INTERNATIONAL MONETARY FUND

Assessing Sustainability

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I. INTRODUCTION

1. Assessments of external and fiscal sustainability are a key element in the Fund's work on member countries. The Fund's advice on macroeconomic policies, both in the context of Fund-supported programs and Article IV surveillance, is informed by a view of the sustainability of the country's external debt and its public debt. Judgments about debt sustainability—whether a country's debt can be serviced without an unrealistically large future correction in the balance of income and expenditure—underpin the Fund's decisions in program contexts, in particular by helping to determine when financing is appropriate, what might be a sensible level of access, and whether a debt restructuring may be needed. These judgments become particularly crucial—and in many cases, particularly finely balanced—in cases of emerging market economies that are highly integrated into global capital markets and may have large financing needs.

2. Assessing sustainability in the first instance means forming a view of how outstanding stocks of liabilities are likely to evolve over time. This requires projecting the flows of revenues and expenditures—including those for servicing debt—as well as exchange rate changes (given the currency denomination of the debt). Projections of the debt dynamics thus depend, in turn, on macroeconomic and financial market developments which are intrinsically uncertain and highly variable. Here, a key factor is the markets' willingness to provide financing, which determines the costs of rolling over debt. Such projections also frequently incorporate judgments, based on historical and cross-country experience, of what adjustment is politically and socially feasible. They also depend importantly on the exchange rate regime—both because the existing regime affects the variability of exchange rates and because a change in regime is always possible. Another complication is that the sustainability of a country's external debt depends on the balance sheets and revenue-expenditure balances of several different sectors—the government, the banking system, and the corporate and household sectors—which are also linked with one another by actual and contingent liabilities. These factors should be incorporated into assessments of sustainability insofar as this is feasible, given the availability of information.

3. A number of aspects of the Fund's existing work are relevant to assessing sustainability. Medium-term projections of the balance of payments and of fiscal developments are a staple of the Fund's work on member countries, particularly in a program setting. The staff has also developed a set of tools for exploring medium-term current account and real exchange rate sustainability. Such judgments have potentially important bearing on assessments of debt sustainability, notably when there is significant foreign currency denominated debt. Financial sector stability assessments, which have recently been added to the Fund's toolkit to help identify the vulnerability of the financial sector to various shocks, may have important implications for the contingent claims on the government. But, while all these elements are present in the Fund's work, their application has not been sufficiently consistent and disciplined to always ensure the credibility of the Fund's overall assessment of sustainability.

4. This paper proposes a framework that builds on existing best practices in the assessment of sustainability. The object of this exercise is both to strengthen the elements that go into assessing sustainability and to put these elements into a common framework.

5. The proposed framework for assessing both fiscal and external sustainability centers on the staff's baseline medium-term projections. First, it would continue to permit such projections to incorporate staff knowledge of country-specific conditions, while providing a greater element of discipline and transparency to these projections by laying bare the underlying assumptions and their implications. Beyond this baseline projection, the framework incorporates a standard set of sensitivity tests, examining the effects of alternative assumptions about the time paths of variables affecting the ability to service debt and the costs of financing it. It is intended that the framework would progressively be applied to surveillance of emerging market economies, as well as requests for use of Fund resources in the GRA, with appropriate modifications in light of initial experience.

6. The remainder of the paper is structured as follows. Section II lays out some of the general analytical issues. Section III discusses existing work in the Fund that goes into assessing sustainability, highlighting the aspects in which improvement is needed. Section IV proposes a new template, and discusses how this could have been applied in some recent cases. Section V concludes and outlines the future work program. Section VI presents issues for discussion.

II. Analytical Background

7. It is useful to start with a definition of debt *sustainability* as a situation in which a borrower is expected to be able to continue servicing its debts without an unrealistically large future correction to the balance of income and expenditure. Sustainability rules out any of the following: a situation in which a debt restructuring is already needed (or expected to be needed); a situation where the borrower keeps on indefinitely accumulating debt faster than its capacity to service these debts is growing (a Ponzi game); or a situation in which the borrower lives beyond its means by accumulating debt in the knowledge that a major retrenchment will be needed to service these debts (even if nothing in the external environment changes). The cost of financing is a key factor influencing debt accumulation (i.e., the present value budget constraint), and thus sustainability. Sustainability thus incorporates the concepts of solvency and of liquidity, without making a sharp demarcation between them (see Box 1).[1] Moreover, the assumption of no expectation of major corrections

[1] Which aspect of sustainability—solvency or liquidity—is more relevant in making the sustainability assessment depends on the country circumstances and, in particular, its source of finance. For low-income countries that do not borrow from private capital markets, but may have a high debt ratio, liquidity is likely to be less of a concern than solvency. For many emerging market countries, although debt ratios may be moderate, the main sustainability risk may arise from liquidity problems.

in income or expenditure[2] captures the notion that there are social and political limits to adjustment that determine willingness (as opposed to ability) to pay, which may be especially important in a sovereign context.

Box 1: Solvency, Liquidity, Sustainability, Vulnerability—Defining the Concepts

There are a number of related concepts used in the discussion of debt dynamics.[1]

Solvency. An entity is solvent if the present discounted value (PDV) of its current and future primary expenditure is no greater than the PDV of its current and future path of income, net of any initial indebtedness.

$$\sum_{i=0}^{\infty} \frac{E_{t+i}}{\prod_{j=1}^{i}(1+r_{t+j})} \leq \sum_{i=0}^{\infty} \frac{Y_{t+i}}{\prod_{j=1}^{i}(1+r_{t+j})} - (1+r_t)D_{t-1} \qquad (1)$$

As discussed in the text, solvency needs to be viewed in relation to the adjustment path that is not only economically feasible, but also socially and politically acceptable such that default is not a preferred option.

Liquidity. An entity is illiquid if, regardless of whether it satisfies the solvency condition, its liquid assets and available financing are insufficient to meet or roll-over its maturing liabilities.

The distinction between solvency and liquidity is sometimes blurred because illiquidity may be manifested in rising interest rates—in the limiting case that no further financing is available, the marginal interest rate becomes infinite—which eventually calls into question the entity's solvency.

Accordingly, it is useful to define:

Sustainability. An entity's liability position is sustainable if it satisfies the present value budget constraint without a major correction in the balance of income and expenditure given the costs of financing it faces in the market.

Vulnerability. Vulnerability is simply the risk that the liquidity or solvency conditions are violated and the borrower enters a crisis.

8. More generally, assessments of sustainability must be predicated on the path of both policy variables (such as expenditure or tax rates) and on endogenous variables, such as

[2] This formulation does not rule out a situation in which a major correction is needed to adjust to a shock.

interest rates and growth rates, but around this central projection will be a number of risks. For instance, the balance of income and expenditure may deteriorate to an extent that the debt dynamics are no longer sustainable. On the income side, this would typically reflect a prolonged downturn or adverse developments in export markets. On the expenditure side, there may be increases in outlays that are difficult to avoid—such as demographic changes that impose a rising burden on (unfunded) social security systems—or that are unforeseen. Assessments of sustainability are thus inherently probabilistic and no framework can dispense with the need for making judgments: at best, it can help inform such judgments. What constitutes a "major correction" may depend very much on the particular history and circumstances of the country.

9. A particularly important source of uncertainty surrounding projections of debt and debt service is associated with contingent claims—such as those associated with either explicit or implicit guarantees of debt or bank deposits. Many contingent claims, by their nature, pass unnoticed in normal times, but are more likely to be exercised in crises. Indeed, such claims have been a key feature in recent emerging market crises, in which defaults in one sector have spilled over to others. But contingent claims are exceedingly difficult to measure in practice, both because amounts subject to such claims are often unknown, and because the terms of the claims—the precise circumstances under which they would turn into actual liabilities—are often unknowable.[3]

10. A second risk is an increase in the cost of financing. Such increases may reflect general developments in the financial markets—including possible contagion effects—or funding difficulties specific to the country in question. In the limiting case in which no financing is available, the effective marginal interest rate is infinite. Increases in the cost of financing may thus threaten sustainability in two ways—by precipitating a liquidity crisis, if the country is unable to rollover its maturing obligations, or, if the increase in interest rates is sufficiently persistent, by calling into question the long-term solvency of the borrower.

11. A third risk is that a sharp change in asset prices will increase the net liability position of the borrower to an unsustainable level. The most obvious example is a depreciation of the real exchange rate—possibly, though not necessarily, in the aftermath of the collapse of an exchange rate peg. Such exchange rate collapses have figured prominently in a number of recent crises, whether by raising the debt burden of the private sector (as in East Asia) or of the public sector (Brazil). A key factor in determining the subsequent dynamics of the real exchange rate is the extent of initial overvaluation. As some of these recent cases have

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[3] Such difficulties should not, however, preclude best efforts at estimating the potential costs of contingent liabilities, for instance by using cross-country historical experience on the costs of bank deposit guarantees or by using information contained in financial asset prices (or using the implied exchange rate volatility from option prices to estimate possible future values of the exchange rate and corresponding losses).

shown, however, once a crisis erupts, the magnitude of capital outflows can result in exchange rate adjustments far in excess of any initial estimates of overvaluation.[4]

12. As reviewed in Section III below, existing work on sustainability analysis within the Fund focuses on various aspects of the central projection and these risks to it. The purpose of the framework proposed in Section IV is tie together some of these elements, and to better discipline the process of making projections and undertaking sensitivity tests.

III. Existing Work in the Fund

13. Given the importance of sustainability to various aspects of the Fund's work, a number of tools are already in use to assess it. In general, there are three aspects of sustainability that are analyzed in the course of the Fund's work: overall external sustainability, fiscal sustainability, and financial sector stability. The sustainability of corporate or even household debt is also studied as part of the Fund's analysis of the financial sector, in cases where this is seen as relevant,[5] but it is not a standard part of the Fund's analytical toolkit.

14. This section will discuss briefly the analytical methods used to assess these three main aspects of sustainability and review of how systematically these have been applied in practice in the Fund. Many of these elements have generated a large literature; the purpose of the discussion here is not to provide a comprehensive review but to highlight the key elements that will be drawn upon in developing a proposed framework in the following section, also highlighting the aspects in which improvement is needed.

A. External Sustainability

15. Assessing external sustainability has a number of dimensions—judgments about whether the current account can be financed through private and official capital flows; projections of the medium-term balance of payments and the associated debt (or net foreign liabilities) dynamics; and assessments about the appropriate level of the exchange rate—that are clearly related through various stock-flow and trade elasticity relationships. Existing work at the Fund, whether in a program or surveillance context, touches upon each of these dimensions, while emphasizing those aspects that are particularly relevant to the application

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[4] See *IMF-Supported Programs in Capital Account Crises*, Occasional Paper 210; and "Balance Sheet Approach to Assessing Vulnerability to Crises, and Policy Responses," forthcoming.

[5] As one illustration, early assessments of Japan's banking crisis analyzed the household sector's mortgage exposures in relation to developments in housing prices. See *International Capital Markets Part II. Systemic Issues in International Finance,* August 1993.

at hand. In addition to the standard indicators of debt and debt service,[6] the main tools are medium-term balance of payments projections and benchmarks for assessing medium-term current account projections. Each of these will be discussed briefly in turn.

Medium-term current account and balance of payments projections

16. Medium-term balance of payments projections are a standard tool, used inter alia to assess a member's exchange rate, its need for Fund financing, and its ability to repay the Fund.[7] The analytical basis of these projections is a variant of the simple intertemporal budget constraint (i.e., the equation showing debt accumulation as equal to the current account deficit plus any valuation changes). The intention is to trace the implications for future debt and debt service of a consistent set of macroeconomic assumptions, including with regard to growth rates, nominal exchange rates, inflation, and financing costs. These assumptions are not standardized but are adapted to the circumstances of the member. Typically, the same macroeconomic scenario used for these projections in the context of surveillance and use of Fund resources are also used for the World Economic Outlook (Table 1). Alternative scenarios are sometimes devised to present the implications of various policy paths or potential risks.

17. These projections often play a dual role—serving at the same time to trace the implications of a particular set of policies and to present the Fund staff's economic forecast. To the extent that the medium-term scenarios are based on stylized assumptions—such as constant nominal effective exchange rates—the staff may not view them as central forecasts.

18. A key question is the realism of the assumptions underlying medium-term scenarios, as well as the behavior they incorporate. There have been concerns that Fund staff projections of economic growth, in particular, err on the optimistic side, making it more likely that forecasts will show sustainability. There have certainly been a number of cases in which staff projections have repeatedly erred on the optimistic side (Box 2). But other observers see

[6] One specific use of such indicators has been in the context of the HIPC initiative (see Appendix I, Box 1)

[7] Such projections need to cover the medium term (rather than just the program period) because the determination has to be made that the member has the capacity to repay the Fund, taking into account the maturity of all indebtedness, including that to the Fund.

Table 1. Medium-term Frameworks - BOP Information in Board Documents for the EMBI Global Emerging Market Countries

Country	Medium-term framework	Time forward (years)	Indicators explicitly included in medium-term framework					Quantified sensitivity analysis for external debt
			external debt	current account	capital/fin. account	debt services	international reserves	
AFR								
Cote d'Ivoire	yes	4	yes 1/	yes	yes	yes 1/	yes	no 2/
Nigeria	yes	5	yes	yes	yes	yes	yes	yes
South Africa	yes	4	yes	yes	yes	yes	yes	no
APD								
China	yes	10	yes	yes	yes	yes	yes	no
Malaysia	yes	5	no	yes	yes	no	yes	no 2/
Philippines	yes	5	yes	yes	yes	yes	yes	yes
South Korea	yes	5	yes	yes	no	yes	no	no
Thailand	yes	10	yes	yes	yes	yes	yes	no
EU1								
Bulgaria	yes	5	yes	yes	no	yes	yes	no 3/
Croatia	yes	3	yes	yes	yes	yes	yes	no
Hungary	yes	3	no 4/	yes	yes	no	yes	no
Poland	yes	5	yes	yes	yes	no	yes	no
Turkey	yes	5	yes	no	no	yes	yes	no
EU2								
Russia	yes	15	no	yes	yes	yes	yes	yes 5/
Ukraine	yes	5	yes	yes	yes	yes	yes	no 2/
MED								
Algeria	yes	5	yes	yes	no	yes	yes	yes
Egypt	yes	5	yes	yes	yes	yes	yes	no
Lebanon	yes	5	no 6/	yes	no 6/	no 6/	yes	no
Morocco	yes	5	yes	yes	yes	yes	yes	no 2/
Pakistan	yes	3	yes 1/	yes	yes	yes 1/	yes	yes 7/
WHD								
Argentina	yes	5	yes	yes	yes	yes	yes	yes 7/
Brazil	yes	5	yes	yes	yes	yes	yes	no
Chile	yes	5	yes	yes	yes	yes	yes	no
Colombia	yes	10	yes	yes	yes	no	no	yes 7/
Ecuador	yes	10	yes	yes	yes	no	yes	no
Mexico	yes	5	yes	yes	yes	yes	yes	yes 8/
Panama	yes	5	yes 1/	yes	yes	no	no	no
Peru	yes	10	yes	yes	yes	yes	yes	yes 9/
Uruguay	yes	5	yes	yes	yes	yes	no	no
Venezuela	yes	5	yes	yes	yes	yes	yes	yes
Percent of total or average	**100**	**6**	**87**	**97**	**87**	**77**	**87**	**33**
By Department								
AFR	100	4	100	100	100	100	100	33
APD	100	7	80	100	80	80	80	20
EU1	100	4	80	80	60	60	100	0
EU2	100	10	50	100	100	100	100	50
MED	100	5	80	100	80	80	100	40
WHD	100	7	100	100	100	70	70	50

Source: Latest Staff Reports.

1/ Only public external debt and debt services are covered.
2/ There are alternative scenarios for the current account/overall balance, but not external debt.
3/ There is a brief discussion in the text.
4/ Net foreign debt is covered, but not total external debt.
5/ Analysis undertaken separately from staff report.
6/ Short-term projections over 2 years are presented.
7/ No table, but report includes graphs and discussion on the sensitivity of external debt in the text.
8/ In Selected Issues.
9/ No table, but quantitative discussion on debt dynamics senstivity in the text

Box 2: Debt Sustainability in the Baltics, Russia, and Other States of the FSU

During the 1990s, most of the Baltic states, Russia, and other states of the former Soviet Union (BRO) saw a marked increase in their external indebtedness. Starting from generally low initial levels of debt, the median debt ratio for these countries had risen to 60 percent of GDP by end-2000, despite having Fund-supported adjustment programs through much of this period.[1]

An analysis of the underlying causes suggests that it was *not* the GDP growth-interest rate differential that accounted for the debt build up, mostly because of the low initial level of debt. Moreover, the steep real appreciations experienced by these countries helped offset the impact of the initial debt. The flip side of these real appreciations, however, were wide "primary" (i.e. excluding interest payments) current account deficits that were only partly offset by foreign direct investment.

While capital flows were generally welcomed as a sign of confidence in the economy and the transition process, FDI and other non-debt generating flows were overestimated, and the extent of the increase in external (and public) debt was not foreseen. As such, staff projections tended to be overly optimistic regarding the fiscal and external adjustment that would be achieved under successive programs (see Table).

Table. Baltics, Russia and Other States of the Former Soviet Union : External Debt, 1993-2001
(In percent of GDP)

	1993	1994	1995	1996	1997	1998	1999	2000	2001	Change in Debt/GDP ratio 1995-2001 Actual	1995-2001 Projections 1/
Armenia	14.5	30.8	29.1	36.1	43.2	42.9	48.9	53.6	55.3	26.2	6.4
Azerbaijan	4.0	20.0	17.6	14.7	10.2	11.4	21.0	23.0	22.7	5.1	.
Belarus	39.8	52.9	29.1	13.2	15.3	17.2	18.7	17.1	18.6	-10.5	15.0
Estonia 2/	5.2	4.9	4.5	35.8	16.4	15.0	15.2	13.0	11.7	7.2	-5.6
Georgia	71.1	141.0	61.0	44.8	42.6	58.5	61.1	61.8	64.2	3.2	-21.6
Kazakhstan	35.7	28.1	26.4	26.4	32.6	35.7	70.9	68.7	64.8	38.4	1.4
Kyrgyz Republic	43.7	37.3	39.1	41.5	54.2	69.0	107.5	134.2	121.4	82.2	14.0
Latvia 2/	10.1	9.7	9.5	14.9	13.8	17.8	20.2	18.7	25.7	16.2	7.0
Lithuania 2/	10.3	10.5	12.6	30.2	35.1	20.9	26.4	26.1	26.5	13.9	-0.7
Moldova	1.3	22.8	49.2	59.2	61.0	75.9	111.0	102.3	102.5	53.3	-16.0
Russia 3/	61.3	46.0	37.9	32.5	31.4	54.0	76.4	60.4	.	22.5	.
Tajikistan	75.0	91.7	154.9	83.2	98.2	89.3	113.2	124.2	104.0	-50.9	-67.0
Turkmenistan 4/	3.1	11.5	206.0	28.1	50.6	61.1	61.6	53.9	103.3	25.8	1.0
Ukraine	30.3	0.0	21.4	19.9	19.0	27.5	39.4	33.1	26.5	5.1	1.7
Uzbekistan	17.3	17.0	17.8	16.5	17.2	23.5	25.5	32.0	39.9	22.1	5.0
Mean	28.2	34.9	47.7	33.1	36.1	41.3	54.5	54.8	56.2	17.3	-4.6
Median	17.3	22.8	29.1	30.2	32.6	35.7	48.9	53.6	47.6	16.2	1.4

Source: International Monetary Fund, WEO.
1/ Medium-term projections reported in Staff Reports dated late-1995 or 1996.
2/ Country Desk data for Estonia, Latvia and Lithuania.
3/ Country Desk data from EDSS. Change in debt ratio is calculated for 1995-2000 period.
4/ Change in debt ratio is calculated for the period 1996-2000

1/ The main exception to the low initial indebtedness was Russia, which assumed the obligations of the Soviet Union under the "zero option."

Fund staff as constructing deliberately pessimistic scenarios in order to persuade the authorities to undertake greater adjustment. The only systematic empirical study of program numbers finds a median bias in GDP growth projections of 0.0 percent—suggesting that these tendencies, if they exist, are surprisingly well balanced for program countries as a whole. But the same study finds a significant bias toward optimism for the sub-sample of

in projections of external current accounts, but finds that the accuracy of these projections is rather low. [8]

Current account and exchange rate assessments

19. The staff's assessments of current accounts and exchange rates are relevant to developing a framework for assessing debt sustainability for two reasons. First, as discussed in Section II above, judgments about the whether the real exchange rate is overvalued may be of particular importance in assessing debt sustainability in the presence of foreign currency denominated debt. Second, some of the analytical tools used may usefully be considered, with appropriate modifications, for use in analyzing debt sustainability.

20. The Fund's macroeconomic balance approach to assessments of current accounts and exchange rates uses analytical techniques associated with "fundamental equilibrium exchange rates."[9] Under this approach, an underlying current account is calculated in one of two ways: one approach is to adjust the actual external current account balance for the output gap (both in that country and its trading partners) and for the lagged effects of recent exchange rate changes. An alternative calculation of the underlying current account uses the staff's baseline projection for the current account at the end of the projection period, at which it is assumed that the output gap will have closed and any past exchange rate movements had their full effects. The underlying current account is then compared with a norm calculated on the basis of econometric estimates of the historical relationship between saving-investment balances and a set of medium-term determinants. The difference between the actual current account and the norm is then used to calculate the degree of exchange rate misalignment.[10]

21. The current account norm derived in this framework is not intended as a measure of either the sustainable or the optimal current account balance. Instead, it is a saving-investment balance predicted to prevail under WEO projections of the determinants of saving and investment if historical relationships continue to hold. In particular, it is calculated on the basis of medium-term projections of fiscal policy variables—and if fiscal policy were unsustainable, it is not clear that the saving-investment norm would be consistent with

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[8] Alberto Musso and Steven Phillips (2001), Comparing Projections and Outcomes of IMF-Supported Programs, IMF *Staff Papers*, 49, pp. 22-48.

[9] An alternative approach, using time series methods to measure deviations from (generalized) purchasing power parity models, is also frequently used by staff in analyzing particular countries' exchange rates.

[10] See Peter Isard and Michael Mussa, A Methodology for Exchange Rate Assessment, in *Exchange Rate Assessment—Extensions of the Macroeconomic Balance Approach*, edited by Peter Isard and Hamid Faruqee, IMF Occasional Paper 167, 1998.

external sustainability. This methodology was initially applied only to industrial countries, as its implicitly assumes perfect capital mobility and assumes that standard behavioral relationship remained stable over the 30-year sample period.

22. More recently, staff have sought to develop a framework for current account and exchange rate assessments that could be also applied to developing countries. For this purpose it has supplemented its econometrically-based saving-investment norms with three other criteria based on the ratios of net foreign liabilities (NFL) to GDP: whether current account deficits exceed average experience over the past decade, whether they occasion an increase in NFL/GDP, and whether they are consistent in the long run with keeping NFL/GDP below a threshold level corresponding to the 75th percentile of sample of emerging market countries. The choice of these criteria and how to apply them collectively in assessing sustainability are matters of judgment. In addition, the quality of sustainability assessments depends critically on frank evaluations of the risks to the current account projections, taking account of the uncertainties surrounding the policy assumptions on which they are based.

23. While these current account and exchange rate assessments are a useful way of systematizing the staff's assessments, they are not intended as the basis for a judgment of overall debt sustainability. Further, they depend on a number of assumptions on which further work would be needed to test their relevance to particular groups of countries.

B. Fiscal Sustainability

24. Assessments of fiscal sustainability are a second key element in the work of Fund staff. These assessments have two main dimensions: indicators of public debt and deficits and medium-term fiscal projections. Each of these elements is based on an extensive body of information, which highlights both the substance and the limitations of these tools.

Fiscal indicators

25. One standard part of the Fund economist's toolkit is the assessment of a variety of measures of the fiscal deficit and public sector debt, as well as ratios such as public debt-to-GDP ratio. Similarly, the debt-stabilizing primary fiscal surplus is often used to assess current fiscal policy by judging whether the existing fiscal surplus is consistent with a stable debt-to-GDP ratio, or to indicate how much effort is required to achieve a stable debt ratio. In using this indicator, it is important to take account of differences in countries' ability to achieve high primary surpluses, both on technical grounds and on grounds of political and social feasibility. For instance, Turkey managed to achieve primary surpluses of some 6–7 percent of GDP in 2001/02 as part of its recent stabilization program, while Argentina has not run a primary surplus of more than 1 percent of GDP since 1993.

26. The usefulness of any fiscal indicators depends on the appropriate coverage of the public sector. Ideally, for sustainability analysis, the fiscal framework should include all parts of the public sector that can accumulate debt including public enterprises, especially to the

extent that their income and debt reflect mostly noncommercial obligations (though it is often difficult to draw the line precisely). If the coverage is too narrow, public debt will be understated and a country's debt may look sustainable when it is not.[11] This issue has become particularly important since more open capital markets have made public debt more likely to be contracted by subnational governments or public enterprises. Already in the debt crisis of the early 1980s, much of the debt had been borrowed outside central government and was assumed by the sovereign only when it became evident that subordinate public (or, in some instances, private) entities could not pay.

27. More generally, contingent liabilities that have an important impact on fiscal sustainability are often difficult to measure. While data are frequently available on debt formally guaranteed by the central government, experience suggests that non-guaranteed debt has often turned out to be an important contributor to public debt build-up and should ideally be monitored and controlled. Many liabilities which are contingent from the standpoint of the central government are actual liabilities of the broader public sector: such exposures are more readily identifiable, the broader is the coverage of the public sector.[12] However, there are usually contingent liabilities not covered by the fiscal framework, either because of limitations to the coverage of fiscal data or because some contingent liabilities such as (actual or implicit) deposit insurance extend beyond the public sector. Government contingent liabilities should be identified and a separate assessment made of the likelihood that they will be called: the Fiscal Transparency Code recommends that a list of government contingent liabilities be appended to budget documents, but this has not yet become common practice in emerging market economies—or indeed, anywhere else.

28. Another important aspect is the need to undertake continuous improvements in the quality of fiscal data, in view of continuing deficiencies in many countries which are highlighted in Box 3.

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[11] Care should be taken to ensure that cross-country comparisons of indebtedness are on a comparable basis. For instance, in most European and OECD countries, only general government data are available.

[12] In this respect, consolidated public sector statistics, which are important in tracking total debt exposures, should be supplemented with a breakdown of the operations of the various components of the public sector (central and local governments, public enterprises, the social security system, etc.) so that the sources of debt accumulation can also be traced.

Box 3: Data Deficiencies in Undertaking Fiscal Sustainability Analyses.

The scope and quality of fiscal data differs significantly across countries and regions.[1]

- **Data availability**. The compilation and dissemination of basic variables such as public debt, primary balances, interest bills, the real interest rate, etc., vary tremendously from country to country.

- **Coverage of the public sector.** Of the EMBI global countries (EMBI-G), 15 monitor the public sector (Latin America plus Malaysia, Philippines, South Africa, Thailand, and Turkey); 9 monitor general government (most transition countries, Nigeria, Egypt and Pakistan); and the rest track only central government. These data limitations are less of a concern in countries where subnational governments and public enterprises do not borrow.

- **Off-budget and contingent liabilities.** The Fund has only recently started tracking whether countries monitor contingent liabilities, in the context of ROSCs and FSAPs. Twelve EMBI-G have had a fiscal transparency ROSC, and of these, eight do not track/report their contingent liabilities. Only a few countries (e.g., Brazil and Hungary) provide partial information on its quasi-fiscal activities.[2]

- **The social security system.** Pensions are a particularly important direct or contingent liability for government in most EMBI-G. The evolution of these liabilities (and, for instance, of "captive financing sources" from private pension systems investing in government paper) will depend on a country's demographics and the maturity of its social security system. Typically, Fund fiscal sustainability assessments have not included any estimate of, or comment on, the impact of the evolution of pension liabilities on sustainability.[3]

- **Standardization and conceptual soundness of definitions.** Standard debt sustainability analysis assumes that, valuation effects aside, the deficit should equal the change in the debt. If the deficit does not capture all changes in the debt, then controlling the primary balance may not be sufficient. In several EMBI-G, Fund programs have targeted partial deficits that excluded important debt-creating government outlays, such as for bank recapitalization (e.g., Indonesia, Thailand) or debt recognition/assumption (e.g., Argentina, Brazil). While such deficit targets may be useful for other purposes—for instance, controlling aggregate demand—a comprehensive definition is required for debt sustainability analyses.

- **Financing requirements and sources.** Even if the debt is shown to converge to a reasonable level, getting there requires continuous re-financing of maturing debt. But traditionally, Fund documents have often omitted to include gross financing numbers or any risk assessment.

- **Government assets.** Fund debt sustainability analyses focus almost exclusively on government liabilities. In reality, debt is likely to be more sustainable when the government has significant liquid assets. The revised Government Finance Statistics system sets as a new standard the compilation of the government's balance sheet. Many countries already have at least pilot balance sheets, but an acceptable methodology and quality will take some years to establish.

1/ See SM/00/241, "Issues in Fiscal Accounting", for a cross-country survey.
2/ This information is from completed ROSCs.
3/ In the 10-15 year timeframe covered, lack of attention to demographics may be justified. However, failure to anticipate (and offset) the fiscal gap caused by the introduction of funded pension schemes explains worse-than-anticipated debt ratios in a number of countries (for instance, Argentina).

Medium-term fiscal projections

29. Medium-term fiscal projections are a key element in the assessment of fiscal sustainability, contributing to an overall assessment of sustainability and providing a framework in which to assess fiscal policy. To be useful, such frameworks need to be based on a realistic set of assumptions which are used to stress-test the projections for robustness.

30. Fund staff prepare medium-term frameworks for many countries, in particular for almost all emerging market economies, but their content is not uniform. Table 2 lists fiscal information included in medium-term frameworks in the recent Board papers of countries making up the EMBI Global index. It shows that projection periods vary from 3 to 15 years (with an average of 6 years). Most frameworks have projections for the public debt ratio and the primary balance, and about two-thirds have explicit projections for expenditure and revenue ratios. About one-third explicitly show interest rate assumptions, while most do not project the government's gross financing needs. Moreover, sensitivity tests for the public debt projections tend to be limited.

31. As with medium-term balance of payments projections, there is also the issue of how realistic are these scenarios. An obvious source of bias toward optimism is that projections start with the assumption that the authorities' policy program will be implemented in full. This is not to suggest that the baseline projection should not be based on the program assumptions—but it does suggest that program design may need to take better account of how much adjustment is realistically feasible. The macroeconomic assumptions are another source of optimism: while, as noted above, there is no clear evidence of overall bias in growth projections in Fund supported programs, there may be significant biases in individual countries or groups of countries. Assumptions with regard to costs of financing may also be a source of optimism.

Table 2. Medium-term Frameworks - Fiscal Information in Board Documents for the EMBI Global Emerging Market Countries

Country	Medium-term framework	Time forward (years)	Coverage of government	Indicators explicitly included in medium-term framework					Quantified sensitivity analysis for public debt
				public debt	primary balance	revenue	gross financing	interest rate	
AFR									
Cote d'Ivoire	yes	4	Central	yes	yes	yes	no	no	no 1/
Nigeria	yes	5	General	yes	yes 2/	yes	yes	no	yes
South Africa	yes	4	Public sector	yes	yes	yes	no	no	no
APD									
China	yes	10	General	yes 3/	yes	yes	no	no	yes
Malaysia	yes	5	Public sector	yes	no	no	no	no	no
Philippines	yes	5	Public sector	yes	yes 2/	yes	no	no	yes
South Korea	yes	5	Central	yes	no	no	no	no	no
Thailand	yes	10	Public sector	yes	yes	yes	no	yes	yes
EU1									
Bulgaria	yes	5	General	yes	yes	yes	no	yes	no 4/
Croatia	yes	3	Central	no	yes 2/	yes	yes	no	no
Hungary	yes	3	General	yes	yes	yes	no	no	yes
Poland	yes	5	General	no	no	yes	no	no	no
Turkey	yes	5	Public sector	yes	yes	no	no	yes	yes 5/
EU2									
Russia	yes	15	General	yes	yes	yes	no	no	no 6/
Ukraine	no	n/a	General	n/a	n/a	n/a	n/a	n/a	n/a
MED									
Algeria	yes	5	Central	no	no	no	no	no	no 7/
Egypt	yes	5	General	yes	yes	yes	no	no	no
Lebanon	yes	5	Central	yes	yes	yes	no 8/	yes	yes 9/
Morocco	yes	5	Central	yes	yes	no	no	no	yes
Pakistan	yes	3	General	yes	yes	yes	no	yes	no 10/
WHD									
Argentina	yes	10	Public sector	yes	yes 11/	no	no	yes	yes 5/
Brazil	yes	5	Public sector	yes	yes	no	no	yes	yes 5/
Chile	yes	5	Public sector	no 12/	yes	no	no	yes	no
Colombia	yes	10	Public sector	yes	yes	yes	no	no	yes 5/
Ecuador	yes	10	Public sector	yes	yes	no	no 13/	yes	no
Mexico	yes	5	Public sector	yes	yes	yes	no	yes	yes 14/
Panama	yes	5	Public sector	yes	yes	yes	no	no	no
Peru	yes	10	Public sector	yes	yes	yes	no	no	no
Uruguay	yes	5	Public sector	yes	yes	yes	no	no	no
Venezuela	yes	5	Public sector	yes	no	yes	no	no	no
Percent of total or average	**97**	**6**	**80 16/**	**86**	**83**	**66**	**7**	**31**	**41**
By Department									
AFR	100	4	67	100	100	100	33	0	33
APD	100	7	80	100	60	40	0	0	60
EU1	100	4	80	60	80	80	20	40	40
EU2 15/	50	…	100	…	…	…	…	…	…
MED	100	5	40	80	80	60	0	40	40
WHD	100	7	100	90	90	60	0	50	40

Source: Latest Staff Reports.

1/ There are alternative scenarios for the overall balance, but not government
2/ Can be derived from the overall balance and interest
3/ Also includes in the scenarios "quasi-fiscal" debt implied by the negative net worth of the public
4/ There is a brief discussion in the
5/ No table, but has graphs and box for sensitivity of fiscal balances and
6/ There is a paragraph in the text on the implications of a worse
7/ There is a low oil price scenario but with no public debt
8/ Does have privatization and eurobond
9/ No table, but quantitative discussion on debt dynamics senstivity in the
10/ There is a senstivity analysis for external
11/ Also includes rows for other debt creating flows, privatization, debt consolidation and
12/ There are projections of public external debt - Chile's domestic public debt is very low (excluding the central
13/ Does have very detailed net financing
14/ In Selected Issues.
15/ Only two observations, only one of which had a medium-term framework with fiscal
16/ Percentage with coverage at general or public sector

32. The experience with these medium-term fiscal projections has been somewhat mixed—with some cases of excessive pessimism (Figure 1) as well as some important recent cases in which medium-term fiscal projections repeatedly turned out to be over-optimistic.[13] Figure 2 shows debt, deficit, and growth projected in various Board documents for Argentina, Brazil, Lebanon and Turkey, together with actual outturns. In the first three cases, projections were consistently over-optimistic: they persistently showed the debt ratio stabilizing after rising for one year, while in reality debt levels continued to mount. The large jumps in the debt ratio typically reflected sharp exchange rate depreciations, but there were biases toward overoptimism more generally as well. To some extent, this overoptimism is not surprising, since program projections were predicated on the program being implemented, and incorporated primary adjustments that did not always materialize.[14] But it also reflects overoptimism regarding other variables such as real growth rates, real exchange rates, and interest rates. The optimism of projections for Turkey was more muted until the unexpected exit from the exchange rate peg in early 2001 raised debt levels substantially.

33. This experience points first of all to a need for greater realism in formulating medium-term fiscal projections, in line with best practice (see Box 4). It also argues for a need to spell out clearly the assumptions underlying these scenarios.

34. In addition to the baseline fiscal projections, sensitivity analysis is important in taking account of the fiscal impact of potential shocks. As mentioned, such analyses are currently undertaken for only two-fifths of emerging market countries. Moreover, the sensitivity analysis is typically limited to one or two scenarios, with the assumptions varied on a discretionary basis. This suggests that there is scope for improvement, both in ensuring that sensitivity analysis is a routine part of sustainability assessments, and in promoting greater uniformity in the kinds of sensitivity tests undertaken for different countries.

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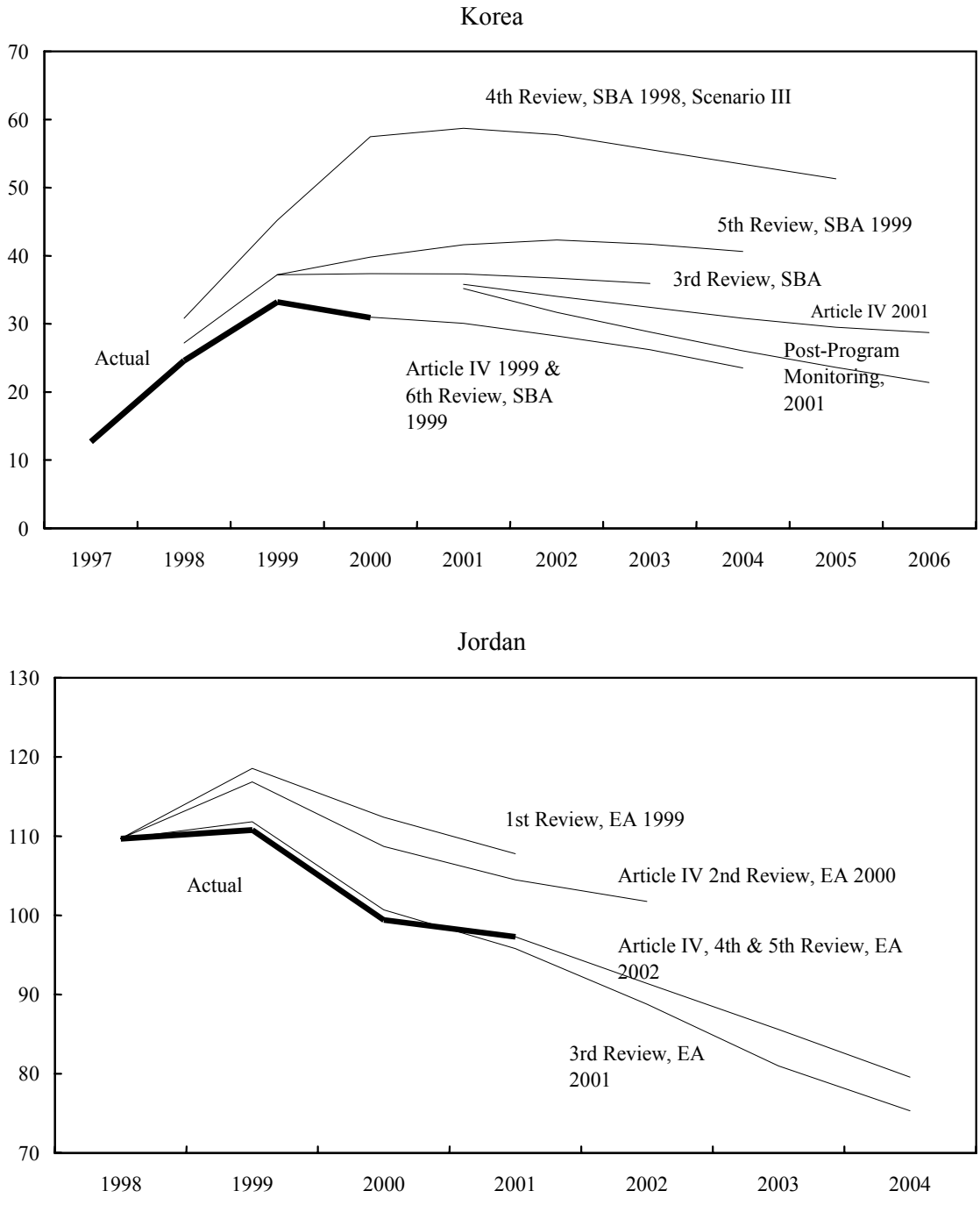
[13] In examining the experience with such projections there may also be an element of "sample selection" bias stemming from the fact that when public debt dynamics are not a major concern, explicit projections are not always undertaken.

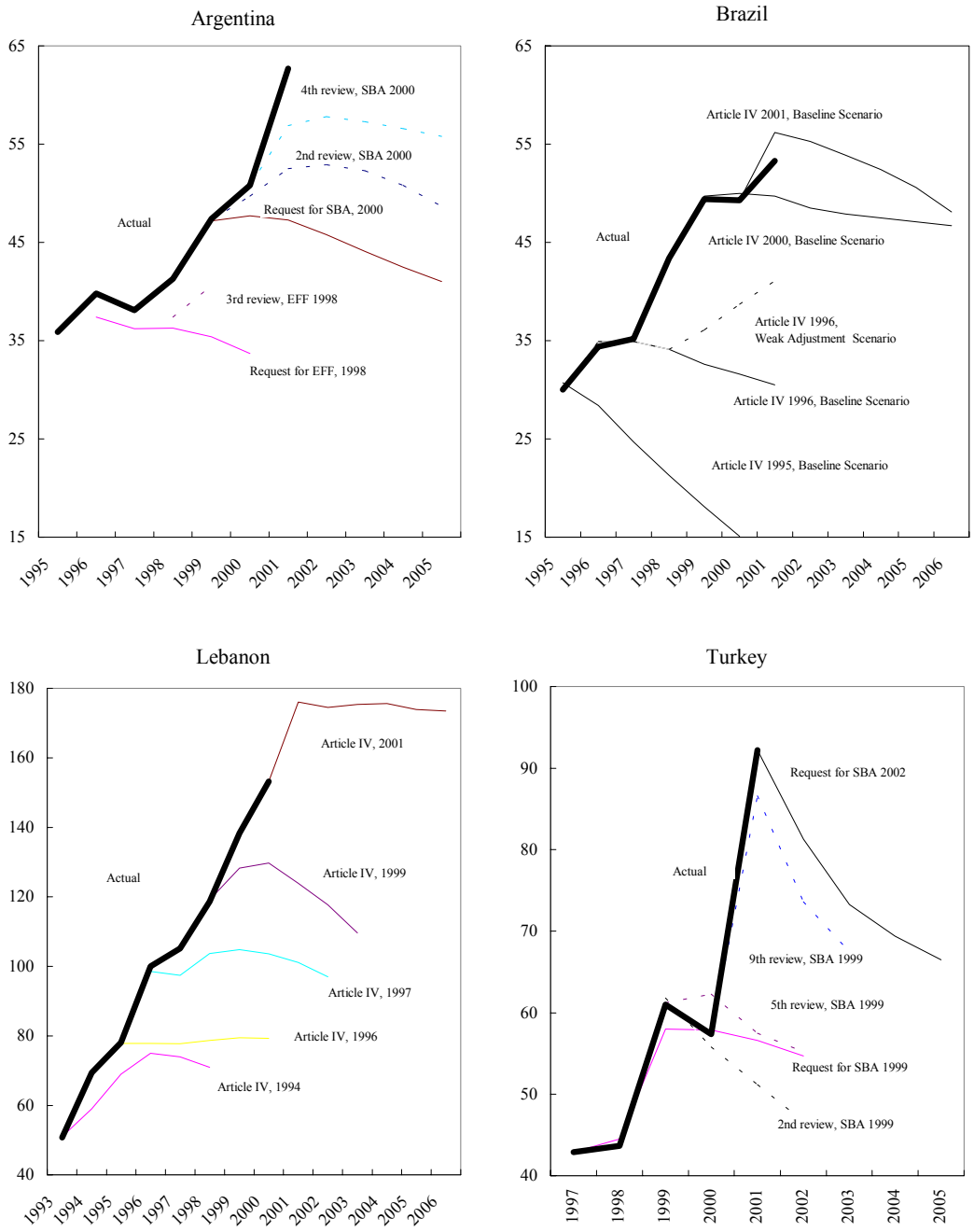
[14] This is largely unavoidable in program projections. The template proposed below also reports projections based on average historical data (including for the primary balance) to give an indication of how optimistic are the program projections for the primary balance (or goods and services balance for external debt) compared to the country's historical performance.

Figure 1. Projections of Public Debt to GDP Ratio : Selected Emerging Market Countries



Source: IMF Staff Reports

Figure 2. Projections of Public Debt to GDP Ratio : Selected Emerging Market Countries



Source: IMF Staff Reports

Box 4. Good Practices for Realistic Fiscal Sustainability Assessments

Staff are working to develop operational criteria for assessing and limiting undue optimism in fiscal projections. However, some good practices are already well-known and are increasingly being incorporated in the staff's work.

Sustainability analysis should not be based on assumptions that by themselves solve the debt sustainability problem (for example, interest rates consistently lower than output growth rates and sharp real exchange rate appreciations)—other than in the very exceptional cases where these are clearly justified.

While the baseline projection may be predicated on policy actions and market outcomes, risks associated with exogenous variables should be balanced between the up- and downside. Moreover, sensitivity texts should be designed in such a way that risks on both sides are adequately examined. Typically, this may be done by calibrating the baseline path of exogenous variables in line with past averages. But in some cases history may not be an adequate guide to the most likely future, and the assessment of the realism of projections may need to take into account other indicators—for instance, levels in similar countries—or a judgment on the impact of a regime change.

The sustainability assessment should be based on the fiscal measures needed to achieve the projected debt path. It is difficult to assess the feasibility of the primary surplus consistent with debt sustainability without first specifying the tax and expenditure measures that would be needed to achieve it, and judging whether these measures are sustainable over time, both technically and politically.

Example I: Fund-supported programs sometimes include taxes which cannot be collected repeatedly or need to be phased out to avoid damage to the economy (e.g., tax on corporate assets, financial transactions tax). Fiscal sustainability exercises need to exclude these taxes from medium-term revenue projections.

Example II: Programs are sometimes predicated on major policy commitments such as fiscal rules, rather than on policy measures. This should be avoided. For instance, Argentina in 1999-02, the authorities adopted a fiscal responsibility law which promised a balanced budget, and this budget was built into the medium-term projections. But in the event the government was unable to take the measures needed to meet the fiscal rule.

Assumptions about fiscal policies should generally be in line with economic behavior. Revenue elasticities should be realistic (tax revenue to GDP and non-tax revenue to inflation elasticities equal or close to 1). Revenues from natural resources should be based on conservative long-term price forecasts (such as WEO projections) and take into account the stock of non-renewable resources and their depletion rate. Primary expenditure projections should grow at a minimum in line with inflation and population growth (i.e., constant in real per capita terms).

Large projected changes in revenue or expenditure ratios should generally be based on revenue and expenditure *policy* measures or tangible changes in the environment, and not on efficiency gains in tax administration or expenditure or on revenue windfalls. Departures from these conventions should be justified.

The assessment should include an evaluation of the authorities' planned financing policies and the implications. Financing amounts from each source should be projected and associated risks assessed. For example, shortening debt maturities would increase roll-over risks while increasing debt maturity usually entails a higher financing cost. For a country with access to external bond markets, the share of the financing it pre-empts from its bond class may be an indicator of vulnerability.

Financing plans should be consistent with medium-term monetary and external sector projections. Domestic bank financing should be consistent with a reasonable increase in money demand, deposit growth (and other factors influencing banks' sources of funds), and the financing needs of the private sector. If the public sector crowds out the private sector, growth and interest rate assumptions may be questionable. Privatization receipt projections should be based on a reasonable assumption about the realizable value of the stock of assets (for example, avoid projecting privatization proceeds that last for more than a few years or which rely on high valuations being quickly realized). The same applies to projections of proceeds from sales of financial assets the government obtains after banking crises.

The impact of large real exchange rate changes on public debt levels and its dynamics need to become a standard part of the core sensitivity test. Experience in Brazil during the East Asian crisis and in other cases of large devaluations shows that changes in external indebtedness resulting from large, unanticipated movements in the exchange rate can be decisive for subsequent debt dynamics.

C. Financial Sector Stability

35. There are important interactions between the stability of the financial system and sustainability of public and external debt. On the one hand, the government often acts as the ultimate guarantor (explicit or implicit) of the financial system, which confronts it with potentially large contingent liabilities in the face of widespread bank insolvencies. On the other hand, an unsustainable stock of government debt could cause broader financial instability, because government securities often constitute a large share of the assets of banks and other financial institutions due to their unique role as a source of collateral or low-risk assets, as well as their role in providing a benchmark for interest rates.

36. The importance of financial system stability has increasingly been recognized. In particular, in the East Asian financial crisis, financial sector imbalances were seen as being at the heart of the crisis. In retrospect, Fund staff did not pay adequate attention to these weaknesses before the crisis. In large part in response to this experience, efforts are now underway to strengthen the Fund's assessments of the financial system and to integrate these assessments into the overall staff assessment of the macroeconomic situation. The cornerstone of these efforts is the joint IMF/World Bank Financial Sector Assessment Program (FSAP).[15] The focus of the FSAP is on financial stability and understanding the vulnerabilities and development challenges facing the financial system, with the ultimate objective of reducing the likelihood and severity of financial crises.

37. The FSAP uses a range of macroeconomic and financial soundness indicators (FSIs) to measure the potential vulnerability of a financial system. In addition to FSIs, the FSAP includes a description of the macroeconomic environment and the likely impact of projected developments in key economic sectors on the stability of the financial system.

38. The FSAP also provides a portrait of the main vulnerabilities based on a qualitative analysis of the institutional environment and policy framework. For instance, the design of the financial sector safety net may determine the extent of the public sector's (implicit or explicit) liability in the event of financial sector distress, with obvious implications for public debt sustainability. Other elements of the institutional environment include the liquidity management framework used for monetary management, the crisis management framework in place to deal with emergencies, and the supervisory and regulatory framework that determines the robustness of the financial system. In addition, the FSAP includes assessments of observance of various internationally accepted standards, codes and guidelines on best

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[15] See *Summing Up by the Acting Chairman: Financial Sector Assessment Program—A Review—Lessons from the Pilot and Issues Going Forward*, Executive Board Meeting 00/123, December 13, 2000, issued as BUFF/00/190.

practices in the financial sector. The *Guidelines for Public Debt Management*[16] are particularly relevant for debt sustainability, as they provide a coherent framework and set of guiding principles for formulating and assessing debt-management policies.

39. A major element of the FSAP is the stress tests. These are typically used to measure the sensitivity of portfolios to changes in underlying prices, or to examine the impact of a particular scenario on the balance sheet of an institution or group of institutions. Most stress tests involve common elements, such as the impact of changes in the yield curve, the exchange rate, or macroeconomic conditions on an institution's portfolio. Although such tests represent a significant advance in monitoring financial sector stability, their use is still relatively novel, and the robustness of their findings remains to be tested.[17] Moreover, while stress tests in the context of the FSAP were useful in integrating different perspectives and bringing out the linkages between prospective macroeconomic developments and the financial sector, in light of data limitations and the difficulty in formalizing the macro-financial linkages or the interlinkages within a financial system, the quantitative results of stress tests should not be overemphasized and should be interpreted with caution. There are also difficult choices in calibrating the tests appropriately.[18] In particular, stress tests should not be so extreme that their likelihood is implausibly small; on the other hand, certain "extreme" scenarios—such as sovereign defaults or devaluations under pegged exchange rates—may need to be included. Stress testing should be viewed as one methodological device among many that supplements the analysis undertaken in the FSAP.

40. The coverage of debt-sustainability issues in the Fund's financial sector surveillance efforts could be expanded in several ways. The stress-testing tools and techniques being developed could be more widely applied outside the FSAP (e.g., in Article IV consultation proper) to provide additional information on the possible extent of contingent liabilities, and the circumstances that could increase their magnitude. For example, the solvency of deposit insurance and implicit bank guarantee schemes and the likely fiscal burden could be analyzed under various macroeconomic scenarios. Sensitivity analysis could also be used to analyze the impact of different debt scenarios, for example, by showing the effect on the financial system of different adjustment paths for the stock of debt. All of this, however, would require a much greater allocation of resources to such exercises than is now envisaged.

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[16] See *Concluding Remarks by the Acting Chairman: Guidelines for Public Debt Management*, Executive Board Meeting 01/27, March 16, 200l, issued as BUFF/01/40.

[17] The forthcoming FSAP review will provide a more comprehensive discussion of lessons learned from experience with recent FSAPs, including on the design of stress tests.

[18] Such calibration difficulties are inherent to any form of stress or sensitivity tests, see Box 5, below.

D. Conclusions

41. While Fund staff currently undertake a variety of work forming the basis of sustainability assessments, this work has some limitations. The indicators used are not standardized and it is not always clear how they should be interpreted.[19] Medium-term projections are used for a variety of purposes, and although no overall bias has been established, in individual cases their validity may be in question. Sensitivity tests are an element in existing work to the extent that alternative scenarios are presented to examine risks and to differentiate among alternative policies. But this could be done in a more integrated and systematic way, even though progress will ultimately be limited by the availability of information, including that pertaining to the nature and magnitude of contingent liabilities. The next section proposes a framework that keys off the existing work of Fund staff, attempting to build on the strengths while remedying the weaknesses.

IV. A Proposed Framework

42. The proposed framework is intended to introduce a greater degree of consistency and discipline in sustainability analyses undertaken at the Fund. The aim is to use these ingredients to make better informed judgments possible, and to discipline these judgments by laying bare the basis on which they are made, rather than to distill a single measure of sustainability that would eliminate the need for judgment. The previous section suggests that, while limited in ambition, this would nonetheless be an important improvement on existing practice.

43. While the purpose is to provide greater uniformity and discipline to sustainability exercises, it is not intended that the framework be applied in a completely mechanical and rigid fashion—depending upon country circumstances, there may be good reasons for deviating from it to some extent.[20] At the same time, the basic logic of undertaking baseline sustainability analyses and calibrated sensitivity tests should apply across countries and, in any event, significant deviations from this practice should be noted and justified. Moreover, the framework is not intended to preclude the articulation of alternative scenarios in staff reports (as is currently done in some cases) but rather to ensure that at least some standard minimum set of stress tests are reported.

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[19] More generally, of course, the underlying economics behind movements of key indicators will have important bearing on sustainability assessments. For instance, a current account deficit and associated debt build-up would presumably be less problematic if it reflects additional productive investment, especially in the tradables sector.

[20] For instance, for oil-producing countries, the non-oil fiscal balance may merit special consideration, and a larger set of sensitivity tests based on oil price movements may be appropriate.

44. The framework may be useful in three different situations: For countries that have moderately high indebtedness, but are not facing an imminent crisis, the framework can help identify vulnerabilities—that is, how the country might eventually stray into "insolvency territory." For countries that are on the brink, or in the midst of a crisis, experiencing severe stress characterized by high borrowing costs or lack of market access, the framework can be used to examine the plausibility of the debt-stabilizing dynamics articulated in the program projections. Finally, in the aftermath of a default, the framework can be used to examine whether alternative structures and levels of restructured debt are consistent with projected outcomes.

45. As discussed, assessments of sustainability are probabilistic, since one can normally envisage some states of the world under which a country's debt would be sustainable and others on which it would not. But the proposed framework does not supply these probabilities explicitly; rather, it traces the implications of alternative scenarios and leaves the user to determine the probabilities that should be attached.

46. Further research will be required to identify the levels at which difficulties have typically emerged in particular groups of countries. Moreover, it is unlikely that any definitive "danger levels" can be established. By means of illustration, Appendix I considers some simple rules of thumb for assessing the external debt-to-GDP ratio. The analysis suggests that an external debt ratio of about 40 percent provides a useful benchmark. For countries with debt ratios below this level, the conditional probability of a debt crisis or "correction" is around 2-5 percent; for countries with debt ratios above this level, the conditional probability rises to about 15-20 percent. The estimated benchmark level thus provides a rough guide for assessing a country's debt ratio, with an appreciable increase in the probability of a crisis at debt levels above it . At the same time, it bears emphasizing that a debt ratio above 40 percent of GDP by no means necessarily implies a crisis—indeed, another way of looking at the results is that there is a 80 percent probability of *not* having a crisis (even when the debt ratio exceeds 40 percent of GDP).

47. More generally, the scenarios for the debt ratio generated by the framework need to be viewed in the context of the structure of the debt (such as its maturity structure, whether it is fixed or floating rate, whether it is indexed, and by whom is it held) as well as various vulnerability indicators (see Appendix II), and information provided by markets, including expectations of interest rates and spreads embedded in the position and shape of yield curves, access to new borrowing, and whether there have been interruptions in such access or difficulties in issuing long-term debt.[21] The framework also proposes a set of sensitivity tests, but further work will be necessary to settle on a precise calibration (see Box 5).

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[21] Other information that could be useful in assessing liquidity problems include, *inter alia*, (i) private market participants' assessments and investor recommendations, (ii) information or investor positioning, (iii) banks' share prices (vi) specifics on banks' subordinated debt;

(continued…)

48. While in principle the different aspects of sustainability—external, fiscal, and financial sector—are interrelated, the linkages between them are not explicitly modeled here. In particular, the framework focuses on the sustainability of the public and external debt dynamics, treating the interaction with the financial sector largely implicitly. As discussed above, while such interactions are likely to be important in practice, they do not lend themselves very easily to explicit quantification. The framework allows for certain aspects of the potential interactions—such as contingent liabilities in the assessment of the public debt dynamics—but it does not, for instance, incorporate a mapping from financial sector vulnerabilities (such as the share of non-performing loans, or the state and funding of deposit insurance scheme) to the magnitude and likelihood of such contingent liabilities being called.[22]

49. In general, the framework focuses on gross rather than net liabilities. In part, this is for pragmatic reasons—timely and consistent data on net investment positions data are not always available.[23] But there are also conceptual reasons. First, even if individual entities in the economy have external assets, they may not correspond to the entities that have external liabilities. Moreover, the liquidity aspect of sustainability, the risk of not being able to roll over existing debts, is likely to be related to gross financing needs. Similarly, while there are arguments both for and against focusing on gross versus net public sector liabilities, the framework generally focuses on gross liabilities.

50. Finally, it is worth noting that, in contrast to exercises such as the WEO, individual country projections in this framework are not constrained to be globally consistent. While such global consistency of real exchange rates and current account balances would be desirable, the only practical way of ensuring it would be to constrain individual projections of the real exchange rate and current balance to assume zero change from their current levels, compromising the accuracy of the projections.

(v) default probabilities estimated from credit default surges and bonds; and (vi) liquidity in secondary markets.

[22] Where indicators of financial sector vulnerability suggest serious weaknesses, some estimates of contingent liabilities would be required.

[23] Lane and Milesi-Ferretti (2001), "The External Wealth of Nations," *Journal of International Economics*, December, calculate net foreign liability positions for a large sample of countries, as of end-1998.

51. With these preliminaries, the framework consists of two presentations, for external and public sector debt sustainability analysis respectively (Tables 3-4).[24] The main block articulates the staff's central medium-term scenario,[25] with the assumptions and implications clearly laid out. In particular, it includes a decomposition of both the historical and the projected debt dynamics.[26] Such a decomposition is useful for identifying whether the purported stability of the debt ratio arises mostly from the behavior of interest rates, growth rates, inflation or real exchange rate movements, or through adjustment of the primary/trade balance.

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[24] Public sector would refer to the consolidated nonfinancial public sector, except for countries where sub-national governments and public enterprises do not borrow. Where data limitations preclude a comprehensive definition, these should be noted.

[25] In program cases, this would be the agreed program projection; in a surveillance case, it would be an articulation of the authorities' plans and proposed policies, as discussed with the staff.

[26] The decomposition is based on the debt dynamics equation:

$D_{t+1} = (1+r)D_t - TB_{t+1}$, where D is end-period debt in US dollars, and TB is the debt-creating component of the balance on goods and non-interest services. Let g denote real GDP growth, ρ the growth rate of US dollar value of the GDP deflator, d the external debt-to-GDP ratio, and tb the debt-creating component of the balance on goods and services (in percent of GDP), then:

$$d_{t+1} = \frac{(1+r)}{(1+g)(1+\rho)} d_t - tb_{t+1},$$

or:

$$d_{t+1}(1+g+\rho+g\rho) = (1+r)d_t - (1+g+\rho+g\rho)tb_{t+1}$$

Rearranging yields an expression for the change in the net debt ratio:

$$d_{t+1} - d_t = \frac{(r-g-\rho-g\rho)}{(1+g+\rho+g\rho)} d_t - tb_{t+1}$$

To this, needs to be added any increase in assets to arrive at the change in the gross debt ratio. (There will typically be a residual as well, because of valuation changes on cross-exchange rates, certain non-debt creating flows and numerical approximation.)

Table 3. External Sustainability Framework

I. Baseline Medium-Term Projections

							Projections		
	t-5	t-4	t-3	t-2	t-1	t	t+1	…	t+10
1 External debt/Exports of G&NFS									
2 External debt/GDP									
3 Change in external debt/GDP									
4 Net debt-creating external flows/GDP (lines 5+9+13)									
5 Current account deficit, excluding net interest payments/GDP									
6 Deficit in balance of G&S/GDP									
7 Exports of G&S/GDP									
8 Imports of G&S/GDP									
9 Minus net non-debt creating inflows/GDP									
10 Net foreign direct investment, equity/GDP									
11 Net portfolio investment,equity/GDP									
12 Net Unrequited transfers/GDP									
13 (r-g-(ρ+gρ))/(1+g+ρ+gρ))debt/GDP (lines 15/14)									
14 Adjustment factor: 1+g+ ρ+gρ									
15 (r-g-(ρ+gρ))debt/GDP (lines 16+17+18)									
16 r (interest rate) times debt/GDP									
17 minus g (real GDP growth rate) times debt/GDP									
18 minus (ρ + gρ) (ρ = US dollar value of GDP deflator, growth rate) times debt/GDP									
19 Residual, incl. change in gross foreign assets/GDP (lines 3-4)									
Memorandum Items: Key macro and external assumptions									
Nominal GDP (local currency)									
Nominal GDP (US dollars) 1/									
Real GDP growth (in percent per year)									
Consumer price index (change, in percent per year)									
Exchange rate (LC per US dollar, end period) 1/									
Real Exchange Rate (change, in percent per year)									
Nominal GDP deflator (in US dollars, change in percent per year)									
External interest rate (percent per year)									
Growth of exports of G&S (US dollar terms, in percent per year)									
Growth of imports of G&S (US dollar terms, in percent per year)									

II. Sensitivity Analysis for External Debt-to-GDP Ratio

1. If interest rate, real GDP growth rate, US$ GDP deflator growth, non-interest current account and non-debt flows (in percent of GDP) are at average of past 10 years									
2. If interest rate in year t and t+1 is average plus two standard deviations, others at baseline									
3. If real GDP growth rate in year t and t+1 is average minus two standard deviations, others at baseline									
4. If US$ GDP deflator growth in year t is average minus two standard deviations, others at baseline									
5. If non-interest current account (in percent of GDP) in year t and t+1 is average minus two standard deviations, others at baseline									
6. Combination of 2-5 using one standard deviation shocks									
7. Repeat 6 using "standard" standard deviations 2/									
8. One time 30% depreciation in year t (-30% GDP deflator shock), others at baseline.									
Memorandum Items									
Current account deficit, excluding interest payments (percent of GDP, average of past 10 years)									
Current account deficit, excluding interest payments (percent of GDP, standard deviation of past 10 years)									
Net non-debt creating inflows (percent of GDP, average of past 10 years)									
Interest rate (average of past 10 years)									
Interest rate (standard deviation of past 10 years)									
Real GDP growth rate (average of past 10 years)									
Real GDP growth rate (standard deviation of past 10 years)									
GDP deflator, US dollar terms (average of past 10 years)									
GDP deflator, US dollar terms (standard deviation of past 10 years)									

1/ Exchange rate projections are not normally explicitly reported in Fund staff reports.
2/ A set of "standard" standard deviations will eventually be provided to desks, according to the type of country (e.g. emerging market, oil exporter etc.)

Table 4. Public Sector Debt Sustainability Framework

I. Baseline Medium-Term Projections

							Projections			
	t-5	t-4	t-3	t-2	t-1	t	t+1	…	t+10
1 Public debt/Revenue									
2 Public debt/GDP									
3 Change in public debt/GDP									
4 Net debt-creating flows/GDP (lines 5+9+12)									
5 Overall deficit, excluding net interest payments/GDP (=primary deficit)									
6 Revenue/GDP									
7 Expennditure/GDP									
8 Minus net non-debt creating inflows/GDP									
9 Unrequited grants/GDP									
10 Privatization Receipts/GDP									
11 (r-g-(π+gπ))/(1+g+π+gπ))debt/GDP (lines 13/12)									
12 Adjustment factor: 1+g+ π+gπ									
13 (r-g-(π+gπ))debt/GDP (lines 14+15+16)									
14 r (interest rate) times debt/GDP									
15 minus g (real GDP growth rate) times debt/GDP									
16 minus (π + gπ) (π = GDP deflator, growth rate) times debt/GDP									
17 Residual, incl. change in assets (e.g. government deposits)/GDP (lines 3-4)									
Memorandum Items: Key macro and external assumptions									
Nominal GDP (local currency)									
Real GDP growth (in percent per year)									
Consumer price index (change, in percent per year)									
Exchange rate (LC per US dollar, end period) 1/									
Exchange rate (LC per US dollar, average of period) 1/									
Nominal GDP deflator (in US dollars, change in percent per year)									
Nominal GDP deflator (in local currency, change in percent per year)									
Average interest rate on government debt (percent per year)									
Growth of revenues (deflated by GDP deflator, in percent per year)									
Growth of expenditure (deflated by GDP deflator, in percent per year)									

II. Sensitivity Analysis for Public Debt-to-GDP Ratio

							Projections			
	t-5	t-4	t-3	t-2	t-1	t	t+1	…	t+10
1. If interest rate, real GDP growth rate, GDP deflator growth, primary balance and non-debt flows (in percent of GDP) are at average of past 10 years									
2. If interest rate in year t and t+1 is average plus two standard deviations, others at baseline									
3. If real GDP growth rate in year t and t+1 is average minus two standard deviations, others at baseline									
4. If GDP deflator growth in year t is average minus two standard deviations, others at baseline									
5. If primary balance (in percent of GDP) in year t and t+1 is average minus two standard deviations, others at baseline									
6. Combination of 2-5 using one standard deviation shocks									
7. Repeat 6 using "standard" standard deviations 2/									
8. One time 30% (average of period) depreciation in year t, others, except primary balance, at baseline.3/									
9. If debt ratio in year t rises by 10 percent of GDP, others at baseline 4/									
Memorandum Items									
Primary deficit (percent of GDP, average of past 10 years)									
Primary deficit (percent of GDP, standard deviation of past 10 years)									
Net non-debt creating inflows (percent of GDP, average of past 10 years)									
Interest rate (average of past 10 years)									
Interest rate (standard deviation of past 10 years)									
Real GDP growth rate (average of past 10 years)									
Real GDP growth rate (standard deviation of past 10 years)									
GDP deflator growth (average of past 10 years)									
GDP deflator growth (standard deviation of past 10 years)									

1/ Exchange rate projections are not normally explicitly reported in Fund staff reports.
2/ A set of "standard" standard deviations will eventually be provided to desks, according to the type of country (e.g. emerging market, oil exporter etc.)
3/ Requires separate calculation of the effect of the depreciation on foreign currency denominated debt and on the primary balance (e.g. if government receives oil royalties).
4/ This scenario is intended to capture contingent liabilities (e.g. financial sector restructuring costs) that may be assumed by the government.
Ideally, the shock would be calibrated to such costs (depending, for instance, on indicators of weakness of the financial system).

52. In formulating the baseline projection, it would, in general, be good practice to base projections of macroeconomic factors on central forecasts (e.g., the scenario should not achieve sustainability by assuming abnormally high growth rates). As regards policy variables, there may be a tension between realism and giving the authorities the benefit of the doubt. The approach adopted here allows for such optimism in the baseline scenario, as deemed appropriate by the staff, but attempts to keep unwarranted optimism in check by laying bare the underlying assumptions and examining the sensitivity of the baseline projection to alternative assumptions.

53. The second block therefore consists of a set of standard sensitivity tests around the medium-term scenario, examining the implications of alternative assumptions about policy variables, macroeconomic developments, and costs of financing. The first sensitivity test sets the key parameters to their historical averages. In effect, it shows the ambitiousness of the baseline projection relative to historical experience including, for instance, whether the adjustment envisaged in the baseline projection far exceeds the country's historical norm (which may give an indication of the social and political limits to adjustment). The other sensitivity tests consider adverse two-standard deviation shocks lasting two years to each of the key parameters in turn, and a one-standard deviation combined shock. The combined shock is also repeated using cross-country standard deviations as a robustness check. Finally, since the volatility of the real exchange rate may, historically, be low under a fixed exchange rate regime, an additional scenario in which there is a 30 percent real exchange rate depreciation is considered as well.[27] The public debt sustainability sheet also contains a scenario in which there is an initial exogenous increase in the debt ratio of 10 percent of GDP—intended to simulate the realization of a contingent liability—with the subsequent debt dynamics governed by the assumptions of the baseline scenario. Ideally, the magnitude of this shock would be related to indicators of financial sector vulnerability; at present, pending further research, it is set 10 percent of GDP.[28]

54. It bears emphasizing that, in designing the sensitivity tests, there are a number of important trade-offs (Box 5). For instance, should the shocks used in the sensitivity tests be calibrated on one or on two standard deviations? On the one hand, the shocks to the

[27] This corresponds approximately to a two-standard-deviation shock to the U.S. dollar value of the GDP deflator growth for the full sample considered in Box 5, below.

[28] The average cost of systemic bank restructuring (fiscal or quasi-fiscal outlays) reported in *Systemic Bank Restructuring and Macroeconomic Policy* (eds. Alexander et al,) is 11 percent of GDP, although there is substantial cross-country variation.

Box 5: Calibrating the Sensitivity Tests

A tricky issue is how to calibrate the sensitivity tests to the baseline scenario. A first point worth noting is that most emerging market and developing countries are subject to large shocks to key parameters (such as real GDP growth rates, interest rates, inflation rates, primary or trade balances), particularly in relation to the underlying averages. A simple, standardized measure of this is the ratio of the mean squared to the sum of the mean squared and the variance, $\mu^2/(\mu^2+\sigma^2)$, which ranges between unity and zero. The Table reports these statistics for some of the key parameters required for external debt sustainability analysis. As the Table indicates, typical values are under 0.5 (except for the interest rate), indicating a large volatility relative to the mean.

Second, there is large variation across countries—the interquartile range for average real GDP growth is 1.9 percent per year to 4.5 percent per year; the interquartile range for the standard deviation of the growth rate is 3.1 to 5.6 percent per year. This suggests that the sensitivity tests should generally be cast in terms of the country-specific standard deviations, rather than in terms of the absolute magnitude of the shock (e.g. a 1 percentage point decrease in real GDP growth). The main exception to this are the uniform shocks that will be applied to all countries, which may be cast in terms of absolute magnitudes (e.g. a 500 basis point increase in interest rates).

Third, there is an important trade off in setting the range of shocks to be considered. The range needs to be sufficiently encompassing to capture most of the risks to the scenario. On the other hand, if the envisaged shocks are too extreme, almost any country would appear "unsustainable," and the likelihood of such shocks materializing may be too remote to be of practical significance. Without knowledge of the precise probability distributions, it is difficult to determine the likelihood of, say, a two standard deviation shock. Chebyschev's inequality states that the probability of a shock more than k standard deviations from the mean is less than $1/k^2$. But this is a very loose bound—applying it to a two standard deviation shock, it implies only that the probability is less than 25 percent. Under specific distributional assumptions, tighter bounds may be established. For instance, if a Normal distribution is assumed, then the probability of a two standard deviation shock is approximately 2 percent—close to the empirical probabilities reported below (which are around 3-5 percent). Shocks may also exhibit serial correlation: if they are perfectly correlated, the probability of a two-year sequence of two standard deviation shocks would also be 3-5 percent, if they are perfectly uncorrelated, the probability of such a sequence is about 0.25 percent.[1] This suggests that casting the sensitivity tests in terms of a two-year sequence of two standard deviation adverse shocks, followed by a return to the historical mean, should capture most of the risks to the scenario—subject to the caveat that the historical data is sufficient to characterize the true underlying probability distributions.

1/ In the data set, there are a few instances of two-year sequence of adverse shocks that are more than two-standard deviations from the average, but almost none of three-year sequences of such shocks.

Table: Key Parameters for External Debt Sustainability Analysis 1/

	All	Transition	Excluding Official Financing Countries	Excluding HIPC countries	Africa	Asia	Middle East and Europe	Western Hemisphere	Fuel and Primary Product Exporters
1. Real GDP Growth									
Average (Sample median)	3.1	3.5	3.1	3.2	2.9	4.6	3.7	2.5	2.7
Sample 25th percentile	1.9	1.8	2.0	2.0	1.8	2.6	2.7	1.4	1.7
Sample 75th percentile	4.4	4.4	4.5	4.6	3.7	6.0	4.4	3.7	3.9
Standard Deviation (Sample median)	4.3	3.6	4.3	4.3	4.8	3.6	5.3	3.9	4.8
Sample 25th percentile	3.1	2.3	3.1	3.2	3.6	3.0	4.5	3.3	3.6
Sample 75th percentile	5.6	6.1	5.3	5.3	5.7	4.9	7.6	4.6	5.7
$\mu^2/(\mu^2+\sigma^2)$	0.3	0.5	0.3	0.4	0.3	0.6	0.3	0.3	0.2
Prob (GDP growth < $\mu-\sigma$)	13.8	17.6	14.3	13.8	13.6	11.3	12.7	13.5	13.1
Prob (GDP growth < $\mu-2\sigma$)	3.2	2.2	3.0	3.2	3.4	3.4	3.0	3.7	3.2
2. Interest Rate									
Average (Sample median)	4.5	4.9	5.5	5.5	2.4	4.5	5.3	6.1	3.7
Sample 25th percentile	2.0	3.6	4.0	3.9	0.7	1.6	3.8	4.3	1.6
Sample 75th percentile	6.6	6.3	7.4	7.8	4.0	6.6	6.8	9.0	5.6
Standard Deviation (Sample median)	1.7	1.2	2.4	2.4	1.6	1.7	2.0	2.4	1.9
Sample 25th percentile	1.0	0.9	1.7	1.2	0.9	0.9	1.4	1.8	1.1
Sample 75th percentile	3.0	1.7	3.4	3.3	3.1	2.6	3.9	3.1	3.3
$\mu^2/(\mu^2+\sigma^2)$	0.9	0.9	0.8	0.8	0.7	0.9	0.9	0.9	0.8
Prob (Interest rate > $\mu+\sigma$)	16.8	15.5	16.9	16.9	16.3	15.6	18.5	18.6	17.3
Prob (Interest rate > $\mu+2\sigma$)	4.2	2.7	4.0	3.7	4.4	3.2	5.5	5.4	5.1
3. GDP Deflator Growth (US dollar value)									
Average (Sample median)	2.3	6.4	2.4	2.3	0.7	1.6	1.9	4.0	1.5
Sample 25th percentile	0.8	2.7	1.2	1.1	-0.3	0.7	1.1	3.0	0.2
Sample 75th percentile	4.5	13.0	4.1	4.0	2.0	2.6	2.6	5.0	3.2
Standard Deviation (Sample median)	13.1	19.1	11.2	10.4	13.8	8.4	15.1	10.6	14.0
Sample 25th percentile	8.8	11.2	7.4	7.4	11.0	6.9	10.1	4.8	10.7
Sample 75th percentile	17.8	32.5	16.0	14.9	17.6	13.6	17.3	14.9	18.4
$\mu^2/(\mu^2+\sigma^2)$	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0
Prob (deflator growth < $\mu-\sigma$)	11.2	8.9	11.5	11.5	11.1	13.4	11.4	11.6	11.7
Prob (deflator growth < $\mu-2\sigma$)	2.2	0.0	2.0	1.8	2.5	2.6	2.9	2.8	2.5
4. Balance on goods and non-factor services (percent of GDP)									
Average (Sample median)	-6.5	-7.2	-5.2	-6.5	-5.8	-10.8	2.3	-8.5	-1.3
Sample 25th percentile	-14.0	-12.5	-16.0	-25.9	-11.5	-21.9	-11.8	-25.9	-9.9
Sample 75th percentile	0.9	-4.4	2.0	2.0	1.8	-3.7	17.5	0.1	6.8
Standard Deviation (Sample median)	5.6	4.5	6.0	6.1	5.7	6.1	9.5	4.8	6.5
Sample 25th percentile	3.6	2.7	3.8	3.8	3.3	3.3	6.1	3.8	4.1
Sample 75th percentile	8.8	7.2	9.8	9.4	7.7	9.0	13.5	7.7	9.9
$\mu^2/(\mu^2+\sigma^2)$	0.6	0.7	0.4	0.5	0.5	0.8	0.1	0.8	0.0
Prob (Trade Bal. < $\mu-\sigma$)	15.1	13.5	14.5	14.9	15.3	16.4	14.8	15.4	15.9
Prob (Trade Bal. < $\mu-2\sigma$)	2.1	1.0	1.8	1.8	2.0	2.6	2.1	2.6	2.6

Source: World Economic Outlook

1/ Sample period 1980-2001; except for transition economies, 1994-2001.

baseline scenario need to cover a reasonable proportion of the likely outcomes. On the other hand, under sufficiently large shocks, almost any country's debt dynamics may appear unsustainable. A further difficulty is that the shocks are likely to be correlated: low GDP growth rates will probably be associated with high interest rates; output declines will likely lead to larger fiscal deficits.[29] Yet there will seldom be sufficient data to estimate the joint probability distributions of the relevant variables (interest rates, GDP growth rates, etc.).[30] As a simple alternative, the envisaged framework uses the mean plus two standard deviations, as well as a scenario in which shocks occur simultaneously, while recognizing that further calibration of the sensitivity tests is likely to be necessary.[31] Indeed, given that most countries undertaking Fund-supported adjustment programs are likely to be going through a period of structural change, the relevant horizon over which to calculate the means and standard deviations is not clear. Typically, long horizons would help guard against excessive euphoria about a country's growth prospects following a growth spurt; conversely, there may have been so many structural changes that the distant past is of limited relevance. In general the framework proposes using the previous ten years to calculate the relevant averages and standard deviations, unless there have been significant structural changes or shocks in this period (such as transition from centrally planned economy, hyperinflation, currency crisis), in which case a five-year period may be more appropriate. [32]When too short a span of data are available for a country, cross-country parameters may need to be used instead. Finally, a judgment needs to be made about the serial correlation of the shocks, particularly as the

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[29] Indeed, a rising level of debt may itself result in lower GDP growth rates as a greater proportion of resources is devoted to servicing the debt and away from physical and human capital investment.

[30] For instance, even if one were willing to impose a joint Normal distribution (which has the advantage of being fully characterized by only the first two moments) and to treat the primary/trade balance as a policy variable, there would still be 8 parameters (the means, standard deviations, and correlations of the interest rate, real growth rate, and inflation/real exchange rate) to estimate. Taking Argentina as an example, there are 8 post-hyperinflation observations (1993–2001) available, unless one is willing to assume that the stochastic processes generating these variables was invariant to the hyperinflation (and other structural changes).

[31] By the Chebyschev inequality, for any well-defined probability distribution function, the probability of an outcome of more than k-standard deviations from the mean is less than $1/k^2$. While this does not require any specific distributional assumptions, it does, of course, assume that the sample mean and standard deviation provide a good estimate of the corresponding population moments.

[32] Alternatively, if the data are available, a much longer period (e.g., 20 years) could be used to arrive at unbiased estimates of the underlying averages and standard deviations.

projection horizon lengthens. A low growth rate in a given year may presage a recession, suggesting a positive serial correlation in at least the level of output, but it is unlikely that there would be repeated negative shocks to the output growth rate. As such, the sensitivity tests are based on a two-year sequence of two-standard deviation shocks followed by a return to the mean growth rates for the remainder of the projection horizon.

Examples

55. As an illustration of the use of the framework, Table 5 reports the baseline projection (together with the associated sensitivity tests) of Turkey's external sustainability,[33] as it would have been viewed at the time of the approval of the 1999 stand by arrangement.[34] Following the currency crisis in 1994, the external debt ratio had peaked at 52 percent of GNP. Thereafter, net debt-creating flows were negative, reflecting modest current account deficits together with real output growth and some real exchange rate appreciation (the latter two factors contributing more than 3 percent of GNP of net debt reduction in 1997 and 1998).

56. Under the program, the external debt ratio was projected to increase by some 10 percent of GNP, though much of this corresponded to an increase in central bank reserves so that net external debt was to remain roughly constant (in fact, to decline by about 2 percent of GNP between 1998 and 2001).

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[33] Projections for only three years (instead of 10 years) are shown so that projected and actual outcomes may be compared.

[34] In fact, the background paper to the 1999 Article IV (SM/99/294) consultation included some sensitivity tests on external sustainability. Those tests, however, were designed to calculate the maximum allowable current account deficit consistent with stabilizing the debt ratio, under alternative assumptions about the behavior of macroeconomic variables such as growth rates and interest rates. In the event, the main shock came from a wider-than-expected current account deficit due to higher oil prices and non-oil imports.

Table 5. External Sustainability Framework Applied to Turkey (1999)

I. Baseline Medium-Term

							Projection					Actu		
	t- 199	t- 199	t- 199	t- 199	t- 199	t- 199	t 199	t+ 200	t+ 200	Increa 1998-	t 199	t+ 200	t+ 200	Increa 1998-
1 External debt/Exports	29.	220.	191.	169.	157.	169.	217.	223.	210.		214.	211.	212.	
2 External	34.	51.	43.	44.	44.	47.	**49.**	**53.**	**57.**	***10.***	**52.**	**57.**	**76.**	***29.***
3 Change in external	.	16.	-	0.	-	2.	2.	3.	3.		5.	4.	19.	
4 Net debt-creating external		14.	-	-	-	-	1.	-	-	-	3.	3.	22.	29.
5 Current account deficit, excluding	1.	-	-	-	-	-	-	-	0.		-	1.	-	
6 Deficit in balance of	-	-	3.	3.	3.	1.	1.	2.	-		3.	7.	1.	
7 Exports of	13.	23.	22.	26.	28.	27.	22.	23.	27.		24.	26.	36.	
8 Imports of	-	22.	25.	30.	32.	29.	24.	26.	26.		27.	34.	37.	
9 Minus net non-debt creating		-	-	-	-	-	-	-	-		-	-	0.	
1 Net foreign direct investment,	0.	0.	0.	0.	0.	0.	0.	0.	0.		0.	0.	2.	
1 Net portfolio		0.	0.	0.	0.	0.	0.	1.	1.		0.	0.	-	
1 (r- ρ+ρ))/(1+ρ+ ρ))debt/GDP (lines	0.	22.	-	1.	-	-	3.	0.	-		5.	2.	28.	
1 Adjustment ρ+ ρ		0.	1.	1.	1.	1.	1.	1.	1.		0.	1.	0.	
1 (r- ρ+ρ))debt/GDP (lines		14.	-	1.	-	-	3.	0.	-		5.	2.	20.	
1 r (interest rate) times	0.	2.	3.	2.	2.	2.	2.	2.	3.		2.	3.	3.	
1 minus g (real GDP growth rate)	0.	2.	-	-	-	-	1.	-	-		2.	-	5.	
1 min (ρ+ ρ) ρ= US dollar value of GDP deflator, gr	0.	10.	-	1.	0.	-	-	0.	-		0.	2.	11.	
1 Residual, incl. change in gross foreign		2.	4.	1.	2.	7.	0.	5.	6.		2.	0.	-	

II. Sensitivity Analysis for External

1. If interest rate, real GDP growth rate, US$ GDP deflator growth, and non-debt flows (in percent of GDP) are at	**45.**	**49.**	**53.**	***6.***
2. If interest rate in year t and t+1 is average plus two standard	**50.**	**54.**	**58.**	***11.***
3. If real GDP growth rate in year t and t+1 is average minus two	**52.**	**62.**	**67.**	***20.***
4. If US$ GDP deflator growth in year t is average minus two	**83.**	**88.**	**95.**	***48.***
5. If non-interest current account (in percent of GDP) in year t and t+1 is average minus	**52.**	**57.**	**58.**	***11.***
6. Combination of 2-5 using one	**63.**	**89.**	**94.**	***47.***
7. Repeat 6 using "standard"				
8. One time 30% depreciation in year t (-30%	**71.**	**75.**	**80.**	***33.***

1/ May not precisely match projections made by staff at the time of program approval due to data revisions or because
2/ Exchange rates are not normally explicitly
3/ In view of Turkey's currency crisis in 1993/94, 5 year averages
4/ A set of "standard" standard deviations will eventually be provided to desks, according to the type of

57. In the event, the debt ratio rose by almost 30 percent of GNP. To analyze why the projected path was not realized, it is useful to consider the period 1999 to 2000—when net debt rose by 7 percent of GNP (instead of the projected ½ percent of GNP)—separately from 2002, when there was a sharp devaluation following the abandonment of the crawling peg regime. During the period 1999-2000, the main source of error was the trade deficit, which, over the two years combined, was some 6 percent of GNP wider than projected.[35] In 2002, the depreciation of the exchange rate contributed some 11 percent of GNP to the increase in the net debt ratio, which, together with higher interest rates, lower GNP growth, and a larger trade deficit resulted in a 22 percent of GNP increase in the debt ratio.

58. The sensitivity tests indicate that the program baseline scenario was somewhat optimistic compared to historical trends. Using five-year averages for the key parameters, net debt would have increased by some 6 percent of GNP, rather than the 2 percent of GNP decline projected under the program. More importantly, the sensitivity tests would have made clear the risks to the projection. In particular, the outcome of a 7 percent of GNP increase in the debt ratio between 1998-2000 (i.e. prior to the devaluation) was within the two-standard deviation shocks to either the interest rate, the real GDP growth rate, or the non-interest current account deficit. Moreover, the two devaluation scenarios—either the two-standard deviation shock to the U.S. dollar deflator growth rate, or the standard 30 percent devaluation shock—would be sufficient to generate the eventual outcome of a 29.4 percent increase in the net debt ratio observed between end-1998 and end-2001.

59. Table 6 reports a similar exercise for Argentina, as it might have been viewed at the beginning of 1999. The baseline projection delineated here provides an approximate reconstruction of the program projections made in early 1999, with the debt ratio projected to increase by 2 percentage points, from 47.3 percent of GDP 1998 to 49.3 percent of GDP in 2001.[36]

60. Over the previous five years, there had been a substantial increase, of some 14 percentage points, in the debt-to-GDP ratio, largely because the interest rate had outstripped the growth of nominal GDP (in US dollar terms). Over the projection period,

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[35] This reflected, in part, the steep rise in oil prices, but also underestimation of the income elasticity of imports. In addition, growth in 1999 was more negative than expected, contributing some 3 percent of GNP to the increase in the debt stock, but this was offset by higher-than-expected growth in 2000.

[36] For a variety of reasons, it is not possible to reconstruct the program projection precisely. In particular, the projection of the *level* of debt differs from the actual program projection made at the time, due to revisions in the debt and national accounts data. The program projection for the *increase* in the debt ratio, however, is approximately the same—i.e., 2 percent of GDP (from 37 percent of GDP in 1998 to 39 percent of GDP in 2001).

smaller trade deficits were projected to help stabilize the debt ratio. In the event, the debt ratio actually rose by about 8 percent of GDP mostly because real GDP growth was weaker than expected and deflation raised the real debt burden.[37]

61. Would the sensitivity tests have indicated such an outcome? The first sensitivity test repeats the projections using the historical averages of the relevant variables. Since Argentina underwent a hyperinflation in the early 1990s, five-year instead of ten-year averages are used. Under this sensitivity test, the debt ratio would have *decreased* by about 2 percentage points of GDP, suggesting that the baseline scenario was somewhat pessimistic (mainly because the program assumed a larger non-interest current account deficit than had been the historical average). Two-standard deviation shocks to the interest rate, the deflator, or the non-interest current account deficit are sufficient to raise the debt ratio by some 3 to 6 percent of GDP—shy of the 7.8 percent of GDP increase that was realized. A two-standard deviation shock to real GDP growth, however, would have raised the debt ratio by 10 percent of GDP, as would the one-standard deviation combined shock.[38] These scenarios would have implied debt ratios of almost 60 percent of GDP—a level that is particular worrisome in view of Argentina's low export-to-GDP ratio (see Appendix I).

V. Conclusions and Next Steps

62. This paper has outlined a framework for assessing members' external sustainability. The intention is to provide a tool to help staff examine systematically the evolution of members' debt dynamics under alternative assumptions regarding the macro economy, the

[37] Under the pegged exchange rate regime, inflation raises the dollar value of nominal GDP while deflation decreases it.

[38] It is worth noting that the U.S. dollar value GDP deflator shock raises the debt ratio by only 5 percent of GDP, reflecting the low real exchange rate volatility of the currency board arrangement. For this reason, the sensitivity tests include a 30 percent devaluation shock, which would have raised the debt ratio by 27 percent of GDP.

Table 6. External Sustainability Framework Applied to Argentina (1999)

I. Baseline Medium-Term

						Projections				Actua			
	t-5	t-4	t-3	t-2	t-1	t	t+1	t+2	Increas	t	t+1	t+2	Increas
	1994	1995	1996	1997	1998	1999	2000	2001	1998-	1999	2000	2001	1998-
1 External debt/Exports of	441.	398.	391.	405.	455.	478.	458.	434.		520.	472.	480.	
2 External	33.6	38.1	40.4	42.7	47.3	**48.7**	**49.3**	**49.3**	***2.0***	**51.0**	**51.4**	**55.1**	***7.***
3 Change in external	2.8	4.5	2.3	2.3	4.6	1.4	0.6	0.0		3.7	0.5	3.6	
4 Net debt-creating external flows/GDP (lines	-0.6	-1.0	-2.0	-2.0	1.7	1.1	0.5	0.4		3.6	0.1	2.7	
5 Current account deficit, excluding interest	2.5	-0.8	-0.1	1.1	1.4	1.7	1.4	1.6		0.2	-1.2	-2.6	
6 Deficit in balance of	4.2	1.5	1.9	3.5	3.8	2.8	2.4	2.1		2.7	0.6	-1.4	
7 Exports of	7.6	9.6	10.3	10.5	10.4	10.2	10.7	11.3		9.8	10.9	11.5	
8 Imports of	11.8	11.0	12.2	14.1	14.2	13.0	13.2	13.4		12.5	11.5	10.1	
9 Minus net non-debt creating	-2.4	-2.2	-2.7	-3.3	-2.3	-2.5	-1.8	-1.9		-3.2	-2.9	-2.2	
10 Net foreign direct investment,	1.4	1.7	2.3	2.8	2.3	2.5	1.8	1.9		3.2	3.0	2.2	
11 Net portfolio	1.1	0.4	0.4	0.5	-0.1	0.0	0.0	0.0		0.0	0.0	0.0	
12 (r-g-ρ+gρ))/(1+gρ+gρ))debt/GDP (lines	-0.6	2.0	0.9	0.1	2.6	1.9	0.9	0.7		6.6	4.2	7.4	
13 Adjustment factor: ρ+gρ	1.1	1.0	1.1	1.1	1.0	1.0	1.1	1.1		0.9	1.0	0.9	
14 (r-g-ρ+gρ))debt/GDP (lines	-0.7	2.0	0.9	0.1	2.6	2.0	1.0	0.8		6.2	4.2	7.0	
15 r (interest rate) times	2.0	2.5	2.8	3.3	3.5	3.6	3.8	3.9		3.8	4.4	4.4	
16 minus g (real GDP growth rate) times	-1.8	1.0	-2.1	-3.3	-1.6	-1.2	-1.9	-2.2		1.6	0.4	1.9	
17 minu (ρ+ gρ) (ρ = US dollar value of GDP deflator, growth rate) times	-0.9	-1.5	0.2	0.2	0.7	-0.4	-0.9	-0.9		0.8	-0.5	0.8	
18 Residual, incl. change in gross foreign assets/GDP	3.4	5.5	4.3	4.3	2.9	0.3	0.1	-0.4		0.1	0.4	0.9	

II. Sensitivity Analysis for External Debt-to-

1. If interest rate, real GDP growth rate, US$ GDP deflator growth, non-interest and non-debt flows (in percent of GDP) are at average of	**46.9**	**46.3**	**45.3**	***-2.0***
2. If interest rate in year t and t+1 is average plus two standard deviations,	**49.3**	**50.4**	**50.3**	***3.0***
3. If real GDP growth rate in year t and t+1 is average minus two standard deviations,	**52.2**	**57.4**	**57.7**	***10.4***
4. If US$ GDP deflator growth in year t is average minus two standard deviations,	**51.2**	**52.3**	**52.7**	***5.4***
5. If non-interest current account (in percent of GDP) in year t and t+1 is average minus two standard	**50.4**	**53.0**	**52.3**	***5.0***
6. Combination of 2-5 using one standard	**51.9**	**57.5**	**57.4**	***10.1***
7. Repeat 6 using "standard" standard				
8. One time 30% depreciation in year t (-30% GDP	**70.4**	**72.6**	**74.2**	***26.9***

1/ May not precisely match projections made by staff at the time of program approval due to data revisions or because projections reported were not
2/ Exchange rate projections are not normally explicitly reported in
3/ In view of the hyperinflation in Argentina in the early 1990s, averages and standard deviations are calculated over
4/ A set of "standard" standard deviations will eventually be provided to desks, according to the type of country (e.g. emerging

external environment and politically and socially feasible adjustment effort. In conjunction with other sources of information and analyses—such as EWS models and market data—the framework can help inform the Fund's decisions on program targets, access levels, and the possible need for debt restructurings. Naturally, such judgments will continue to be made on a case-by-case basis, taking into account the implications for member's economy, but also the possible contagion and systemic ramifications in line with the Fund's mandate.

63. An important question is how such a framework could be incorporated into staff reports. It is envisaged that the framework will be progressively applied and included in Article IV staff reports and in staff reports for use of Fund resources in the GRA, with appropriate modifications as indicated by initial experience.[39] Making such assessments public, in line with existing practice for staff reports, would help strengthen the credibility of staff assessments by making it clear that there has been an explicit assessment of the risks surrounding the baseline scenario. Most of the elements of the assessment are information that is already available in principle to market participants. While the sensitivity tests would be a new element, it must be borne in mind that similar tests are undertaken by financial institutions.

64. The resource costs of applying the proposed framework to surveillance of all emerging market countries and all requests for Fund resources in the GRA, while not trivial, are likely to be relatively modest, given that it is based on the medium-term framework that should already be a standard part of staff work. Assembling the various vulnerability indicators that place into context the sustainability scenarios (as described in Appendix II) would be more onerous and, in some instances, may require substantial statistical work by country authorities, possibly leading to requests for increased technical assistance.[40]

65. Beyond the present framework, further research work will be necessary to develop more sophisticated models and methods for assessing sustainability—though it is unlikely that such work, to any great extent, will narrow the need for judgment in making assessments. Such work will need to focus, in particular, on fleshing out the linkages between the financial sector and the public and external debt dynamics. While the framework in its current form highlights some of these connections, it does not fully integrate them. For instance, financial sector restructuring costs are an important contingent liability for the

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[39] The precise format in which these tables will be included and how to avoid overwhelming the reader is yet to be decided.

[40] In a number of countries, significant deficiencies exist in the coverage of the public sector accounts and in the availability of some external sector data, such as the breakdown of foreign exchange-linked debt by sector, that will necessitate additional efforts to compile balance of payments and international investment position statistics.

budget,[41] but further work will be necessary to map the outputs of the FSAP process to obtain plausible magnitudes for conducting the sensitivity tests. More generally, the framework will need to be integrated with other work on financial sector vulnerabilities, the "balance sheet" approach to assessing vulnerability based on linkages between the private financial and nonfinancial sectors and the government sectors,[42] as well as forward-looking market information on yield curves, evolution of spreads, and the duration and terms of emerging markets countries' access to capital markets.[43]

66. A related task for staff is to reach firmer views about the "danger" threshold levels of various debt indictors, either in isolation or perhaps combined in a composite indicator of sustainability. Here experience suggests that it is probably impossible to arrive at clear warning indicators, a view shared by a panel of outside experts convened for a seminar on assessing sustainability.[44] Yet, information, including on sovereign borrowing spreads for countries that eventually defaulted, may be useful for ascertaining conditions under which it might be difficult for countries to come back from the brink.

67. This is an ambitious agenda for future research, but the enhancements to the framework would make it all the more valuable as an input to surveillance discussions and the program design process.

VI. Issues for Discussion

68. Directors may wish to focus on the following issues.

- Directors may wish to comment on the proposed framework for assessing sustainability. Do Directors believe that the objective should be to bring together relevant information as a basis for better informed judgment, or rather that an attempt should be made to generate a single indicator of sustainability that could largely remove the need for judgment in individual cases? Do Directors agree that the proposed elements of the framework are those that would be most useful in informing

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[41] See, in particular, sensitivity test 9 in the public sector debt dynamics template.

[42] See "Balance Sheet Approach to Assessing Vulnerability to Crises, and Policy Responses," forthcoming.

[43] A further task will be to consolidate individual country assessments to make sure that global "adding-up" constraints are respected. For instance, what are the implications of say countries tightening fiscal policy simultaneously? And how are aggregate borrowing needs related to the available supply of credit?

[44] This seminar was held at Fund headquarters on February 8, 2002.

decisions on access and in surveillance of emerging markets, or are there further elements that merit inclusion?

- The paper notes a tension between the need to avoid excessive optimism in forecasts and the importance of tailoring projections to country-specific circumstances. The proposes framework addresses this tension by laying bare the assumptions underlying the projections and subjecting them to stress tests, rather than seeking to standardize the basis on which projections are made. Do Directors support this approach?

- Directors may wish to comment on the proposed coverage of the framework as background for all requests on access to Fund resources in standby and extended arrangements and in connection with all Article IV consultations for emerging market countries.

- Directors may wish to comment on whether the information presented in the proposed framework, including the indicators, medium-term projections and sensitivity tests, should be made public.

- Directors may also wish to comment on the suggested next steps in developing and applying this framework and the work program proposed for strengthening various elements.

Assessing External Debt Sustainability—An Indicative Threshold Approach

69. The framework proposed in Section IV focuses on the dynamics of the (external or public) debt ratio, while leaving open the question of whether the *level* at which the debt ratio is likely to be stabilized is appropriate. Yet clearly this is not a matter of indifference: a (modestly) increasing debt ratio from a "low" initial level of indebtedness is likely to entail less risk than stability of the debt ratio at a "high" level of debt (though, of course, the latter is preferable to an increasing debt ratio from a high level). The difficulty lies in defining "high" and "low"—in some instances, countries have run into debt servicing difficulties (a "debt crisis") at moderately low levels of debt, while others have been able to support much higher levels of indebtedness. While thresholds have been established in certain instances for particular groups of countries (such as the HIPC Initiative, see Appendix I, Box 1), in general, country specific factors and circumstances are likely to be at play, and there will likely be a large element of judgment involved in assessing whether an individual country's debt exceeds prudent levels. Nonetheless, to help inform such assessments, this appendix surveys some of the cross-country evidence on external debt.[45]

70. The first challenge is to define a "debt crisis." One method is define a crisis as an event in which there are arrears (above some *de minimis* threshold) of principal or interest on external obligations towards commercial creditors (banks or bondholders), or in which the country reschedules or restructures its commercial debt. A number of empirical studies use such indexes (see Appendix I, Box 2); the index adopted here is taken from Detragiache and Spilimbergo (2001; D&S). The drawback of this approach is that it excludes external payments difficulties that do not result in formal arrears or rescheduling as well as instances in which, faced by an unsustainable debt burden, the country anticipates a crisis by taking corrective adjustment. An alternative approach, therefore, considers all cases in which there is a sharp decline or "correction" of the debt-to-GDP ratio (again, beyond some *de minimis* threshold), regardless of whether this correction comes about through debt default, debt restructuring, or a deliberate adjustment effort (see Appendix I, Box 3).

71. Over the period 1979-2001, the D&S index identifies 43 debt crises, while the second method identifies 53 debt corrections—roughly 10 percent of the observations.[46] Figure 1

[45] This appendix considers only external debt; a similar analysis can be undertaken for public debt, though it is difficult to obtain comparable cross-country data. An alternative approach would be to construct a full "early warning" model of debt crises/corrections, perhaps using a probit framework, from which each individual country's probability of a crisis may be obtained. The approach adopted here is to try to obtain some simple rules-of-thumb against which a country's debt ratio may be assessed.

[46] The data cover all IMF member countries, except the advanced industrialized countries, in five year averages over the period 1979-2001; transition countries are included over the period 1994-2001.

graphs the relative frequency distribution of the peak debt ratios associated with these 53 debt corrections. While the distribution of the debt/GDP ratio ranges widely—from less than 10 percent to more than 150 percent—about two-thirds of the observations occur at a debt/GDP ratio of below 60 percent and more than three-quarters of the observations occur at a debt/GDP ratio of below 70 percent. Excluding HIPC-eligible countries or those that rely primarily on official financing, the peak debt ratios are lower, with three-quarters of the observations occurring at debt ratios below 60 percent of GDP. Figure 2 graphs the corresponding frequency distribution for the 43 D&S index debt crises, where about three-quarters of the observations occur at debt ratios below 60 percent of GDP. While any cut-off of the distribution (e.g. three-quarters of the observations) is necessarily arbitrary, both indexes suggest that, when debt crises or corrections occur, they typically do so at debt ratios below 50-60 percent of GDP.[47]

72. A more formal method of establishing a threshold level of debt is by means of a *binary recursive tree* (BRT). In its simplest form, with a single explanatory variable, a BRT chooses a threshold value of debt, $\hat{d}$, that best discriminates between crisis and non-crisis cases in the sense of minimizing the sum of Type I and Type II errors.[48] Table 1 reports, for a variety of samples, the unconditional probability of a crisis/correction, the estimated threshold value, $\hat{d}$, and the associated conditional probabilities. For instance, in the full sample, there are 53 crisis cases out of 508 observations, so the unconditional probability of a debt crisis is 0.104. The estimated debt threshold is $\hat{d} = 44.7$ percent of GDP and there are 233 observations with $d \leq \hat{d}$, of which 14 entailed a debt crisis nonetheless, so the conditional probability of a debt crisis for countries with debt-to-GDP ratios below 44.7 percent is $14/233 \approx 0.06$. Conversely, there are 275 observations with $d > \hat{d}$ of which 39 entailed a debt crisis, so the conditional probability of a debt crisis for countries with a debt-to-GDP ratio above 44.7 percent is $39/275 \approx 0.14$

73. Across samples, and using either index, the estimated threshold is a debt level of about 40 percent of GDP. For countries whose debt falls below this threshold, the conditional probability of a debt crisis or correction is typically 2-5 percent; for countries above the threshold, the conditional probability is about 15-20 percent. The estimated threshold thus

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[47] This is not quite the same as saying that there is a high likelihood of a debt crisis/correction whenever debt exceeds 50-60 percent of GDP; recall that the unconditional probability—across all debt ratios—is about 10 percent.

[48] It is also possible to weight the relative cost of Type I and Type II errors in the penalty function. A more general BRT allows for multiple explanatory variables and multiple branchings of the decision tree. These are not estimated here because the small number of crisis observations makes the method unreliable.

provides a very rough guide for assessing a country's debt ratio, with an appreciable increase in the likelihood of a debt crisis or debt correction as the debt ratio rises above 40 percent of GDP. At the same time, it bears emphasizing that a debt ratio above 40 percent by no means necessarily implies a debt crisis—indeed, another way of looking at the results is that there is a 80 percent probability of *not* having a crisis (even if the debt ratio exceeds 40 percent of GDP).

74. Moreover, as emphasized in the text, no single indicator is likely to capture fully the likelihood that a country's debt will prove unsustainable. In the context of external debt, the "transfer problem" implies that a country must generate trade surpluses to service its debt. Taking as given the degree of possible import compression, this implies that, among other factors, the export/GDP ratio (or debt export or debt service/export) ratio will be relevant as well. Figure 3 therefore plots the bivariate frequency distributions of the peak debt ratios, analogous to Figures 1 and 2, but split by the export/GDP ratio. The Figure indeed suggests that the peak debt ratios that can be supported are higher the greater the export ratio. For example, of the observations that occur at export ratios below 20 percent, three-quarters occur at a debt ratio below 60 of GDP; of the observations that occur at export ratios between 20 and 40 percent of GDP, the corresponding debt-GDP ratio is 60-80 percent. Likewise, when the debt service-to-export ratio is low, the debt-GDP ratio can be higher.

75. Table 2 reproduces the binary recursive tree estimates for the debt threshold, but allowing for various export-GDP ratios. As expected, the estimated debt threshold increases with higher export ratios. For the debt correction index, the threshold increases from 45 percent of GDP to almost 50 percent of GDP when countries with export ratios below 10 percent are excluded. For the D&S debt crisis index, the threshold increases from 40 percent of GDP to 53 percent of GDP (and 65 percent of GDP for countries with export ratios above 40 percent, although such observations are very few).

Appendix I, Box 1. The HIPC Initiative Framework

The HIPC Initiative framework aims to reduce the debt burdens of heavily indebted poor countries to more sustainable levels. Eligibility for debt relief under the Initiative is limited to countries that are IDA-only and PRGF-eligible. Countries must also demonstrate a track record of policy performance.

The determination of debt relief under the Initiative is based on qualifying thresholds for debt remaining after the full application of traditional debt relief mechanisms. Traditional relief includes a stock-of-debt operation on Naples terms[1] by the Paris Club and comparable treatment by non-Paris Club official bilateral and commercial creditors (multilateral creditors do not provide traditional relief). The thresholds for determining HIPC relief are (i) a ratio of the net present value (NPV) of debt to exports[2] above 150 percent; or (ii) for very open economies,[3] a ratio of the NPV of debt to government revenue above 250 percent.[4] The NPV,[5] rather than the nominal stock, of debt is used because it reflects the relative degree of concessionality of the country's debt. By taking into account the concessionality of debt, the NPV is a more accurate measure of a country's effective debt burden. Countries with debt ratios above the thresholds after traditional relief qualify for HIPC relief. The HIPC Initiative also set targets for debt service ratios of 15-20 percent of exports (20-25 percent under the original framework), but in practice debt relief brought the debt service ratios faced by HIPCs much below these targets—and often into the single digits.

The HIPC Initiative utilizes the concept of external public and publicly-guaranteed debt outstanding and disbursed (as opposed to debt committed), and includes arrears. Domestic debt is not included in the calculations, which is consistent with treatment by the Paris Club. The inclusion of domestic debt in the debt stock for HIPC relief purposes could prove very disruptive to the limited domestic financial markets in HIPCs. Once a country qualifies for relief under the Initiative, the relief to be delivered by each creditor is determined based on each creditor's exposure, in NPV terms after traditional relief.

In 1999, the HIPC Initiative was enhanced to provide broader, deeper, and faster debt relief. The modifications to the Initiative included a reduction in the debt sustainability thresholds from a range of 200-250 percent to 150 percent for the NPV of debt-to-exports ratio, and from 280 percent to 250 percent for the NPV of debt-to-revenue ratio. The new thresholds were to provide a more substantial cushion for HIPCs to be able to meet their debt service obligations in the face of external shocks.

A country can be said to achieve debt sustainability if it can meet is current and future external debt service obligations in full, without recourse to debt rescheduling or the accumulation of arrears, and without compromising growth. Analytically, the there are three key determinants of debt sustainability: (i) the existing stock of debt and its repayment terms; (ii) the development of a country's fiscal and external repayment capacity; and (iii) the growth, composition, and terms of new external financing. Maintaining debt sustainability after debt relief remains an important challenge for HIPCs.

1/ Naples terms provides for a 67 percent NPV reduction of pre-cutoff date commercial (non-ODA) debt, and a rescheduling over 40 years with 16 years' grace for pre-cutoff date ODA debt. The cutoff date is a concept used by the Paris Club and differs for each country.

2/ The three year average of exports of goods and services (consistent with the IMF *Balance of Payments Manual*, 5th edition, 1993) ending in the last year for which actual data is available, is used for the calculation of HIPC relief. This average is used to avoid situations where exports may be unusually high or low in the base year (i.e., the year on which the DSA is based).

3/ Countries for which the exports-to-GDP ratio is at least 30 percent, and whose central government revenue-to-GDP ratio is at least 15 percent.

4/ Central government revenue, excluding grants. This is consistent with the objective of releasing government resources from external debt service, which in HIPCs is mostly undertaken by the central government, to spending in priority areas. Also, information on revenue on a wider basis is not available for most of those countries.

5/ Under the HIPC Initiative framework, currency-specific commercial interest reference rates (CIRRs) are used as discount rates when calculating the NPV of debt.

Appendix I, Box 2. Literature Survey on Debt Sustainability

Although debt crises in the early 1980s spurred academic research on debt sustainability and underlying causes of crises, most of the empirical literature in the 1990s has focused on currency crises rather than debt sustainability.

A few notable exceptions are Detragiache and Spilimbergo (2001) and Reinhart (2002). Detragiache and Spilimbergo (2001) analyzed the relationship between debt crises and external liquidity by using a large panel sample of 69 countries over 1970-98. They identified 54 debt crises in total by the occurrence of a default on commercial debt, a rescheduling, or a debt reduction agreement.[1] The results of the probit analysis indicate that, after controlling the effects on debt crises of macroeconomic variables and debt characteristics, less liquid countries are more likely to default on their external debt. Liquidity variables, measured by the share of short-term, debt service due and reserves, continue to be highly significant in various model specifications and stress tests, while it was not the case for other variables. Reinhart (2002) also used a large panel sample to investigate the predictive power of sovereign credit ratings for currency crises and defaults on external debt. Within the framework of signals approach and by using the sample that includes 59 countries and spans 1970-1999, she found a strong link between currency crises and default in developing countries: about 85 percent of all defaults in the sample are linked with currency crises.[2] Another major finding was that sovereign credit ratings systematically fail to anticipate currency crises, but do considerably better predicting defaults.

Although these studies explore whether debt crises are predictable—and if so, what indicators are important in predicting crises—they did not directly address the more complex issues involved in the assessment of debt sustainability, particularly those associated with setting the appropriate threshold values of various sustainability indicators, and hence, provide only limited reference.[3]

In this context, the studies of the IMF and World Bank on the debt sustainability of highly indebted poor countries (HIPCs) would appear to be more relevant, despite the reservation that the methodology employed and judgment made for HIPCs are unlikely to be fully applicable to other developing countries. As noted, for example in IMF(1996), the ratios to export earnings of current debt service and/or the net present value of all future debt-service payments were chosen as the most direct indicators of external sustainability. And levels of 20-25 percent and 200-250 percent for these indicators were suggested as thresholds which, if exceeded, may presage imminent debt-servicing difficulties. Those thresholds are arguably based on an empirical analysis of the experience of developing countries and their debt service performance over time, but the scope of the underlying empirical analyses seems to be limited with only a small number of countries included in the sample.[4]

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1/ They classify an observation as a debt crisis if either or both of the following conditions occur: 1) there are arrears of principal or interest on external obligations toward commercial creditors (banks or bondholders) of more than 5 percent of total commercial debt outstanding; 2) there is a rescheduling or debt restructuring agreement with commercial creditors as listed in the World Bank's *Global Development Finance*.

2/ In the study, currency crises were identified by using the crisis index developed by Kaminsky and Reinhart(1999), while the episodes of defaults were dated by relying on the cases documented by Beim and Calomiris(2001), Detragiache and Spilimbergo(2001) and others. In the sample used to analyze the interaction between defaults and currency crises, there are a total of 106 defaults and 154 currency crises, of which 135 are in emerging markets.

3/ For currency crises, the signals or indicator approach was extensively explored in many studies. See Frankel and Rose(1996), Goldstein, Kaminsky and Reinhart(2000), and Kaminsky, Lizondo and Reinhart(1998), among others.

4/ For more detail, see Underwood(1990) and Cohen(1995).

Appendix I, Box 3: Identifying Debt Corrections and Peak Debt Ratios

Conceptually, a debt "correction" is a large reduction in the debt-to-GDP ratio which comes about either because of debt default or restructuring, or because of corrective adjustment policies. To make this concept operational, however, requires identifying the peak of the debt ratio as well as a judgment about how large a reduction in the debt ratio qualifies as a "correction."

Most of the difficulties in identifying the peak debt ratio stem from exchange rate devaluations that distort the debt ratio. While a steady rate of devaluation is likely to feed into domestic inflation (and nominal GDP) thereby limiting the distortion of the debt ratio, a spike in the devaluation rate may result in a significant increase in the debt ratio even though the level of GDP or of GDP measured in local currency has remained relatively constant.

In constructing the data set, an isolated episode of currency depreciation of 50 percent or more for a given year is considered a spike devaluation. Persistent but modest depreciation refers to several years of continued or recurrent depreciation within the ceiling set to the smaller of 50 percent per year and 1½ times the historical average (calculated excluding extreme values over 500 percent per year if they are present in the sample). Persistent depreciation beyond this ceiling is again considered a spike.

With these definitions, the peak debt is defined as: (i) the historical peak of debt-to-GDP ratio in the sample if a country exhibits no or small movements in its exchange rate, or if the historical peak is less than 100% *and* preceded by several years of modest currency depreciation; (ii) year t-1 (t-2) if the historical peak at year t is apparently a blip associated with a spike in the devaluation rate in the same (previous) year, and; (iii) year t-*s* if the historical peak at time t is preceded by *s* years of large and continued depreciation.

In the second stage, the decline from the peak debt ratio is defined as a debt "correction" only if it is sufficiently large. Measuring the debt decline as the percentage change in the debt-to-GDP ratio over the two-year period subsequent to the date of the peak, debt "corrections" were defined as those that are greater than the average cross-country decline. For the dataset, this corresponded to a fall in the debt-to-GDP ratio of about 20 percent (not percentage points), yielding 53 episodes of "debt corrections."

Appendix Table 1: Estimated Threshold Levels and Associated Conditional Probability of

	All Observations				Debt	Observations with Debt <				Observations with Debt >			
	Crisis	Non-crisis	Total	Uncond. Prob.	Threshold	Crisis	Non-crisis	Total	Cond. Prob.	Crisis	Non-crisis	Total	Cond. Prob
Debt corrections 1/													
Full sample	53	455	508	0.104	44.72	14	219	233	0.060	39	236	275	0.14
Excluding	36	320	356	0.101	38.98	9	172	181	0.050	27	148	175	0.15
Excluding HIPC/Official	36	308	344	0.105	31.40	4	120	124	0.032	32	188	220	0.14
Private Financing	14	146	160	0.088	38.88	3	71	74	0.041	11	75	86	0.12
Debt crises 2/													
Full sample 3/	29	403	432	0.067	38.99	5	256	261	0.019	24	147	171	0.14
Excluding	29	403	432	0.067	43.06	5	256	261	0.019	24	147	171	0.14
Excluding HIPC/Official	28	388	416	0.067	43.28	4	238	242	0.017	24	150	174	0.13
Private Financing	20	160	180	0.111	38.99	2	89	91	0.022	18	71	89	0.20

1/ As defined in the

2/ As defined by Detragiache and Spilimbergo

3/ The full sample consists of 545 observations of which 43 are crisis observations. The optimal tree picks out two
(a) debt/GDP < 18.7 percent, conditional prob. of crisis =0, debt/GDP > 18.7 percent, conditional prob. of crisis = 0.10; (b) the second threshold (38.99 percent of GDP) is

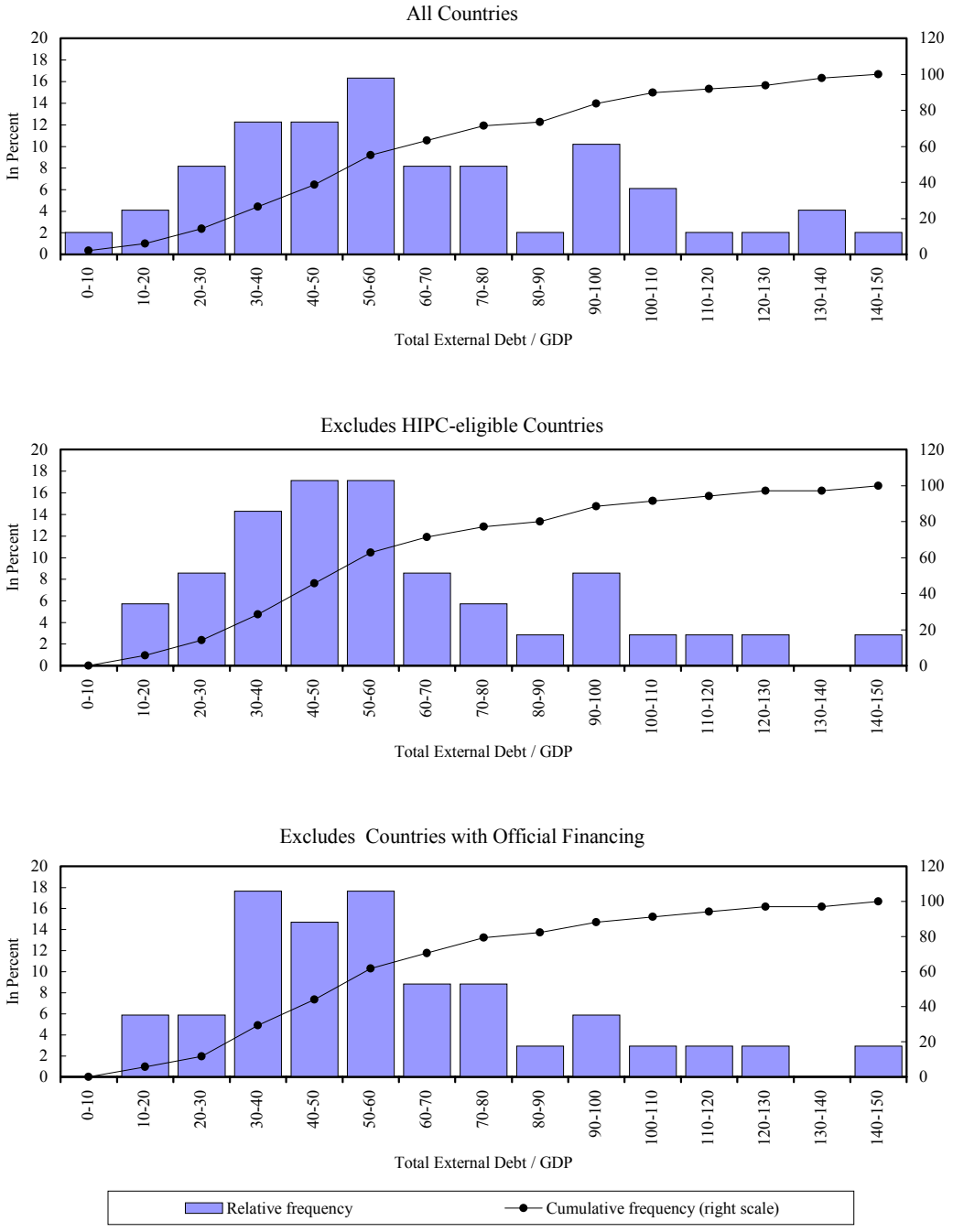
Appendix Table 2: Estimated Threshold Levels and Associated Conditional

	All				De	Observations with Debt <				Observations with Debt >			
	Cris	Non-	Tot	Uncond.	Thresh	Cris	Non-	Tot	Cond.	Cris	Non-	Tot	Cond.
Debt													
Full	5	45	50	0.10	44.7	1	21	23	0.06	3	23	27	0.14
Export/GDP > 20	2	23	26	0.10	48.5	0	14	15	0.05	1	9	11	0.16
Export/GDP > 30	2	22	24	0.11	48.5	0	11	11	0.04	2	10	12	0.17
Export/GDP > 40	1	15	17	0.10	48.5	0	9	9	0.04	1	6	7	0.20
Debt													
Full	2	40	43	0.06	38.9	0	25	26	0.01	2	14	17	0.14
Export/GDP > 20	1	30	32	0.05	53.0	0	21	21	0.00	1	8	10	0.15
Export/GDP > 30	1	28	29	0.04	53.0	0	17	18	0.00	1	10	11	0.11
Export/GDP > 40	0	21	21	0.01	64.9	0	16	16	0.00	0	4	5	0.05

1/ As defined in

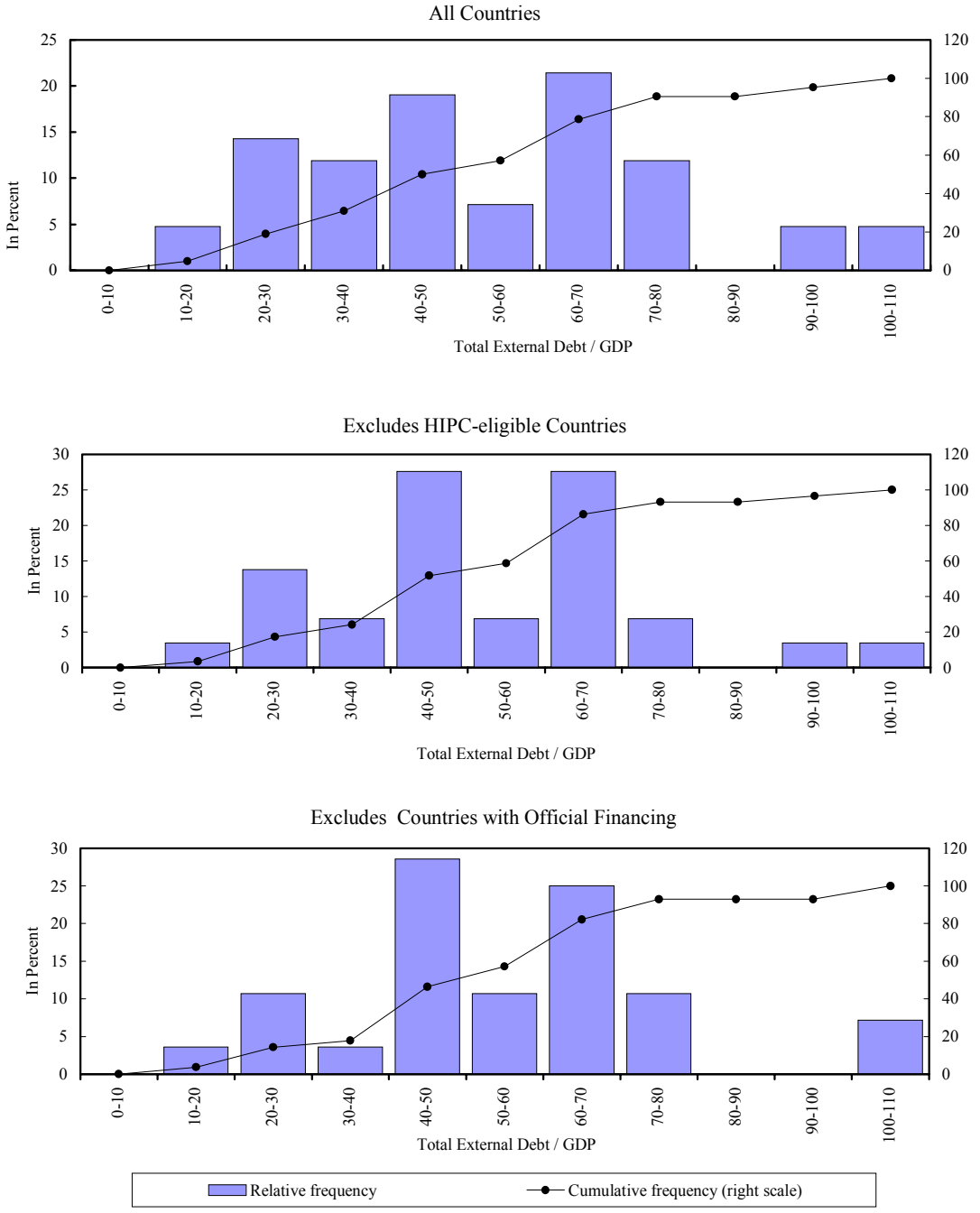
2/ As defined by Detragiache and

Figure 1. Relative Frequency Distribution of Peak Debt Ratio: 1979-2001 1/



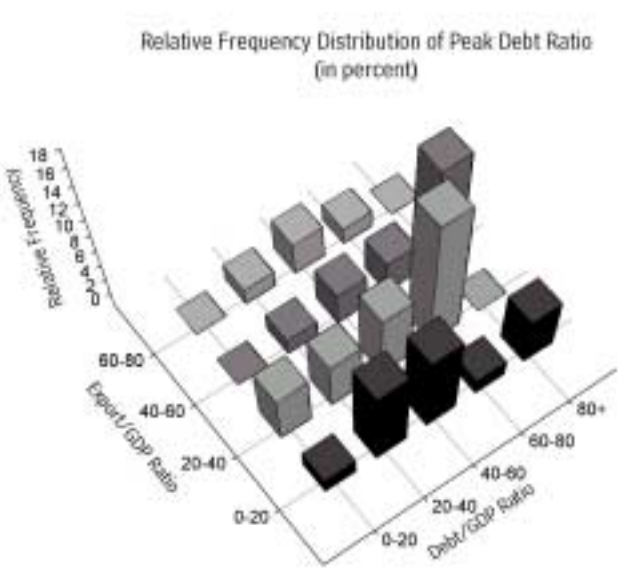
Source: International Monetary Fund; *World Economic Outlook,* and staff estimates.
1/ Excludes major industrialized countries.

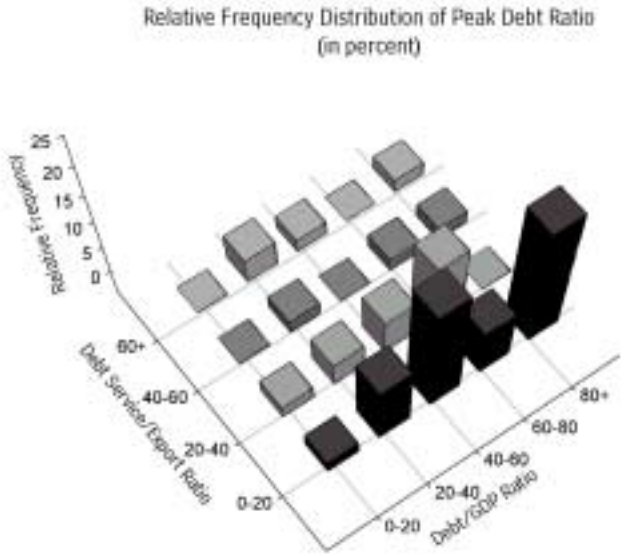
Figure 2. Relative Frequency Distribution of Peak Debt Ratio: 1979-2001 1/

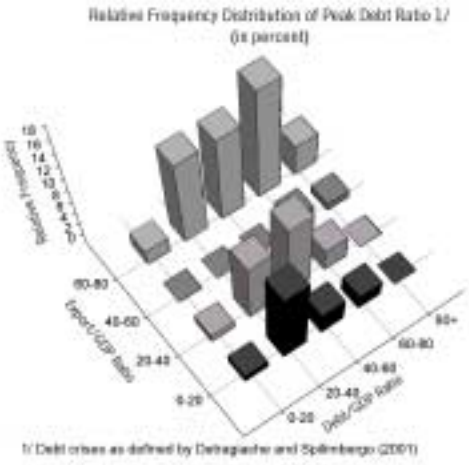


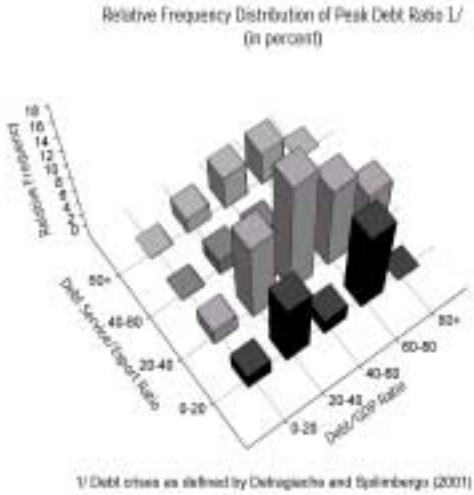
Source: International Monetary Fund; World Economic Outlook, and staff estimates.
1/ Debt Crises as defined by Detragiache and Spilimbergo (2001).

Figure 3: Frequency Distributions of Peak Debt Ratios









Best Practices for Vulnerability Indicators

76. Following the onset of the Mexican and Asian crises, analysis at the Fund has been paying increasing attention to the question of crisis prevention and, in particular, to the analysis of external vulnerability. One key method has been the identification, collection and inclusion in Board papers of vulnerability indicators comparable across countries. This annex provides some background on the use of core vulnerability indicators in surveillance.

77. A standardized table of vulnerability indicators was introduced in staff reports in early 1998, based on a review of empirical evidence, experience, theory and data needed for such assessments. Following the introduction of this table,[49] there has been steady improvement in the use of such indicators for surveillance purposes, furthered by guidance on the use of reserve indicators focused on capital, rather than current account risks. In the 2000 *Biennial Review*, the use of selected vulnerability indicators in staff reports, was reviewed. There, it was reported that "references to ratios of reserve cover [in terms of short-term debt had become] standard in staff reports," whereas "the coverage of external debt and related flows in vulnerability assessment varied greatly."[50] Another weakness was the uneven use of indicators for financial system monitoring. The 2000 *Biennial Review* also highlighted specific country cases where the analysis of external vulnerability had been noteworthy and could provide a model for other countries with similar characteristics.[51]

78. *The paper Approaches to Vulnerability Assessment for Emerging Market Economies* reported on advances in the [52] systematic use of cross-country external vulnerability indicators in the context of the quarterly vulnerability assessment exercise conducted by Fund staff. Cross country indicators, Early Warning System (EWS) models (and the

[49] The suggested format of this table was reported to the Executive Board in the context of vulnerability analysis as Table VII-2 in the *Biennial Review of the Implementation of Fund's Surveillance and of the 1977 Surveillance Decision*, SM/00/40 (2/18/00), while versions of it would have been seen by the Board as part of country Staff Reports. The paper *Debt- and Reserve-Related Indicators of External Vulnerability*, SM/00/65 (3/23/00) provided the rationale for the use of some of the key indicators.

[50] As earlier cited, pp.54-56.

[51] See Box 16, which analyzed the cases of South Africa, Tunisia and China, and Box 17, which examined the case of New Zealand.

[52] SM/01/301 (10/3/01).

indicators on which they are based) together with data on forward-looking financing needs and average cross-correlations of foreign exchange spreads are among the indicators used.

79. Yet another, and more recent, look at the use of selected external vulnerability indicators in staff reports was provided to the Board in the paper *Data Provision to the Fund for Surveillance Purposes*.[53] There, it was reported that staff reports now systematically include indicators of external vulnerability and generally a separate standard table. Of the countries with access to private capital markets, 89 percent did meet this requirement, and 78 percent discussed reserve adequacy explicitly, many by discussing the relation of reserves to short-term external debt. The paper also identified critical data needs for external vulnerability assessments: the need to have the relevant detail of data on reserves, debt, capital flows, the International Investment Position and corporate and financial sector indicators.

80. Since the early introduction of the standard table on vulnerability indicators the empirical results now confirms the selection of indicators used. In addition, staff has gained experience in interpreting the indicators in the context of in depth country analysis. Much additional work has been done on identifying data needed for vulnerability assessments (e.g. the new external debt guide and the SDDS reserve template), and the framework for analyzing vulnerabilities has improved. Distinguishing the liquidity and solvency aspects of vulnerability (and sustainability) (see also Box 1, and SM/00/65), provides a useful way to classify indicators.

81. Reflecting these developments, the attached table of core vulnerability indicators provides for:

- A more systematic identification of the information needed for judging the indicators and assumptions (partner GDP growth rate; GDP and export paths) from the indicators themselves.

- A separation of indicators according to whether they pertain primarily to external solvency (debt solvency and dynamics; related balance sheet information); and liquidity.

- A separation of whether the indicators cover the overall economy or the sectors (public, financial, corporate).

- Information that captures views of private markets (stock market performance; debt ratings, spreads, and a maturity indicator).

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[53] SM/02/126 (4/26/02).

82. The core table (Table 1) is set up in a manner that would allow it to replace the 1998 table following further internal review.

83. Table 2 presents a similar set of indicators for assessing vulnerability of the public sector debt dynamics, although a definitive list is yet to be established. Indicators of financial sector soundness are discussed in “Macro prudential Indicators” (SM/01/159).

Table 1. Country Name: Vulnerability Indicators for External Debt Sustainability Assessments 1/
(In percent unless otherwise indicated)

	1991-97	1998	1999	2000	2001	2002	2003	2004
				Prelim.	Latest Estimate Date		Projection	
External balance sheet information								
External debt (in US$)								
o/w: Public sector debt								
Non-concessional public debt								
Banking sector debt								
Domestic currency debt								
External debt (in US$) by maturity								
Domestic, foreign currency linked or indexed public debt (in US$)								
Net stock of FDI (in US$)								
Net foreign assets of the banking sector (in US$)								
Net external liabilities (in US$)								
Other external solvency information 1a/								
Exports of GS (growth rate)								
Partner country import growth								
Imports of GS (growth rate)								
Terms of trade (growth rate)								
Real exchange rate (growth rate)								
GDP (growth rate)								
Partner country GDP growth								
Industrial production growth								
CPI (12 months)								
31 day T-bill yield 2/								
External interest payments to exports GS 3/								
Profit remittances plus reinvested earnings/stock of FDI 4/								
Share of corporate external debt held by export oriented firms								
External debt dynamics 1a/								
Net debt creating external flows/exports GS								
Minus (exports GS growth) * (debt/exports GS)								
External solvency indicators								
External debt to exports GS								
External debt to GDP								
Net external liabilities to exports GS								
Gross financing need (in millions of US$)								
o/w: Amortization of MLT debt (in millions of US$)								
Short-term debt (in millions of US$)								
Current account deficit								
Liquidity information								
Central Bank short-term foreign currency liabilities (in US$) 2/ 5/								
Short term foreign liabilities of the banking sector (in US$) 2/ 5/								
Short term foreign currency liabilities of the banking sector (in US$) 2/ 5/								
Overall open foreign currency position of the banking sector (in US$) 5/								
REER appreciation (-) (12 month basis)								
Current account balance (in US$)								
o/w: Financed by debt creating inflows								
o/w: Financed by trade credits								
Domestic credit to GDP								
Liquidity indicators								
Gross official reserves (in US$)								
Reserves to total short term external debt by remaining maturity (rm)								
Reserves to short-term debt (rm) plus current account balance								
Reserves to M2								
Reserves in months of imports GS 3/								
Sectoral liquidity indicators								
Gross reserves to foreign currency public debt service								
Gross reserves/central bank foreign currency liabilities								
Foreign currency public debt service to exports GS								
Foreign currency liabilities over liquid foreign currency assets (for banks)								
Market Indicators 6/								
Stock market index 7/								
Foreign currency debt rating 8/								
Spread of benchmark bonds (basis points, end of period) 9/								
Maturity of non concessional public external debt issued during period (weighted average)								
Memo items								
GDP (in US$)								
Exports of GS (in US$)								

Table 1. Country Name: Vulnerability Indicators for External Debt Sustainability Assessments 1/
(In percent unless otherwise indicated)

1/ Sectoral solvency indicators, such as domestic public debt ratios, financial sector and corporate indicators (such as leverage) are not included here. Similarly detailed public sector liquidity indicators on the maturity structure, the share of floating rates and on the corporate sector such as short-term debt to working capital are excluded. Indicators of external debt dynamics are not needed if the prescribed sustainability analysis is undertaken. It could be useful to add information on adherence to key standards, such as Basle Core Principles, and International Accounting Standards if not done so elsewhere. The data in this table are expected to be provided in briefing papers and staff reports for countries with significant but uncertain access to private market financing (emerging market economies). In some cases, data may not be available or in the suggested format. Definitions can be interpreted with some flexibility, bearing in mind that the purpose of providing such details also to facilitate a cross-country comparison of indicators of vulnerability so that the deviations need to be clarified where necessary.
1a/ Under this header the most recent information should be provided. Data for rates of change are to be provided on a 12-month basis. For example, REER appreciation, Sept. 1999-Sept. 98. For stocks, provide the most recent observation point, for flows the latest 12-months observation. The date of the most recent observation can be usefully indicated in a separate column rather than through numerous footnotes. Comparing the latest information, as indicated, with trends in the end/full year data should provide a clear indication of reversal in trends. Additional information regarding details in recent trends is best provided in the form of time series graphs.
2/ Short-term is defined as1 year and under. The use of remaining maturity, rather than original maturity, is required.
3/ Ideally imports of exports of goods and services (GS). This excludes factor income in line with the fifth edition of the Balance of Payments Manual.
4/ Inconsistency between reported remittances and FDI stock is a major issue in many countries.
5/ This position includes the notional value of off-balance sheet foreign currency liabilities, such as short forward position.
6/ No projections are expected for financial market indicators.
7/ Stock market capitalization as percent of GDP can be added as indicator of scale.
8/ Please highlight date and nature of recent down/up grading. Specify rating source.
9/ Spread of Euro, Brady bonds or other benchmark instrument compared to government bonds of equivalent maturity in the currency of issue. Please specify comparator instrument and maturity.

Table 2. Country Name: Vulnerability Indicators for Public Sector Debt Sustainability Assessments 1/
(In percent unless otherwise indicated)

	1991-97	1998	1999	2000 Prelim.	2001 Latest Estimate Date: (specify date of latest observation)	2002	2003 Projection	2004
Public Sector's balance sheet information								
Total financial assets of the general government (percent of GDP)								
o/w: In domestic currency								
In foreign currency								
Net International Investment Position of the general government (percent of GDP) 2/								
Total public sector and guaranteed debt (percent of GDP)								
o/w: Sovereign debt								
Debt guaranteed by the sovereign								
Debt of provincial and local authorities								
State enterprise debt								
Total public sector foreign currency or linked debt (percent of GDP)								
Total public sector CPI or interest rate linked debt (percent of GDP)								
Total public sector debt held by foreign residents (percent of GDP)								
Outstanding stock of derivatives positions held by public sector (including monetary authorities and SOEs) (Percent of GDP)								
Duration of public sector debt (concessional and non-concessional)								
Other fiscal solvency information								
General government revenues (percent of GDP)								
General government expenditures (percent of GDP)								
General government balance, cash basis (percent of GDP)								
General government arrears (percent of GDP)								
Primary general government balance, cash basis (percent of GDP)								
Domestic financing of general government balance (percent of GDP)								
Foreign financing of general government balance (percent of GDP)								
Financing provided by external grants and other non-debt creating sources (percent of GDP)								
Operating balance of SOEs (percent of GDP)								
Uncalled public sector guarantees (percent of GDP)								
Net lending (percent of GDP)								
Public investment (percent of GDP)								
Privatization receipts (percent of GDP)								
Market valuation of SOEs (percent of GDP)								
Market valuation of other marketable government assets (land, etc) (percent of GDP)								
31 day T-bill nominal yield (percent per annum)								
31 day real T-bill yield (percent per annum)								
Sovereign spread (bps)								
Interruptions to external market access (months without access during last 12 months)								
Interest payments to revenues (in percent)								
Interest payments on domestic currency debt (in percent)								
Interest payments on foreign currency debt (in percent)								
Public debt dynamics 3/								
Public debt-stabilizing primary surplus (percent of GDP)								
Primary surplus needed to reduce debt to 60 percent of GDP in 20 years (percent of GDP), if applicable								
Interest payments on foreign currency or linked debt (percent of GDP)								
Public sector solvency indicators								
Public debt (in percent of revenues)								
Public debt (in percent of GDP)								
Net public sector external liabilities (in percent of revenues)								
Gross financing need (in percent of GDP)								
o/w: MLT debt amortization								
Short-term debt								
Overall deficit								
Liquidity information								
Short-term public debt (percent of GDP)								
o/w: Sovereign								
Provincial and local authorities								
State enterprises								
Debt of non-SOE's guaranteed by the sovereign, provincial or local authorities								
o/w: foreign currency								
Sovereign								
Provincial and local authorities								
State enterprises								
Debt of non-SOE's guaranteed by the sovereign, provincial or local authorities								
Central Bank short-term foreign currency liabilities (in US$)								
Overall open foreign currency position of the public sector (mainly monetary authorities) (in US$)								
General government interest payments plus debt service in next 12 months to revenues								
o/w: on foreign currency debt								
o/w: on domestic currency debt								
General Government liquid assets to short-term debt service								
o/w: domestic currency								
foreign currency								

Table 2. Country Name: Vulnerability Indicators for Public Sector Debt Sustainability Assessments 1/
(In percent unless otherwise indicated)

	1991-97	1998	1999	2000 Prelim.	2001 Latest Estimate Date: (specify date of latest observation)	2002	2003 Projection	2004
Memo items								
GDP (in local currency)								
GDP (in US dollars)								
Implicit debt (payg pensions and other; percent of GDP)								

1/ The public sector is broadly defined to include the general government, which consists of the central, provincial and local authorities, and state owned enterprises (especially where their activities are mostly non-commercial in nature) The data in this table are expected to be provided in briefing papers and staff reports for countries with significant but uncertain access to private market financing (emerging market economies). In some cases, data may not be available or in the suggested format. Definitions can be interpreted with some flexibility, bearing in mind that the purpose of providing such details also to facilitate a cross-country comparison of indicators of vulnerability so that the deviations need to be clarified where necessary.
2/ Where available, the IIP of the general government could be identified in detail following the classification of table on page 108-111 of the BOP Manual. It is expected that the detailed IIP for the sovereign would be available in most cases.
3/ Need not be completed if sustainability analysis has been undertaken.