undertaken significant fiscal reforms in recent years and is now achieving a higher sustained primary surplus than it has historically, the assumption that its past track record provides a good guide to future primary surpluses may of course not be valid.

[23]If future growth rates are expected to be higher, or real interest rates lower, than their historic average, this will affect the estimated overborrowing ratio. Because data on spreads are not available for the whole sample period or for all countries, the Institutional Investor rating—which is highly correlated with spreads—is used to derive a proxy (see Appendix 3.1).

[24]The calculation was not made for those countries where the average primary balance was negative or the discount factor was negative in the sample period.

[25]Because of a number of outliers, the mean overborrowing ratio for emerging market economies at 16 is much higher than the median.

the following policy variables are important determinants of overborrowing.[26]

- *Government revenues.* Governments with low revenues will often have difficulty meeting their desired expenditures from revenues, increasing the pressure on them to borrow. The econometric results suggest that an increase in emerging market economies' revenue ratio to the industrial country average would, other things remaining unchanged, reduce the overborrowing ratio by about 35 percent.
- *Trade openness.* Openness has a positive effect on economic growth, which helps mitigate the existing debt burden. Further, more open economies are able to generate the larger trade surpluses needed to service foreign debt after an exchange rate depreciation, and are therefore less likely to experience difficulties with external public debt.[27] The estimates suggest that reducing foreign exchange rate restrictions for current transactions—the proxy used here for trade openness—to industrial country levels would, other things remaining unchanged, reduce the overborrowing ratio in emerging markets by 60 percent.[28]
- *The quality of domestic institutions and the nature of the political system.* A number of studies have found a relationship between the quality of fiscal institutions—the rules and regulations by which budgets are constructed and implemented—and fiscal outcomes.[29] Further,

[26]Other factors not directly under the control of policymakers—macroeconomic volatility and relative (to the U.S.) per capita income—were also included in the regressions, as was an industrial country dummy variable (see Appendix 3.1 for details).

[27]On openness and economic growth, see the survey by Berg and Krueger (2003), and on openness and external debt difficulties, see Sachs (1985).

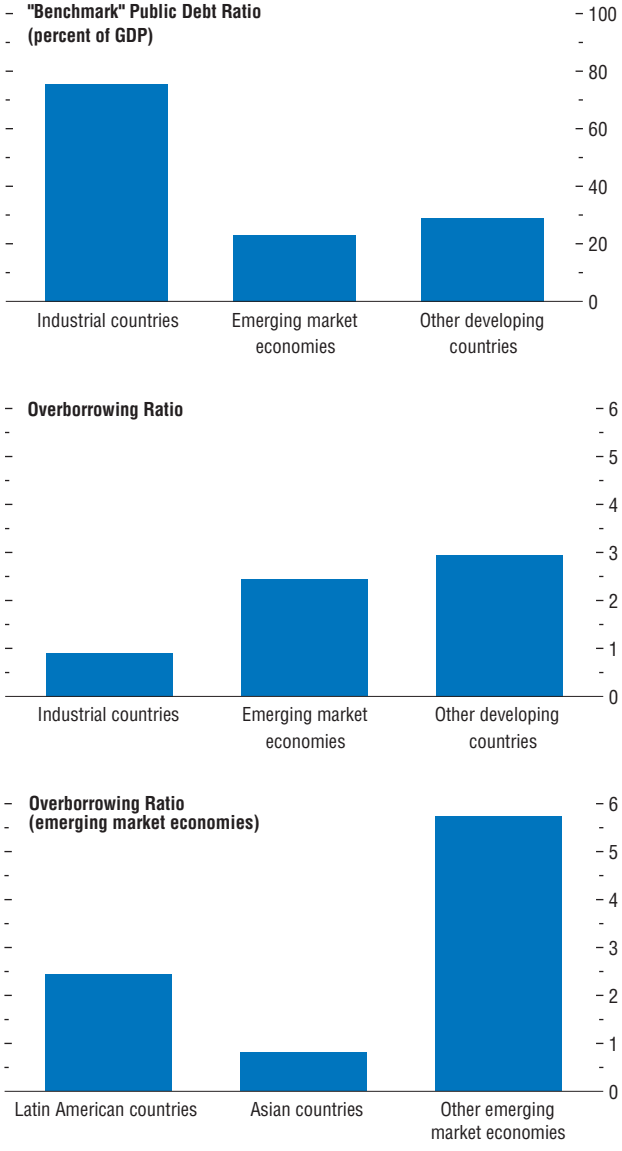
[28]The index of exchange rate restrictions for current transactions is used here because it is available for the countries during the full sample period of the analysis. The reported results, however, remain broadly unchanged when alternative measures of trade openness—such as that developed by Sachs and Warner (1995)—are used.

[29]See, for example, von Hagen (1992) and von Hagen and Harden (1995). Alesina and others (1998) find the nature of the budget process strongly influences fiscal outcomes in Latin America.

Figure 3.11. Do Governments in Emerging Market Economies Overborrow?

(Median values)

Governments in emerging market countries have a tendency to overborrow; however, there are important regional differences.



Source: IMF staff estimates.

good institutions are associated with stronger growth, which boosts revenues and eases the debt servicing burden.[30] On the other hand, political systems that deliver weak (minority or coalition) governments often delay fiscal adjustment and accumulate public debt based on short-term needs.[31] Simple correlations suggest that good institutions are associated with less overborrowing. In the econometric analysis, however, only the protection of property rights was found to be a significant explanatory variable, with the estimated coefficient suggesting that were the protection of property rights in emerging market economies to be raised to the level of industrial countries, the overborrowing ratio would be reduced by about 50 percent.

Uncertainty and Public Debt Sustainability

One of the problems with the three approaches to debt sustainability that have been discussed so far in this chapter is that they do not take account of the uncertainties that face governments in emerging market economies.[32] As outlined earlier, government revenues in emerging market economies are more variable than in industrial economies, and a government could find itself in a situation where it is faced with low revenues for an extended period of time because of, say, a collapse in the price of the country's primary commodity export. Further, emerging market governments also face considerable uncertainty from interest and exchange rate movements. There have recently been a number of attempts to incorporate such uncertainties into the analysis of public debt sustainability. One approach has been to apply the Value-at-Risk (VaR) methodology that is commonly used in the assessment of financial institution risk to look at the risks faced by the government—see Box 3.3 for a discussion of this methodology. A different approach has been to use economic models that incorporate uncertainty to derive estimates of sustainable public debt ratios (see Mendoza and Oviedo, 2003).

One way to look at the impact of uncertainty on public debt sustainability is to consider the case of a government that is credibly committed to servicing its debts in all circumstances. Such a government would need to take into account the fact that its future revenues—and consequently primary balance outcomes—are uncertain, and that it could be faced with the possibility of a long period of low revenues in the future. To be credibly committed to servicing its debt in all circumstances, the government cannot borrow more than the debt that it would be able to sustain with the primary balances that would occur with these low revenue outcomes.[33] This is not to say that the government could not borrow at all: if actual debt were below the maximum sustainable debt level, the government would be able to borrow until the threshold was reached, at which point it would need to reduce expenditures to maintain the credibility of its commitment.

The requirement that a government should only borrow up to the debt level that it could sustain in the face of a long period of low revenues may seem a stringent one. Emerging markets, however, have faced long periods of low revenue realizations in the past when the price of their main commodity export has fallen. For example, governments in oil-exporting countries faced this situation after the collapse of oil prices in the 1980s.[34] In such circumstances, the government is suddenly confronted with a debt stock that it had believed was sustainable when revenues

[30]See the April 2003 *World Economic Outlook* for an analysis of the relationship between growth and institutions.

[31]Alesina, Perotti, and Tavares (1998) find that coalition governments often have a harder time consolidating fiscal policy than do single party governments.

[32]See Gavin and others (1996) for an extensive discussion of the effects of volatility on fiscal policies in Latin America.

[33]Revenue volatility can also create liquidity problems even if long-run public debt is sustainable.

[34]Indeed, slumps in commodity prices—particularly oil—are generally quite long lasting. For example, Cashin, McDermott, and Scott (2002) find that slumps in commodity prices typically last for about three and a half years, with slumps in oil prices on average lasting over four years.

related to commodity exports were high, but which is not sustainable with the new reality of lower revenues from commodity exports.

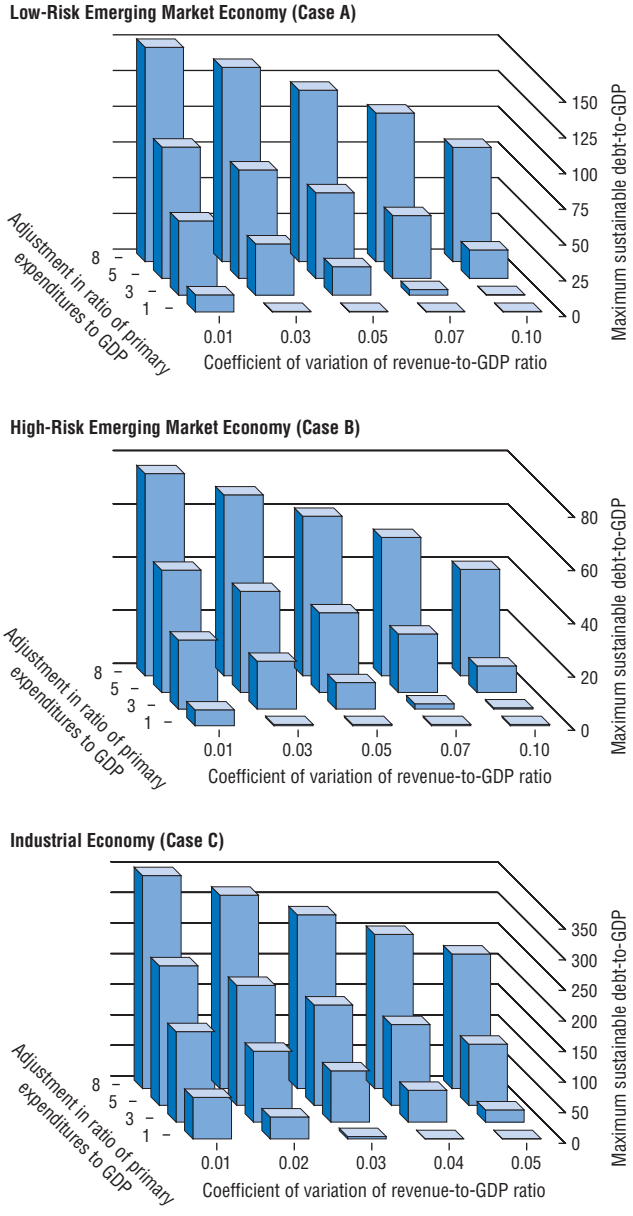
To implement these ideas, it is first necessary to determine what constitutes a low revenue outcome, and in such circumstances, what fiscal adjustment the government could make. Here, a low revenue outcome is characterized by a revenue-to-GDP ratio that is two standard deviations below the average level, and the range of primary expenditure reductions that emerging markets have made in the past is taken as an indication of the fiscal adjustment that a government could potentially achieve. Using these assumptions, Figure 3.12 shows the maximum sustainable public debt ratios for two "typical" emerging market economies and an industrial economy for different assumptions about the possible variability of their future revenues (measured by the coefficient of variation) and their commitment to adjust expenditures if a low revenue outcome occurs. In the calculations, both emerging market economies are assumed to have revenue and primary expenditure ratios of 20 percent of GDP on average—broadly the averages seen in non-European emerging markets—while one (a "low-risk" country—Case A) has a real interest rate on public debt that is 5 percentage points higher than its growth rate, and the other (a "high-risk" country—Case B) has a real interest rate that exceeds its growth rate by 10 percentage points.[35] The industrial country (Case C) has revenue and primary expenditure ratios of 40 percent of GDP on average, and a real interest rate that is 2.5 percentage points higher than its growth rate.

Looking at the first emerging market country example (Case A), the more stable its revenues—i.e., the smaller the coefficient of variation of the revenue ratio—the higher is the maximum ratio

[35]While these assumed differences between the real interest rate and the real growth rate may seem high, they are intended to capture a situation where a country has been hit by a shock and spreads have increased sharply and growth weakened.

Figure 3.12. Maximum Ratios of Sustainable Public Debt to GDP[1]

Countries with more variable tax revenues, less ability to adjust expenditures, and a larger difference between the real interest rate and the real growth rate are able to sustain lower public debt ratios.



Source: IMF staff estimates.
[1]Based on the Mendoza-Oviedo Model. Zeros indicate that the government can not sustain a positive debt-to-GDP ratio under these conditions.

Box 3.3. Assessing Fiscal Sustainability Under Uncertainty

Conventional approaches to assessing fiscal sustainability and vulnerability—such as scenario analysis or summary indicators—are subject to a number of weaknesses. Besides limitations in coverage (they usually focus only on debt, and therefore exclude a range of contingent assets and liabilities and other components of the public sector balance sheet), they do not adequately address the downside risk of adverse future economic and financial outcomes. Attempts to correct this deficiency—particularly critical for emerging market economies that typically face a volatile economic environment—have usually focused on sensitivity (or stress) tests with respect to arbitrary changes in selected variables.

A recent extension of the Value-at-Risk (VaR) methodology—which is commonly used in the assessment of financial institution risk—to the public sector balance sheet provides a more comprehensive assessment of a country's fiscal sustainability. In this approach, the fiscal risks that are faced by the government and the potential impact that these may have on its net worth position (assets minus liabilities, which are defined to include the present value of contingent assets and liabilities) can be explicitly modeled.[1] Among other things, such fiscal risks may include interest and exchange rate movements, commodity price changes, and output fluctuations. The VaR analysis assesses the effect that movements in such variables, and their co-movements—for example, between oil prices and exchange rates—have on a government's net worth position, and it summarizes the worst possible position that the government could be in after a given time period for a given level of confidence. Put a different way, the VaR presents a numerical estimate of the potential loss in net worth the government could face over a given period of time if a "worst-case" scenario were to develop.

The VaR analysis proceeds broadly as follows. The first step is to calculate the government's current net worth from its balance sheet. But this net worth position in the future is uncertain, and will be strongly affected by the outcomes of key variables that affect the value of the government's assets and liabilities. For example, in a country that is a large oil exporter, the value of the government's assets will be influenced by the future price of oil, which is uncertain. Likewise, the value of both assets and liabilities may be affected by future exchange rate movements. To capture these uncertainties, the possible future movements of the main risk variables that affect the balance sheet, and any co-movements between these variables, are estimated. Based on these estimates, an overall probability distribution of the government's net worth is calculated, and the overall risks to the government's balance sheet can then be assessed. For example, while the estimated net worth may currently be, say, 100 percent of GDP, the calculations may suggest that because of the risks the government faces there is a 5 percent chance that in one year its net worth will only be 60 percent of GDP. In this case, the government's "value-at-risk" is said to be 40 percent of GDP.

From the VaR analysis, the government can identify the factors that present the most significant risks to its net worth position, and the potential size of these risks. To the extent possible, it can then act to mitigate or limit these risks, while also pursuing other fiscal reforms that could strengthen its overall balance sheet position and make it more resilient to such shocks if they occur.

While in principle the VaR approach could be applied to any country, incorporating the specific behavioral and institutional features of that country, at present the absence of data on the public sector balance sheet in most emerging market countries precludes the widespread application of the technique. A stylized applica-

Note: The main authors of this box are George Kopits and Tim Callen.

[1]See Barnhill and Kopits (2003). In a similar spirit, IMF (2003) reports the results of a stochastic simulation exercise that looked at the probability distribution of future public debt outcomes for a sample of 41 emerging market countries.

tion of the VaR approach has, however, recently been conducted for Ecuador, a country where the necessary data are available (see Barnhill and Kopits, 2003). The results from this exercise, which are briefly discussed below, are broadly illustrative of some of the fiscal risks that many emerging market countries face, and should not be taken to imply that these risks are greater in Ecuador than elsewhere.

The VaR calculations—which were carried out on the balance sheet for the year 2000—suggest that the public sector in Ecuador faces a number of important fiscal risks. The government's net worth position was found to be vulnerable to shocks that could affect the present value of its future income from petroleum reserves, the profits of its state-owned enterprises, the net liabilities of the public pension system, and its external liabilities. The VaR analysis was also used to look at the relative importance of specific fiscal risks in Ecuador by separately assessing the potential impact of interest and exchange rate movements and oil prices on the government's net worth position. Interest rate volatility was found to be the single most important source of risk facing the government in Ecuador. If, hypothetically, the government was able to eliminate the interest rate risk it faced, it would significantly reduce the potential erosion in net worth that it could experience in a worst-case scenario. Exchange rate movements were also an important source of risk at the time, and Ecuador's move to dollarization—which was actually introduced in early 2000—consequently reduced the risks to the government's balance sheet. Finally, if oil prices—the only truly exogenous source of risk—had been hypothetically stabilized, this would also have limited the downside to net worth, but by less than eliminating interest or exchange rate risk.

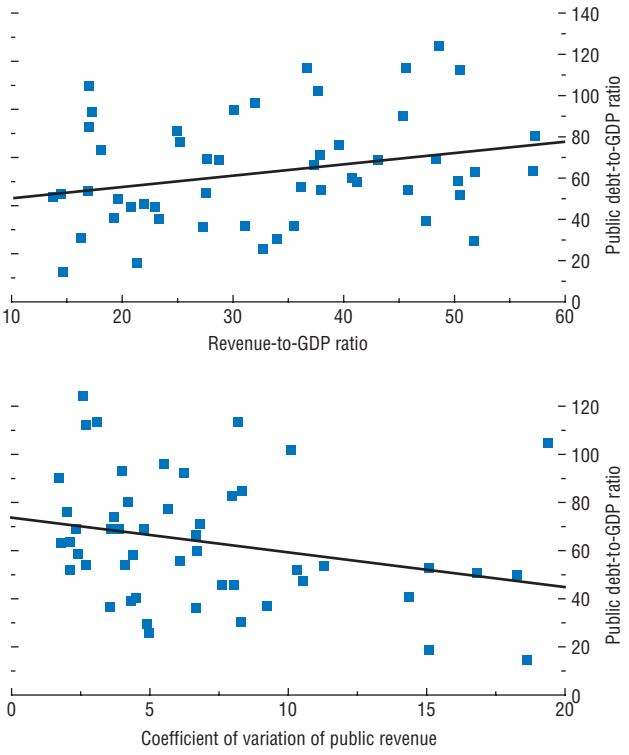
of sustainable public debt to GDP for any given level of expenditure adjustment that it can commit to. The rationale for this is that when the government is faced with a low revenue outcome, the actual revenue-to-GDP ratio will be higher, and consequently the primary surplus larger, than if the variability of revenues is greater. For example, if this country has a coefficient of variation on its revenue ratio of 5 percent and can commit to adjust primary expenditures by 5 percent of GDP, then its maximum sustainable public debt ratio is 60 percent of GDP. For the "high-risk" emerging market country (Case B) with similar revenue and expenditure characteristics, the maximum sustainable debt ratio is just 30 percent of GDP. But, if the coefficient of variation for this country is 7 percent, then the maximum debt level is only 22 percent of GDP. For the industrial country (Case C), the combination of a higher average revenue ratio, low revenue volatility, and a smaller difference between the real interest rate and the real growth rate means its maximum sustainable debt ratio is higher than for the emerging market economies even if it can only commit to a modest cut in expenditures. For example, with a commitment to cut primary expenditures by 3 percent of GDP and revenue volatility of 3 percent, the maximum sustainable debt ratio for the industrial country is about 85 percent of GDP.

These calculations illustrate the link between revenue generation capacity, revenue variability, and primary expenditure adjustment—all of which affect the primary balance—and debt sustainability. If a country has low and variable government revenues, it will be able to sustain a lower public debt level than a country with a higher and more stable revenue base. This means that the sustainable debt level may vary—potentially by a considerable amount—between countries (it will also depend on real interest rates and growth). The implication is that differences in sustainable debt levels can be expected not only between industrial and emerging market economies, but also among emerging market

economies themselves. For example, India—which has relatively stable government revenues—could be expected to sustain a higher debt level than Venezuela, where revenues are much more variable. (Of course, there may also be other reasons why India could sustain a higher public debt ratio, including the maturity profile and interest costs of the debt, the size of the domestic bond market, and its relatively strong growth rate.) Indeed, countries with higher average revenue ratios and lower revenue variability do in general have higher public debt ratios (Figure 3.13). Because revenue variability has important implications for debt sustainability, proposals have been made to create debt instruments that could help cushion emerging markets from changing economic conditions (Box 3.4).

Figure 3.13. Ratios of Revenue and Public Debt to GDP

Countries with higher and less volatile revenue ratios tend to have higher public debt levels.



Source: IMF staff estimates.

Can Governments in Emerging Markets Economies Sustain Their Current Debt Levels?

A common theme running through the results presented in this section is that historically many emerging market economies have not generated large enough primary budget surpluses to ensure the sustainability of their public debt. This stands in contrast to industrial countries. This inability to generate adequate primary surpluses is both a function of weak revenue bases (which generally have low yields and are volatile) and an inability to control expenditures during economic upswings (this appears to be particularly important in Latin America). These factors suggest that emerging market economies can generally sustain lower public debt ratios than industrial countries. Although this sustainable debt level will certainly vary—and potentially by a considerable amount—the calculations based on past fiscal performance suggest that for the typical emerging market economy it is quite low. Of course, industrial countries face considerable pressures from population aging going forward, so this analysis should not be taken as suggesting that public debt levels in these countries are currently at a comfortable level.

How Can High Public Debt Levels Be Reduced?

If governments face high public debt levels, what can they do to reduce them? Governments have a number of potential policy options available to them to reduce their debt: (1) they can adjust fiscal policy and run primary budget surpluses sufficient to reduce the debt; (2) they can seek to grow or inflate their way out of their debt difficulties; (3) they can sell assets to retire debt; or (4) they can explicitly default on the debt.

While reducing the public debt ratio through strong economic growth would generally be a government's preferred option, growth is beyond the direct control of the government. Of course, the government can play an important role by creating an environment conducive to growth through the implementation of sound macroeconomic and structural policies (including by not accumulating excess debt that could adversely affect private sector activity).[36] The other options each have advantages and disadvantages. Reducing public debt by running primary budget surpluses, for example, maintains the fiscal credibility of the government, but is often difficult politically—particularly if high primary surpluses need to be maintained for any length of time—and may involve decisions that, at least in the short run, have a detrimental effect on activity.[37] An explicit default or high inflation provide ways of reducing debt without having to run larger primary surpluses, but they both entail costs. If it defaults, a government is likely to suffer a loss of reputation that could prevent or limit its future borrowing, and hence constrain its future fiscal policy options, while high inflation has significant negative effects on economic activity and welfare.[38] Finally, a policy of selling government assets is only likely to be successful in reducing debt if accompanied by responsible fiscal policy (so the proceeds are not simply spent), and the policy does not change the underlying net worth position of the government although it reduces debt.

To examine how large public sector debt reductions have occurred in practice, data for 79 industrial, emerging market, and other developing countries for the period 1970–2002 were used, and a sample of large public debt reductions was constructed as follows. Cases were identified where public debt was reduced over a three-year period, and then the top 15 percent of these episodes (in terms of the size of the debt reduction, which in the sample corresponded to a drop in public debt of at least 18 percent of GDP) were chosen. Lastly, cases in which the debt stock at the end of the three-year

[36]A simple correlation between public debt and growth in emerging market economies since 1990 shows a clear negative relationship. More formally, Pattillo, Poirson, and Ricci (2002) find that external debt begins to have a negative effect on growth once it exceeds 35–40 percent of GDP.

[37]Assessing the impact of fiscal consolidation on economic activity is not straightforward. While most evidence points to the conclusion that fiscal multipliers are positive—i.e., that a fiscal consolidation will have a negative impact on growth in the short run—this appears not always to be the case (see Hemming, Kell, and Mahfouz, 2002). Recent studies in advanced countries have shown that if fiscal consolidation is mainly achieved through a reduction in current spending it may be expansionary (see Alesina, Perotti, and Tavares, 1998). For emerging market economies where there is a public debt sustainability problem and the risk premia on interest rates are high, a credible fiscal consolidation could result in a large fall in interest rates, spurring private activity and more than offsetting the withdrawal of fiscal stimulus. Hemming and Ter-Minassian (2003) discuss the impact of fiscal tightening during crisis episodes.

[38]The costs of an explicit default and/or high inflation are difficult to measure. For an extensive discussion of reputation and sovereign debt, see Obstfeld and Rogoff (1996) and the references therein. A default affects a country's access to capital markets, its borrowing costs, and its trade relations with its debtors. Empirical evidence on the size of the costs of default, however, is mixed. For example, Lindert and Morton (1989) argue that investors pay little attention to the past repayment record of a borrowing government. Özler (1993), however, finds that countries with default histories faced higher commercial bank interest rates in the 1970s. In terms of costs through the trade channel, Rose (2002) finds that a sovereign debt default is associated with a decline in bilateral trade between a debtor and its creditors of about 8 percent a year and this persists for about fifteen years. With regard to the costs of high inflation, Lucas (2003) estimates that the gains from eliminating an inflation rate of 200 percent—a level observed in many Latin American countries during the 1980s—are in excess of 5 percent of income in the long run.

Box 3.4. The Case for Growth-Indexed Bonds

Highly leveraged emerging market economies are heavily exposed to volatility in economic conditions, resulting in increased risk of financial distress and even debt crises. Debt instruments with repayments linked to key macroeconomic variables could help cushion emerging markets from unexpected changes in economic conditions. In particular, the idea of creating bonds indexed to GDP—or, equivalently, GDP growth—has recently regained attention (see Borensztein and Mauro, 2002).

Growth-indexed bonds could work as follows. Consider a country whose real GDP has been growing for many years at 3 percent, and is expected to continue doing so. Assume that this country can issue regular bonds at 7 percent interest. That country could contemplate issuing growth-indexed bonds whose yearly coupon payments will be increased by, for example, 1 percentage point for every percentage point by which GDP growth exceeds its 3 percent trend, with a symmetric reduction in the coupon rate when growth falls short of the reference growth rate (the contract could specify that coupon payments cannot fall below zero). In years when growth turns out to be 1 percent, the coupon will be 5 percent, and in years when growth turns out to be 5 percent, the coupon will be 9 percent.

Such growth indexation results in a number of advantages. First, growth-indexed bonds would help to reduce the volatility of debt-to-GDP ratios, thereby reducing the likelihood of crises. When GDP growth turns out lower than usual, interest payments due will also be lower than in the absence of indexation, and vice versa. Second, growth-indexed bonds provide an "automatic-stabilizer"-type mechanism, thus reducing the need for procyclical policies. These bonds would help avoid politically difficult adjustments in the primary balance at times of weak economic performance and, conversely, they would help avoid excessive fiscal expansions in times of strong growth. This is especially important for emerging market economies, where economic downturns often lead to waning confidence in international financial markets, forcing them into untimely fiscal tightening to defend credibility. But interest savings, and the corresponding room for a somewhat lower primary fiscal surplus, in times of weak economic growth might also prove appealing for advanced countries—particularly those with limits on their overall fiscal deficits, such as the EMU countries. Finally, growth-indexed bonds would improve risk sharing at the international level. Indeed, individual GDP risk has relatively low correlation with global risk and can be largely diversified in a financial portfolio; global investors holding growth-indexed bonds issued by a variety of countries might thus be willing to accept a relatively low risk premium (see Borensztein and Mauro, 2002).

While focusing on GDP risk has intrinsic appeal, there are also other sources of risk affecting the debt-service capacity of emerging markets. Terms of trade risk has been stressed in this regard, supporting the idea of debt instruments with repayments adjusted to the world price of some key commodity, for example. However, the economic structure of many emerging market countries is becoming increasingly more diversified. Indexing bond payments to the prices of one or two key commodities may provide significant insurance only to a handful of countries. Indexing to the growth of GDP—the broadest measure of how the economy is doing—would provide far greater insurance benefits.

Similar proposals have been on the table for some time. In particular, the idea of linking debt payments to growth, exports, or export prices generated considerable interest in the aftermath of the debt crisis in the 1980s. In the event, a few of the Brady bonds that were issued to restructure syndicated bank loans included "value recovery rights" (VRRs) that occasionally provided for a higher payoff to bondholders in the event that GDP (or GDP per capita) of

Note: The main authors of this box are Eduardo Borensztein and Paolo Mauro.

the debtor country rose above a certain level. Precedents of countries that have used elements of GDP indexation in debt restructurings include Bosnia and Herzegovina, Bulgaria, and Costa Rica. For example, a portion of Bulgaria's Brady bonds provided for a GDP "kicker" such that, once real GDP exceeded 125 percent of its 1993 level, creditors would be entitled to an additional 0.5 percent in interest for every 1 percent of real GDP growth in the year prior to interest payment. A more recent precedent is a bond issued by the City of Buenos Aires in 2003 as part of a debt restructuring operation, which includes indexation of principal repayments to the city's tax revenues.

Still, creating markets for new financial instruments is by no means easy, and there are many practical and conceptual difficulties with the implementation of a growth-indexed bond market. Would investors find growth-indexed bonds too complicated or risky? Could countries misreport their growth rates or lose incentive to grow rapidly?

International investors already invest heavily in stocks of emerging market countries, whose prices are much more volatile than the GDP growth rates of the same countries. Moreover, international investors are already highly exposed to GDP risk under standard debt contracts, though implicitly, as growth slowdowns cause drops in bond prices, and may even prompt defaults. While some investors may be turned away by instruments that are difficult to understand and price, the indexation mechanism is not alien to financial markets, as inflation-indexed bonds are well established in several sovereign debt markets in both advanced and developing countries. In addition, as noted above, a few emerging market countries have already issued bonds that include payment conditions that are contingent on GDP.

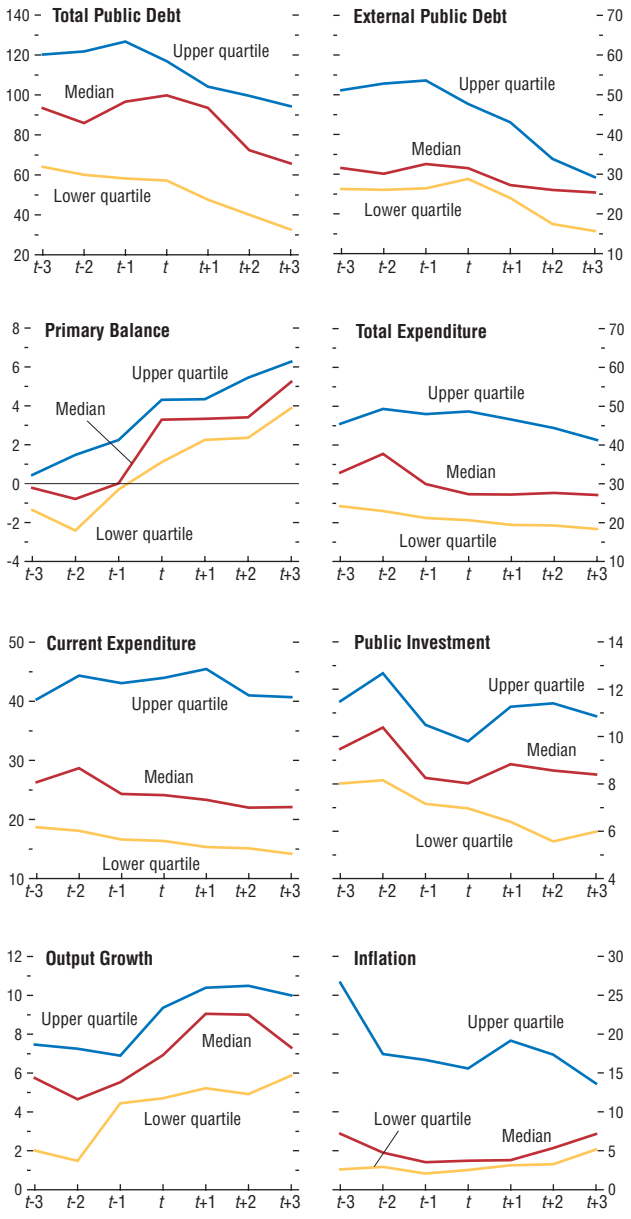
If growth-indexed bonds were to constitute a large fraction of a country's external debt, that country's authorities might be tempted to understate its growth rate or even reduce the growth orientation of its policies. How strong that temptation would be, and whether it could be resisted, are open questions, but they might reasonably make some investors reluctant to hold growth-indexed bonds. Nevertheless, one should note that it is high growth rather than low growth that typically gets politicians reelected. Data revisions could present another obstacle for investors. The bond contracts would therefore need to establish a clear method for dealing with revisions: for example, coupon payments for each date *x* could be based on GDP as estimated on date *y*, ignoring any subsequent data revision. Of course, the contract should specify that, for the purposes of the bond payment, the methodology used to estimate GDP data cannot be changed in midcourse.

Beneficial financial innovation is often hindered by the need to coordinate the actions of many potential market participants before a new instrument can be launched. As a result, historically, innovations in sovereign borrowing have been limited and have often seemed to emerge from a combination of historical accident, special circumstances, and strong official intervention. For example, a forceful case has been made for the introduction of inflation-indexed bonds by distinguished economists since the nineteenth century. Yet, inflation-indexed bonds represent a large share of debt in only a few countries. Moreover, the timing of introduction and the popularity of these bonds present no obvious regularities in terms of economic circumstances such as inflation history or the level of development. Similarly, financial flows to emerging markets switched from the bond format—the historical norm—to syndicated bank loans in the 1970s, and back to bonds in the 1990s largely on account of official encouragement and guarantees, regulations in financial markets, and the international financing needs that originated from the oil price shock in 1973. The episodes of financial turbulence that prompted the efforts under way to rethink the international financial architecture might thus also help bring about a new era of innovation in sovereign finance instruments.

Figure 3.14. How Do Emerging Market Countries Reduce Their Public Debt?[1]

(Percent of GDP)

Strong growth and fiscal consolidation were key factors behind the decline in the debt-to-GDP ratio. Fiscal consolidation was largely achieved through a reduction in the ratio of current expenditures to GDP.



Source: IMF staff estimates.
[1]Only includes debt reduction episodes that do not involve debt defaulter countries.

period was still above the level three years prior to the event were eliminated. This selection process highlighted 26 debt reduction episodes in the emerging market economies in the sample.[39]

A large majority (19 out of 26) of these episodes were associated with a debt default. While it is not possible to identify the exact impact that the restructuring had on the outstanding debt, it appears to have generally been an important factor behind the decline in the debt ratio. The seven remaining episodes (which took place in five different countries) were then examined to understand the principal factors behind the debt reductions that have not involved a restructuring.[40] In these seven cases, the median decline in the public sector debt ratio was 34 percent of GDP over the three-year period (Figure 3.14). Strong growth appears to have been a significant contributing factor to the decline in the debt ratio, with real GDP growth averaging 8.5 percent a year. Fiscal consolidation played an important role as well, with a significant improvement in the primary balance beginning immediately before the debt began to fall. The fiscal consolidation was largely the result of expenditure restraint—with current expenditure being reduced and capital spending remaining constant—although the revenue ratio also increased somewhat. Moderate inflation of about 5 percent also helped, while exchange rate appreciation acted to reduce outstanding external public debt.

This analysis suggests that while large debt reductions have often occurred in conjunction with debt defaults, there are cases where they have been brought about by a combination of strong economic growth and fiscal consolidation. Interestingly, in all five of the countries where debt was reduced without a restructuring, the public debt ratio is still below the level at the

[39]This exercise is roughly parallel to the analysis of major reductions in external debt in Reinhart, Rogoff, and Savastano (2003).

[40]These occurred in Hungary, Israel (twice), Korea, Malaysia (twice), and Thailand.

beginning of the identified debt reduction episode (although in the Asian countries, the ratio has again risen in recent years following the financial crisis in the region). The outcome is more mixed in the cases where debt reduction was associated with a default. While in 10 of these countries debt has remained below the level prevailing at the beginning of the debt reduction episode, in 5 cases the country has either defaulted again and/or debt is currently above the level at the beginning of the debt reduction episode. This suggests that default does not always provide a long-term solution to public debt problems, and that, unless it is accompanied by complementary changes in fiscal and other economic policies, it will not be successful in fostering sustainably lower debt levels.

Whether it is achieved with or without a debt restructuring, a substantial and sustained reduction in public sector debt requires the implementation of sound economic and fiscal policies over a number of years. For example, Chile has implemented strong and sustained fiscal (and other economic) reforms since it defaulted on its external public debt in the 1980s, and the government has reduced its debt from 54 percent of GDP in 1990 to 21 percent of GDP in 2002. Several elements have contributed to this successful adjustment, including expenditure restraint, improved revenue collection, and state enterprise reform that transformed losses into significant profit transfers to the government. Privatization proceeds have also been used to reduce debt, and real exchange rate appreciation has reduced external debt in relation to GDP. Chile did not impose specific rules for the fiscal balance, but other institutional factors played useful roles in maintaining fiscal discipline, including giving more power to the finance ministry than to other ministries or the legislature; prohibiting the central bank from extending credit to the government; and preventing lower levels of government from borrowing. Since 2001, the government has committed to an annual target—a surplus of 1 percent of GDP—for the central government structural balance (adjusted for cyclical effects and copper price movements), thus allowing automatic stabilizers to work.

The benefits of these sustained policy actions are clear. The financial markets have confidence in Chile's fiscal policies, and spreads on government debt are well below those of other governments in the region. Further, uninterrupted access to the capital markets has enabled the Chilean government to avoid the forced procyclical fiscal policies seen in other countries in the region, reinforcing confidence in its economic management.

A number of other countries have also made progress in reducing high levels of public debt. In Hungary, public debt has fallen from about 85 percent of GDP in the mid-1990s to less than 60 percent now as a result of strong growth, a period of sustained primary budget surpluses (which, however, ended in 2002), and the proceeds from the sale of government assets. Bulgaria has reduced its public debt from about 160 percent of GDP in the early 1990s to less than 60 percent of GDP in 2002 as a result of debt restructuring, a fiscal consolidation program that has seen primary budget surpluses sustained since 1994, and high inflation (up to 1997). Lastly, in Mexico, public debt was reduced in the early 1990s as the country emerged from its Brady debt restructuring. Despite the Tequila crisis in 1995, which entailed a costly restructuring of the banking system, debt is currently about 50 percent of GDP, and the last of Mexico's Brady debt has recently been repaid.

Conclusions

High public debt is a cause for concern in many emerging market economies. At about 70 percent of GDP, the average public debt ratio in emerging market economies now exceeds that in industrial countries. Not only does this high level of public debt raise the risk of a fiscal crisis in some countries, but it also imposes costs on the economy by keeping borrowing costs high, discouraging private investment, and constrain-

ing the flexibility of fiscal policy. Lower public debt levels would likely enable governments in emerging markets to run a more countercyclical fiscal policy, with benefits for economic stability.

The analysis in this chapter suggests that, historically, many emerging market economies have not generated large enough primary budget surpluses to ensure the sustainability of their public debt. This stands in contrast to industrial countries. The inability to generate adequate primary surpluses appears to stem from the characteristics of the fiscal systems: governments in emerging market countries generally have weak revenue bases (with lower yields and higher volatility) and are less effective at controlling expenditures during economic upswings (this is particularly the case in Latin America).

While the sustainable level of public debt varies between countries—depending on the characteristics of each country—for the typical emerging market economy it is often quite low. For example, the analysis of overborrowing suggested that, based on past fiscal performance, the sustainable public debt level for a typical emerging market economy may only be about 25 percent of GDP, while the estimates of the fiscal policy reaction functions indicated that emerging market economies as a group have failed in the past to respond in a manner consistent with ensuring fiscal sustainability once public debt exceeds 50 percent of GDP.[41] There are, however, regional differences, with Asian countries generally doing more to ensure debt sustainability than countries in other regions.

What can policymakers do to reduce public debt and cushion themselves against the risks that high debt presents? It is important to recognize that the past does not necessarily condition the future—policies and institutions do change. The example of Chile, in particular, shows that strong fiscal and structural policy reforms—sometimes in combination with an initial debt restructuring—can be effective in putting public debt on a firm and lasting downward path. To be successful, however, a broad and sustained package of reforms is needed that encompasses the following.

- *Tax and expenditure reforms.* Reforms to strengthen and broaden the tax base are needed so that governments have access to higher and less variable revenues. Effective tax rates in emerging market economies are generally low, suggesting that tax avoidance—through either legal or illegal means—and weak tax administration are serious issues that need to be addressed. The continued reliance on taxes and transfers related to commodity exports is a weakness of many current tax systems, and efforts are needed to broaden the tax base to reduce its variability. Better control of expenditures during economic upswings is also essential to ensure that periods of strong revenue growth result in higher primary surpluses rather than increased spending.
- *Steps to improve the credibility of fiscal policy.* Governments need to be able to demonstrate that their overall debt burden is manageable, and that it is likely to remain so under most circumstances. Building this credibility requires not only the implementation of effective fiscal reforms, but also a record of adhering to these reforms through upturns and downturns. The strengthening of fiscal institutions has a very important role to play in this regard. Fiscal rules—broadly defined as a permanent constraint on fiscal performance—in some cases may play a useful role in strengthening fiscal policy credibility if appropriately designed and obeyed. For example, the Fiscal Responsibility Law introduced in Brazil in 2000—which established policy rules consisting of limits and targets for selected fiscal indicators for all levels of government, including debt ceilings and transparency requirements—

[41]These thresholds are not dissimilar from those found in recent studies on external debt crises in emerging markets. For example, IMF (2002) estimates a threshold of 40 percent of GDP, Manasse, Roubini, and Schimmelpfennig (2003) estimate a threshold of 50 percent of GDP, and Reinhart, Rogoff, and Savastano (2003) derive country-specific thresholds in the range of 15–20 percent of GDP for countries that have repeatedly defaulted on their sovereign debt.

appears to have helped strengthen the government's credibility in financial markets.[42] Poland has also introduced a constitutional limit on public debt of 60 percent of GDP (including the risk-weighted stock of outstanding government guarantees) and corrective procedures that kick in when public debt exceeds 50 percent of GDP.

- *Steps to reduce exposure to exchange rate and interest rate movements.* Given the structure of their public debt, many emerging market economies are exposed to considerable interest rate and foreign exchange risk. Steps are needed to reduce the reliance on domestically issued foreign currency and short-term debt. Policies to promote more open economies would help reduce the risks from external debt as exchange rate depreciations would then provide more of a boost to exports and government revenues to mitigate the impact on the budget of higher debt servicing costs. Recent proposals to create GDP-linked bonds could also provide some cushion during times of economic stress.
- *Structural reforms to boost growth prospects.* Historic experience suggests that it is difficult to bring public debt ratios down without robust economic growth. In this context, the implementation of a broad-based agenda of structural reforms is a crucial complement to fiscal consolidation efforts. As emphasized in the April 2003 *World Economic Outlook*, the strengthening of institutions could be expected to provide a significant boost to growth over the medium term. Addressing corporate and financial sector weaknesses will also be a key, while further steps to liberalize trade and promote long-term foreign investment will have lasting growth benefits.
- *Addressing the risks from contingent and implicit liabilities.* It is also important that governments act to minimize the risks they face from contingent and implicit liabilities. This applies not only to countries trying to reduce high debt levels, but also to those that currently have relatively low debt. The experience of many countries in recent years has shown that the recognition of such liabilities can significantly add to public debt and quickly raise questions about sustainability. The recapitalization of banking systems, in particular, has proved costly, while government guarantees on private sector projects are a further source of risk. Governments need to be fully aware of the contingent and implicit liabilities they face—in this regard, improving fiscal transparency would help—and act to reduce them to the extent possible. Improving financial sector supervision is an essential step toward this goal.

More generally, the mechanisms for the restructuring of sovereign debt also need to be strengthened. Defaults on external public debt have been common among emerging market economies, and certainly cannot be ruled out in the future. It is therefore important that mechanisms are in place to deal with such events in an orderly manner to minimize, to the extent possible, the costs and disruptions to all the involved parties. To this end, current efforts to promote the inclusion of collective action clauses in debt contracts and, more generally, to find ways to improve arrangements for sovereign debt restructuring within the existing legal framework are important.

Appendix 3.1. Assessing Fiscal Sustainability: Data and Econometric Methods

The main authors of this appendix are Marco Terrones and Xavier Debrun.

This appendix provides further details on the data and the econometric methodology and results discussed in the main text.

[42]Kopits (2001) contains a detailed discussion of fiscal policy rules. For more detail on fiscal policy rules in Brazil, see Goldfajn and Guardia (forthcoming).

Data Issues

The main issues related to the two data sets used in the chapter have been discussed in Box 3.1. The emerging market and other developing countries in the data sets are as follows.

Data set 1: 1990–2002: Argentina, Brazil, Bulgaria, Chile, China, Colombia, Costa Rica, Côte d'Ivoire, Croatia, Ecuador, Egypt, Hungary, India, Indonesia, Israel, Jordan, Korea, Lebanon, Malaysia, Mexico, Morocco, Nigeria, Pakistan, Panama, Peru, the Philippines, Poland, Russia, South Africa, Thailand, Turkey, Ukraine, Uruguay, and Venezuela.

Data set 2: 1970–2002: Algeria, Argentina, Bangladesh, Benin, Bolivia, Botswana, Brazil, Burkina Faso, Burundi, Cameroon, Chile, China, Colombia, Costa Rica, Côte d'Ivoire, Czech Republic, Dominican Republic, Ecuador, Egypt, El Salvador, Gabon, Ghana, Guatemala, Haiti, Honduras, Hungary, India, Indonesia, Israel, Jamaica, Jordan, Korea, Malaysia, Mauritius, Mexico, Morocco, Niger, Nigeria, Pakistan, Papua New Guinea, Panama, Paraguay, Peru, the Philippines, Poland, Russia, Singapore, South Africa, Sri Lanka, Syrian Arab Republic, Tanzania, Togo, Thailand, Tunisia, Turkey, Ukraine, Uruguay, Venezuela, and Zimbabwe.

The industrial economies common to both data sets are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, the Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, the United Kingdom, and the United States.

Estimating Fiscal Policy Reaction Functions

A major issue in the specification of fiscal reaction functions is the choice of the policy instrument or operational target. Given this chapter's focus, it is important to choose a policy variable directly related to debt dynamics. The budget identity (1) indicates that the stock of public debt at the beginning of period $t + 1$ (B_{t+1}) results from the inherited debt, B_t, to which the period t financing requirements (the overall balance) F_t is added:

$$B_{t+1} = B_t + F_t. \tag{1}$$

Since F_t depends on interest payments (in principle not a choice variable of the fiscal authorities), and thereby on B_t itself (which reflects *past* policies), interest payments can be separated from other expenditures, and the identity rewritten as:

$$B_{t+1} = (1 + r)B_t + S_t - R_t = (1 + r_t)B_t - P_t, \tag{2}$$

where S_t is noninterest (primary) government spending, R_t is total government revenues, and r is the interest rate paid on existing debt. The variable $P_t \equiv R_t - S_t$ is the primary balance (surplus). To account for the effect of growth on borrowing capacity, (2) can be rewritten in terms of ratios to GDP (denoted by lowercase letters):

$$\frac{B_{t+1}}{Y_{t+1}}\frac{Y_{t+1}}{Y_t} = (1 + r)\frac{B_t}{Y_t} - \frac{P_t}{Y_t}$$

$$\Updownarrow$$

$$(1 + g)\,b_{t+1} = (1 + r)b_t - p_t, \tag{3}$$

where Y_t is the level of GDP and g is the nominal growth rate. From equation (3), the primary balance that stabilizes the debt ratio (that is, b_{t+1}) is given by $\bar{p}_t = b_t\,(r - g)$, where r and g can also be measured in real terms as the effect of inflation disappears with the use of ratios. Since the real interest rate is generally higher than real growth, the primary surplus consistent with a constant debt-to-GDP ratio increases with the initial debt stock and the difference between the real interest rate and the real growth rate.

With these identities in mind, and in line with Bohn (1998) and other studies, the primary balance is used as the operational target in the fiscal reaction function:

$$p_{i,t} = \alpha_i + \sum_{j=1}^{J}\beta_j X_{j,i,t} + \rho\, b_{i,t-1} + \varepsilon_{i,t}, \tag{4}$$

where $p_{i,t}$ is the primary balance in country i at time t; α_i is a country-specific intercept (fixed effect) accounting for heterogeneity in the group of countries under consideration; $b_{i,t-1}$ is the debt level at the end of the previous period; $\varepsilon_{i,t}$ is an error term; and X_j is a vector of macroeconomic variables explaining changes in the primary balance unrelated to the long-run sol-

vency requirement. In the spirit of Barro's (1979) "tax smoothing" theory, these variables reflect transitory shocks to expenditure and revenues, such as business cycle fluctuations and exceptional events such as wars or natural disasters. That conjecture conveniently limits the number of potential explanatory variables while remaining consistent with a well-specified theory of fiscal policy.[43] Finally, as discussed in the main text, the connection between current policy actions and long-run solvency lies in the assumption that the primary balance systematically responds to past changes in the public debt, an aspect captured by the coefficient ρ in equation (4). While Bohn (1998) demonstrates that a positive value for ρ is sufficient to ensure long-run solvency under very weak technical assumptions, it is interesting to see how the dynamics of the debt-to-GDP ratio are affected by assuming (as in equation (4)) that $p_t = \rho b_t + x_t$, where x_t summarizes the determinants of the primary surplus unrelated to debt sustainability concerns. Equation (3) can then be rewritten as

$$b_{t+1} - b_t = -\left[1 - \left(\frac{1 + r - \rho}{1 + g}\right)\right] b_t - \frac{x_t}{1 + g}. \qquad (5)$$

Assuming that x_t is "stationary" (which in practice excludes a downward trend in the non-debt-related surplus), the sign of the term in square brackets determines whether the debt ratio is mean reverting, in the sense of converging toward some finite level pinned down by the average of x_t. A positive sign implies mean reversion and will be observed if $r - \rho < g$. Hence, ρ can be interpreted as the largest difference between the real interest rate and real growth that remains consistent with a mean-reverting debt ratio.

Equation (4) was separately estimated for panels of emerging market and industrial economies for the period 1990–2002. Four transitory determinants of fiscal policy were incorporated, with the latter two only being included for emerging markets: the output gap, defined as the relative deviation of real GDP from its Hodrick-Prescott (HP)-filtered trend (to capture the impact of the business cycle on the primary balance); the CPI inflation rate (to account for shocks to seigniorage revenues); an indicator to capture the years in which a country experienced a debt default or restructuring (to account for the lack of financing that generally accompanies such situations); and the deviation of oil and non-oil commodity price cycles from their respective HP-filtered trends (to capture the direct effect of commodity price swings on government revenues in commodity exporting countries).

Commodity price data (oil price index and an index of food and metal commodities) are from the Commodity Price System database. All other data, including budgetary series in industrial countries, come from the World Economic Outlook database. For the econometric exercise, countries in a state of war or an extended period of default or restructuring during the sample period were eliminated on the grounds that unusual events were affecting the primary surplus. Countries in which there were clear trends in the fiscal series were also excluded.[44] The results reported in the main text refer to this restricted sample. As confirmed by the last column in Table 3.1, the exact country composition of the sample does not qualitatively affect the results for emerging market countries, although there is now a statistically significant positive, but very weak, reaction of the primary surplus to debt. For industrial countries, however, the inclusion of Japan in the sample does mean that the 80 percent of GDP threshold reported in Table 3.2 (and discussed below) could no longer be found.

Tables 3.1 and 3.2 present different variants of equation (4) for emerging market and industrial economies respectively. A key dimension of the empirical investigation was to capture statistically the nonlinear relationship between debt and

[43]See Favero (2002), Galí and Perotti (2003), and Fatàs and Mihov (forthcoming) for detailed discussions of the issues related to the specification of fiscal reaction functions.

[44]Of course, the short time-series dimension of the panel prevents formal stationarity tests.

Table 3.1. Emerging Market Economies: Fiscal Policy Reaction Functions, 1990–2002
(Dependent variable: primary surplus, percent of GDP)

Explanatory Variables	No Controls	Controls	Regional	Spline	Openness	Institutions	Full Sample
Output gap (*YG*)	. . .	0.141***	. . .	0.134***	0.057	–0.098	0.128***
Total public debt (*TD*)-lagged	0.039***	0.047***	. . .	0.123***	0.134***	0.132***	0.091***
Controls							
Inflation	. . .	0.001***	0.001***	0.001***	0.001***	0.001***	0.001***
Oil price cycles (if oil producer)	. . .	0.054**	0.050***	0.071***	0.071***	0.071***	0.088***
Non-oil commodity price cycles (if commodity producer)	. . .	0.069	0.067	0.078*	0.081*	0.066	0.105**
Default/restructuring	. . .	0.715***	0.541***	0.654***	0.493***	0.686***	0.822***
Nonlinearities and interactions							
Interaction of *YG* with:							
Trade openness	. . .	. . .	. . .	. . .	0.131**	. . .	. . .
Institutional quality	. . .	. . .	. . .	. . .	. . .	0.078***	. . .
Regional dummies	. . .						
Latin American	. . .	. . .	0.044*	. . .	. . .	. . .	. . .
Non–Latin American	. . .	. . .	0.235***	. . .	. . .	. . .	. . .
Interaction of *TD* with:							
Trade openness	. . .	. . .	. . .	. . .	–0.018**	. . .	. . .
Institutional quality	. . .	. . .	. . .	. . .	. . .	–0.003**	. . .
Regional dummies							
Latin American	. . .	. . .	0.041***	. . .	. . .	. . .	. . .
Non–Latin American	. . .	. . .	0.051***	. . .	. . .	. . .	. . .
Nonlinearities							
Spline regression coefficient							
Break at 50 percent	. . .	. . .	. . .	–0.115***	–0.113***	–0.111***	–0.072***
Test if slope equal to 0 (Wald χ^2)	. . .	. . .	. . .	1.641	. . .	. . .	8.601***
Adjusted R^2	0.497	0.578	0.562	0.630	0.578	0.623	0.682
Number of observations	249	249	249	249	249	249	362

Note: All equations have been estimated with Generalized Least Squares allowing for fixed effects and using a heteroscedasticity-consistent variance-covariance matrix for statistical tests. The symbols *, **, and *** indicate that the estimated coefficient is significantly different from zero at the 10, 5, and 1 percent level, respectively. Except for the full sample column, the following countries have been excluded for one of the reasons explained in the text: Bulgaria, China, Côte d'Ivoire, Croatia, Egypt, India, Israel, Jordan, Lebanon, Nigeria, and Pakistan.

the primary balance suggested by Figure 3.9. Although various powers (quadratic and cubic) of the debt variable were added to the basic specification (4) to test the statistical significance of a nonlinear relationship, spline regressions—that is, models allowing for a kink in the regression line—were found to fit the data very well, suggesting that the reaction of the primary surplus to the debt was indeed contingent on the debt level itself. A variety of debt thresholds were tested (from 30 percent of GDP to 90 percent of GDP by increments of 5 percentage points). For emerging market economies, the 50 percent of GDP threshold provided the best fit to the data (highest adjusted R^2), and this was also the lowest debt-to-GDP ratio beyond which the positive debt feedback effect disappeared (in the sense of not being statistically different from zero). For industrial countries, spline regressions confirmed the visual impression from Figure 3.9, and indicated that the debt feedback effect was statistically larger when the debt-to-GDP ratio was above 80 percent.

In addition to the discussion in the main text, it is worth noting that all transitory determinants of fiscal policy have the expected signs and are generally highly significant in the regressions. Interestingly, whereas higher inflation is generally associated with a larger primary surplus in emerging market economies (in line with the effect on seigniorage revenues), inflation appears to have a strongly negative effect on the surplus in industrial economies, perhaps reflecting contemporaneous efforts to reduce inflation and to adjust the fiscal balance in a number of countries in the 1990s.

Table 3.2. Industrial Economies: Fiscal Policy Reaction Functions, 1990–2002
(Dependent variable: primary surplus, percent of GDP)

Explanatory Variables	No Controls	Controls	Spline	Full Sample
Output gap (*YG*)	. . .	0.971***	0.960***	0.961***
Total public debt (*TD*) – lagged	0.057***	0.060***	0.045***	0.039***
Inflation	. . .	–0.407***	–0.349***	–0.416***
Spline regression coefficient	. . .	. . .	. . .	. . .
Break at 80 percent	. . .	. . .	0.086***	–0.042
Adjusted R^2	0.367	0.691	0.702	0.621
Number of observations	191	191	191	227

Note: All equations have been estimated with Generalized Least Squares allowing for fixed effects and using a heteroscedasticity-consistent variance-covariance matrix for statistical tests. The symbols *, **, and *** indicate that the estimated coefficient is significantly different from zero at the 10, 5, and 1 percent level, respectively. Except for the full sample column, the following countries have been excluded for one of the reasons explained in the text: Germany (effect of reunification), Norway (effect of oil revenues), and Japan (increasing primary deficits).

The impact of broader economic and institutional factors on fiscal policy in emerging market economies was also investigated. Two points emerged from the econometric analysis (see Table 3.1).

- First, *trade openness* and *institutional quality* (defined as a combination of lower corruption, better bureaucracy, greater democratic accountability and a more effective rule of law according to indicators from *International Country Risk Guide*) tend to be associated with a much more countercyclical response of fiscal policy. The effect of trade openness may partly reflect the generally bigger size of governments in more open economies and the consequently larger automatic stabilizers (Rodrik, 1998). The effect of institutions is consistent with the conjecture that good institutions are associated with a better ability to raise revenues, more fiscal policy credibility, and correspondingly looser resource constraint, allowing the government to run more countercyclical policies.
- Second, governments in open emerging market economies tend to behave more like industrial countries as they post higher average primary surpluses and react less strongly to debt sustainability concerns at low debt levels. Countries with better institutions have on average lower public debt, which explains why their governments need to react less to debt sustainability concerns.

Finally, Table 3.3 shows strong evidence of a procyclical expenditure policy in Latin America, in contrast to other emerging markets and, even

Table 3.3. Expenditure Equations, 1990–2002
(Dependent variable: Primary expenditure, percent of GDP)

	Emerging Markets			Industrial Countries			
Explanatory Variables	Restricted sample		Full sample	Restricted sample		Full sample	
Output gap	. . .	. . .	. . .	–0.968***	–0.318***	–0.953***	–0.331***
Latin America	0.156***	0.121***	0.122***	. . .	. . .	. . .	. . .
Emerging markets excluding Latin America	–0.231***	–0.113***	–0.064***	. . .	. . .	. . .	. . .
Inflation	–0.003***	–0.002**	–0.001***	0.149**	0.023	0.196***	0.039
Total public debt lagged	0.002	–0.012**	–0.005	–0.006	–0.056***	0.015**	–0.039***
Default/restructuring	–0.851***	–0.718***	–0.711***	. . .	. . .	. . .	. . .
Lagged dependent variable	. . .	0.428***	0.535***	. . .	0.769***	. . .	0.759***
Adjusted R^2	0.926	0.939	0.940	0.928	0.972	0.925	0.970
Number of observations	242	242	350	191	191	227	227

Note: All equations have been estimated with Generalized Least Squares allowing for fixed effects and using a heteroscedasticity-consistent variance-covariance matrix for statistical tests. The symbols *, **, and *** indicate that the estimated coefficient is significantly different from zero at the 10, 5, and 1 percent level, respectively.

Table 3.4. Overborrowing and Institutions: Bivariate Regression Results

	Regression					
	(1)	(2)	(3)	(4)	(5)	(6)
Corruption	−0.75					
	(0.18)***	. . .	. . .	. . .	. . .	. . .
Property rights		−0.69				
	. . .	(0.20)***	. . .	. . .	. . .	. . .
Constraint on the executive			−0.15			
	. . .	. . .	(0.06)**	. . .	. . .	. . .
Quality of bureaucracy				−0.79		
	. . .	. . .	. . .	(0.18)***	. . .	. . .
Democratic accountability					−0.55	
	. . .	. . .	. . .	. . .	(0.16)***	. . .
Law and order						−0.84
	. . .	. . .	. . .	. . .	. . .	(0.22)***
Constant	1.1	3.2	1.55	2.91	3.21	1.18
	(0.26)***	(0.80)***	(0.33)***	(0.60)***	(0.80)***	(0.28)***
R^2	0.18	0.18	0.07	0.19	0.13	0.17
Number of observations	50	46	50	49	49	50

Notes: Robust standard errors are in brackets. The symbols *, **, and *** indicate statistical significance at 10, 5, and 1 percent levels, respectively. The dependent variable is the logarithm of the ratio of overborrowing. For definitions and sources of the three first measures of institutions, see Appendix 3.1 of the April 2003 *World Economic Outlook*. For definitions and sources of the three last measures of institutions see the International Country Risk Guide.

more so, to industrial economies, in which primary expenditures have a stabilizing influence on the business cycle. The results also suggest that industrial countries react to debt accumulation through a contraction in expenditure that appears stronger than in emerging market economies.

Determinants of Overborrowing

Following the literature on the determinants of debt default and fiscal crises, the role of a country's economic and institutional structure on public sector overborrowing was investigated.[45] The analysis assumes a linear cross-section regression model of the form

$$y = \alpha + \mathbf{X}\beta + u, \qquad (6)$$

where y is a $(n \times 1)$ vector of the overborrowing ratio; $\mathbf{X}$ is a $(n \times K)$ matrix of economic and institutional characteristics; β is a $(K \times 1)$ vector of parameters; and n is the number of countries in the sample. The model was estimated using both ordinary least squares (OLS) and instrumental variables (IV) techniques.

As discussed in the main text, the overborrowing ratio is measured as the ratio of actual public debt to the benchmark level of debt (both as percent of GDP). The benchmark debt level is calculated as the present discounted value of future primary balances (here proxied by the average historical primary balance), with the discount factor being the difference between the average real interest rate (measured by the real LIBOR rate plus a spread proxied from a country's Institutional Investor rating) and the average real GDP growth rate.[46] It was possible to calculate the benchmark debt-to-GDP ratio for 50 countries (14 industrialized countries and 36 develop-

[45]See, for instance, Manasse, Roubini, and Schimmelpfennig (2003).

[46]The benchmark debt-to-GDP ratio, ν, is calculated using the following present value formula:

$$\nu = \int_0^\infty p_s \exp - \left\{\left(r - g\right)s\right\} ds \approx \frac{p}{r-g},$$

where p is the average primary balance as percent of GDP, r is the real interest rate, g is output growth, and s is time. The average primary balance is used to predict future fiscal policies under the premise of no major change in policies. Of course, if there is a structural break in the conduct of fiscal policy, this assumption may not be valid. Data on spreads are not available for all countries or all years in the sample. Therefore, the spread was proxied by (100 – the Institutional

ing countries, of which 21 were emerging market economies) using data for 1985–2002.[47]

The following economic factors were considered in the analysis: trade openness, the ratio of government revenue to GDP, economic volatility, and relative (to the United States) income per capita. Trade openness is measured as the average of the foreign exchange restrictions for current account transactions as compiled by the *Annual Report on Exchange Arrangements and Exchange Restrictions;* government revenue is calculated as the average ratio of total government revenue to nominal GDP, obtained from *Government Finance Statistics* and *International Finance Statistics*, respectively. Output volatility is measured as the standard deviation of the growth rate of real GDP, and relative income is measured as the ratio of the PPP-adjusted real per capita income of each country relative to United States using the WEO database.

A number of different measures of institutional quality were used in the analysis.[48] Simple bivariate regressions suggest that measures of institutional quality are inversely related to overborrowing (Table 3.4). Two institutional measures were found to be important in the regression analysis: an index of property rights and a measure of corruption. The property rights index, obtained from Heritage Foundation's Index of Economic Freedom, measures the extent of protection of private property, while the measure of corruption is the freedom from graft index—see Kaufmann, Kray, and Zoido-Lobatón (1999)—which measures the extent public investiture is used for corruption or private benefit.

The main results are reported in Table 3.5. In addition to the variables reported in the main text, the regression also included output volatility, relative income per capita, and an industrial country dummy. The first and the last regressors were statistically significant. One concern about the OLS results—reported in the first column—is that the revenue-to-GDP ratio may be endogenously determined as the degree of overborrowing could influence a government's policy response, including its tax policy. Although the Wu-Hausman test does not reveal strong evidence of such endogeneity, in view of

Table 3.5. Determinants of Overborrowing

	Ordinary Least Squares	Instrumental Variable
Openness (trade restrictions)	1.64	1.65
	(0.59)***	(0.55)***
Government revenues	−0.05	−0.04
(percent of GDP)	(0.02)**	(0.02)**
Property rights (index)	−0.62	−0.64
	(0.35)*	(0.33)**
Volatility of growth rate of output	25.15	25.50
	(11.16)**	(10.40)**
Relative (to the U.S.)	−0.57	−0.62
income per capita	(1.35)	(1.21)
Constant	2.21	2.11
	(1.15)*	(1.02)**
R^2	0.48	. . .
Number of observations	46	46
Wu-Hausman *F* test	. . .	0.29
P-value	. . .	(0.59)
Sargan test	. . .	0.77
P-value	. . .	(0.86)

Notes: Robust standard errors are in brackets. The symbols *, **, and *** indicate statistical significance at 10, 5, and 1 percent levels, respectively. The dependent variable is the logarithm of the ratio of overborrowing. The regressions also included an industrial country dummy. The following variables were used as instruments: government revenues as percent of GDP for the 1970–85 period, average terms of trade growth, an index of corruption, and an emerging market country dummy. The null hypothesis under the Wu-Hausman test is that the ratio of government revenues to GDP is exogenous. The null hypothesis under the Sargan test is that the instruments are uncorrelated with the error term and correctly excluded from the estimated equation.

Investor (II) index); the II index is based on international banks' risk assessment of individual countries and has a scale of 0–100, with 100 representing the least chance of a debt default. Reinhart, Rogoff, and Savastano (2003) find a strong correlation between the Institutional Investor index—which is available for a large number of countries since 1979—and external debt, and between external debt and spreads. A simple regression on a subsample of countries where spreads data are available confirms a strong positive relationship between actual spreads and those constructed from the II index.

[47]The calculations were not made for those countries where the average primary balance or the discount factor was negative during the sample period. The ratios were calculated for 1985–2002 so that data for 1970–84 could be used to instrument variables in the regressions.

[48]Different measures of institutions are discussed in Appendix 3.1 of the April 2003 *World Economic Outlook*.

earlier results—whereby governments improve their primary balances in response to increased debt—this remains a concern. To deal with this possibility, instrumental variables analysis was employed, with the following variables used as instruments: the average ratio of government revenues to GDP during 1970–1984; average terms of trade for 1985–2002; the corruption index; and a Latin American country dummy. These instruments seem adequate, as the Sargan test fails to reject the null hypothesis that they are uncorrelated with the error term and correctly excluded from the estimated equations. The results from the first-stage regression suggest that the ratio of government revenues to GDP is strongly positively correlated with terms of trade growth and the freedom from graft index. In other words, high terms of trade growth and less corruption have a positive impact on the ratio of revenues to GDP, which in turn affects overborrowing.

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