INTERNATIONAL MONETARY FUND

**Information Note on Modifications to the Fund's Debt Sustainability Assessment Framework for Market Access Countries**

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**Introduction**

1.      **The Executive Board endorsed a standard framework for external and public debt sustainability for market borrowers in June 2002, with the goal of improving the consistency and discipline of debt sustainability analyses (DSAs).**[1] The framework is intended to inform, rather than replace, judgment regarding sustainability by laying bare, in standardized DSA templates, the main assumptions underlying debt projections and subjecting them to a set of stress tests. The Fund-wide use of DSA templates appears to have increased the awareness of the criticality of comprehensive DSAs as a necessary component of both surveillance and program work.

2.      **Review of experience with the standard framework since its inception has identified some possible areas for improvement**. The Board as well as some staff have expressed concerns regarding a lack of realism in stress tests in the templates and an insufficient integration of DSAs into policy discussions. Specifically, key issues concerning the existing DSA templates are:

•       *Large but temporary shocks for stress tests*. In stress-testing the baseline projection, the existing templates apply large but temporary shocks to the underlying parameters of debt dynamics. Temporary shocks, even if large, are rarely able to derail the

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[1] See *Assessing Sustainability* (SM/02/166). Some refinements were introduced a year later (*Sustainability Assessment—Review of Application and Methodological Refinements*, SM/03/206). In cooperation with the World Bank, a separate DSA framework was developed for low-income countries and endorsed by the two Boards in 2005 (SM/05/109).

baseline (i.e., turn a declining debt trajectory into an increasing one).[2] Therefore, due to the temporary nature of the shocks, most stress tests tend to generate a hump-shaped debt trajectory, often breeding a false sense of complacency about the sustainability of a given level of debt. Moreover, given the large magnitude of the shock (two standard deviations for the relevant parameter), stress tests were often dismissed as unrealistic in discussions with country authorities.

- *Limited use of alternative (country-tailored) scenarios*. While the existing templates allow for full-fledged alternative scenarios, country teams have rarely used them. The limited scope for presenting country-specific details of the underlying assumptions regarding macroeconomic variables and market-related information in the templates may have constrained the use of alternative scenarios.

- *Presentation of DSAs*. The standard DSA tables reported in staff reports were not regarded as very reader-friendly, as statistics for many scenarios and stress tests were presented within limited space.

- *Lack of integration with main text of staff reports*. DSA templates are often relegated to the appendix of staff reports, with limited discussion of their findings in the main text. Discussions with country teams showed that this was, at least in part, due to some of the shortcomings highlighted above, which reduced the usefulness of the templates. The lack of integration may also have reflected too rigid a standardization of the DSAs in the templates. Thus, to encourage further ownership by country teams and national authorities, there may be need to allow for more country-tailored approaches while ensuring the discipline of a common set of standards for DSAs across countries.

**Modifications introduced in the DSA**

3.      **To address these concerns, several modifications to the DSA framework for market access countries have been introduced, which balance the disciplinary benefits of a standardized framework with the cost of limited flexibility in focusing on country-specific issues.** These modifications involve technical changes in the design of the templates, including re-configuring the stress test shocks and the format of presentation, as well as a separate treatment of full-fledged alternative scenarios outside the standard framework.

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[2] This issue was actually underscored in *Sustainability Assessment—Review of Application and Methodological Refinements*, (SM/03/206), paragraph 20.

4.      **First, the new templates configure smaller but more persistent shocks for stress tests**. Based on stochastic simulations conducted for a sample of emerging market countries (see Box), one-half standard deviation shocks will be applied to all five projection years (as opposed to two standard deviation shocks for two years in the existing templates).[3] This modification not only avoids the hump-shaped debt trajectory but also increases the likelihood of the debt trajectory resulting from such shocks—according to simulations, probabilities range from 15 to 30 percent (compared to the notional probability of 5 percent in the current framework)—thus also making the results more useful in discussions with the authorities. These projections including permanent shocks can also be read as a check against the possibility that the baseline reflected an optimistic bias.

5.      **Second, the stress test for U.S. dollar GDP deflator has been dropped from the external template in light of the shift to more persistent shocks**. A permanent shock to the domestic price level over the full projection years would be considered unrealistic, while the effects of a shock to the exchange rate is already included separately in the templates.

6.      **Third, the shocks are applied to the baseline projection**. While the size of shocks will continue to be measured in units of country-specific historical standard deviations, the shocks will be applied to the baseline projection developed by country teams—rather than to the historical averages—to allow a more direct test of the robustness of the baseline scenario.[4]

7.      **Fourth, the presentation is streamlined with the use of simplified tables and through a new graphical presentation**. The DSA tables (see Tables 1 and 2 for samples of external and public DSA tables, respectively) have been made more readable by focusing only on the baseline and the historical scenario.[5] In the public debt DSA, the "no policy change scenario" is also highlighted in order to capture the risks stemming from an inadequate policy stance, as opposed to those associated with adverse macroeconomic developments. The stress tests results are now presented in a more user-friendly manner through panel charts (Figures 1 and 2). These charts allow the reader to identify more easily any deviations from the baseline that would arise in the presence of shocks (or, in case of an optimistic bias in the baseline). Each panel includes: (i) the baseline; (ii) the relevant stress

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[3] The "combined shock" stress test shows the combined effect of joint one-fourth standard deviation shocks for the relevant variables.

[4] For instance, in the existing templates a negative shock to GDP growth is formulated by subtracting two standard deviations from its *historical mean*. In the new templates, it is formulated by subtracting one-half standard deviation from the *baseline GDP growth*.

[5] For reference, the old tables are also attached (Tables 3 and 4).

**Determining the Size of Permanent Shocks: Stochastic Simulation Approach**

**Determining the appropriate size of permanent shocks requires balancing two concerns**: shocks should be large enough to realistically capture the medium-term risk in debt dynamics, but small enough to generate debt ratios with a reasonable likelihood of occurrence to be of policy relevance (since it would not be sensible to undertake extreme adjustment against the possibility of a large, but very unlikely, shock).

**Stochastic simulations were conducted to provide a basis for judging the likelihood of alternative scenarios and calibrating the size of shocks accordingly**. If the true probability distribution of debt ratio is known, the likelihood of the debt path resulting from the standard stress tests can be measured directly. By experimenting with different sizes of shocks, the appropriate magnitude for the stress test shocks can then be chosen, balancing the considerations listed above.

**In reality, the true probability distribution of debt ratio is unknown**. Stochastic simulation fills this gap by simulating the probability distribution of the debt ratio from historical data. In the simulation, key parameters that affect debt dynamics are treated as random variables, and are drawn from a *multivariate* normal distribution whose mean and variance-covariance matrix are estimated from historical data.[*] Stochastic simulation thus allows for interaction among the parameters of debt dynamics in constructing empirically the probability distribution of the path of the debt ratio.

**Given the history-dependence, and thus country-specificity, of the simulated probability distribution, the likelihood of the resulting debt ratio for a given size of stress test shock differs across countries**. Furthermore, the standard templates involve multiple stress tests that generate different debt ratios over the projection horizon. For these reasons, the calibration of the stress test shocks is based on the *average likelihood of the worst-case (highest) debt ratio in the fifth year of the projection horizon* where the average is taken across countries in the sample.

Stochastic simulation exercises conducted for a sample of emerging market countries indicate that **when a half-standard deviation permanent shock is used for the standard stress tests, the probability that the debt ratio will be higher than that implied by the most extreme stress test is around 15-30 percent**, which seems to be a reasonable balance between capturing the medium-term risks to debt dynamics without being so extreme as to be irrelevant for policy discussions.

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[*] For technical details regarding simulation of the probability distribution of debt ratio from historical data, see Appendix I in SM/03/206. Simulations using boot-strapping techniques (i.e., without the need to assume a joint normal distribution) yield similar results.

test; (iii) a small box reporting the historical average value of the key parameter, together with the average value of the same parameter in the baseline and under the stress test; and (iv) the numerical value of the debt ratio in the baseline and stress test at the end of the forecast horizon. The top-left panel compares the baseline to the so-called "historical scenario," i.e., the scenario in which all parameters are at the historical average. This panel also reports the gross financing needs under the baseline (in percent of GDP).

8.      **Finally, alternative (country-tailored) scenarios would be incorporated directly in the main text, instead of being reported in the templates**. The basic set of standard DSA indicators (one table and one chart for the external and the public debt DSA, respectively) will be complemented, as appropriate, by country-specific scenarios that would be discussed in the main text of the report. These scenarios will be devised by country teams to make them more relevant for discussion with country authorities. In contrast to the stress tests in the templates, which allow limited or no interaction between the shocked variable and other economic variables (as discussed in SM/03/206), these will be full-fledged scenarios. To ensure adequate interdepartmental scrutiny, the key features of the scenarios (including the choice of the relevant shocks to explore) will be a focus of the meetings between area department and reviewing department that take place ahead of the completion of a mission's briefing paper (pre-brief meetings).

**Further Steps**

9.      **Improving the Fund's DSA remains an ongoing effort**. The staff is working on ways to model sustainable primary balances based on not only historical fiscal performance but also other structural variables such as the quality of fiscal institutions. Efforts are also underway to model more complex debt dynamics by using, *inter alia*, contingent claims approach. The current proposed enhancements to the templates provide a good platform for further improvements based on these studies, as they become available.

Table 1. Country: External Debt Sustainability Framework, 2000-2010
(In percent of GDP, unless otherwise indicated)

| | Actual | | | | | Projections | | | | | | Debt-stabilizing non-interest current account 6/ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | |
| **1 Baseline: External debt** | **46.1** | **47.5** | **52.3** | **46.4** | **37.8** | **38.4** | **38.4** | **38.1** | **36.8** | **35.6** | **34.5** | **-1.8** |
| 2 Change in external debt | 0.6 | 1.5 | 4.8 | -5.9 | -8.6 | 0.6 | 0.0 | -0.3 | -1.3 | -1.3 | -1.0 | |
| 3 Identified external debt-creating flows (4+8+9) | -2.2 | -3.8 | 7.4 | -6.3 | -11.5 | -0.7 | -0.8 | -0.7 | -0.9 | -0.9 | -0.8 | |
| 4 Current account deficit, excluding interest payments | -4.1 | -2.0 | -1.6 | -1.5 | -1.5 | 0.4 | 0.6 | 0.6 | 0.3 | 0.2 | 0.3 | |
| 5 Deficit in balance of goods and services | -10.2 | -7.8 | -7.6 | -7.0 | -6.4 | -4.2 | -4.3 | -3.5 | -3.5 | -3.6 | -3.8 | |
| 6 Exports | 20.1 | 18.3 | 19.9 | 19.0 | 18.2 | 18.0 | 18.5 | 18.0 | 18.5 | 19.0 | 19.7 | |
| 7 Imports | 9.9 | 10.5 | 12.2 | 12.0 | 11.8 | 13.8 | 14.2 | 14.5 | 15.0 | 15.3 | 15.9 | |
| 8 Net non-debt creating capital inflows (negative) | -2.6 | -3.0 | -1.8 | -1.0 | -2.5 | -2.2 | -2.0 | -2.2 | -2.2 | -2.2 | -2.1 | |
| 9 Automatic debt dynamics 1/ | 4.6 | 1.2 | 10.8 | -3.8 | -7.5 | 1.1 | 0.6 | 0.8 | 1.0 | 1.1 | 1.1 | |
| 10 Contribution from nominal interest rate | 3.1 | 3.4 | 3.5 | 2.9 | 2.4 | 2.6 | 2.2 | 2.3 | 2.4 | 2.5 | 2.4 | |
| 11 Contribution from real GDP growth | -1.4 | -0.6 | -1.1 | -1.7 | -1.4 | -1.5 | -1.5 | -1.5 | -1.4 | -1.4 | -1.3 | |
| 12 Contribution from price and exchange rate changes 2/ | 2.8 | -1.5 | 8.3 | -5.0 | -8.6 | ... | ... | ... | ... | ... | ... | |
| 13 Residual, incl. change in gross foreign assets (2-3) 3/ | 2.8 | 5.3 | -2.6 | 0.5 | 2.9 | 1.3 | 0.8 | 0.5 | -0.4 | -0.3 | -0.2 | |
| External debt-to-exports ratio (in percent) | 229.1 | 260.1 | 263.3 | 244.5 | 207.8 | 212.9 | 207.5 | 211.9 | 199.1 | 187.6 | 175.2 | |
| Gross external financing need (in billions of US dollars) 4/ | 8.7 | 10.8 | 13.2 | 12.8 | 12.5 | 15.7 | 15.7 | 16.3 | 17.6 | 18.4 | 19.7 | |
| in percent of GDP | 11.1 | 13.1 | 18.5 | 15.6 | 11.9 | 14.9 | 14.8 | 14.8 | 15.2 | 15.0 | 15.1 | |
| **Scenario with key variables at their historical averages 5/** | | | | | | **38.4** | **36.5** | **35.6** | **34.5** | **33.4** | **32.5** | **-1.2** |
| **Key Macroeconomic Assumptions Underlying Baseline** | | | | | | | | | | | | |
| Real GDP growth (in percent) | 2.9 | 1.5 | 1.9 | 3.8 | 3.8 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| GDP deflator in US dollars (change in percent) | -5.8 | 3.4 | -14.9 | 10.6 | 22.6 | -2.9 | -3.6 | -0.2 | 1.7 | 1.7 | 2.0 | |
| Nominal external interest rate (in percent) | 6.7 | 7.7 | 6.4 | 6.5 | 6.7 | 6.9 | 5.7 | 6.3 | 6.8 | 7.1 | 7.2 | |
| Growth of exports (US dollar terms, in percent) | 12.8 | -4.6 | -5.7 | 9.8 | 21.9 | 0.0 | 3.0 | 0.9 | 8.6 | 8.4 | 10.3 | |
| Growth of imports (US dollar terms, in percent) | 9.0 | 11.4 | 1.1 | 12.8 | 24.4 | 18.5 | 2.9 | 6.1 | 9.2 | 8.5 | 9.9 | |
| Current account balance, excluding interest payments | 4.1 | 2.0 | 1.6 | 1.5 | 1.5 | -0.4 | -0.6 | -0.6 | -0.3 | -0.2 | -0.3 | |
| Net non-debt creating capital inflows | 2.6 | 3.0 | 1.8 | 1.0 | 2.5 | 2.2 | 2.0 | 2.2 | 2.2 | 2.2 | 2.1 | |

1/ Derived as $[r - g - \rho(1+g) + \varepsilon\alpha(1+r)]/(1+g+\rho+g\rho)$ times previous period debt stock, with r = nominal effective interest rate on external debt; $\rho$ = change in domestic GDP deflator in US dollar terms, g = real GDP growth rate,
$\varepsilon$ = nominal appreciation (increase in dollar value of domestic currency), and $\alpha$ = share of domestic-currency denominated debt in total external debt.
2/ The contribution from price and exchange rate changes is defined as $[-\rho(1+g) + \varepsilon\alpha(1+r)]/(1+g+\rho+g\rho)$ times previous period debt stock. $\rho$ increases with an appreciating domestic currency ($\varepsilon > 0$) and rising inflation (based on GDP deflator).
3/ For projection, line includes the impact of price and exchange rate changes.
4/ Defined as current account deficit, plus amortization on medium- and long-term debt, plus short-term debt at end of previous period.
5/ The key variables include real GDP growth; nominal interest rate; dollar deflator growth; and both non-interest current account and non-debt inflows in percent of GDP.
6/ Long-run, constant balance that stabilizes the debt ratio assuming that key variables (real GDP growth, nominal interest rate, dollar deflator growth, and non-debt inflows in percent of GDP) remain at their levels
of the last projection year.

Figure 1. Country: External Debt Sustainability: Bound Tests  1/
(External debt in percent of GDP)
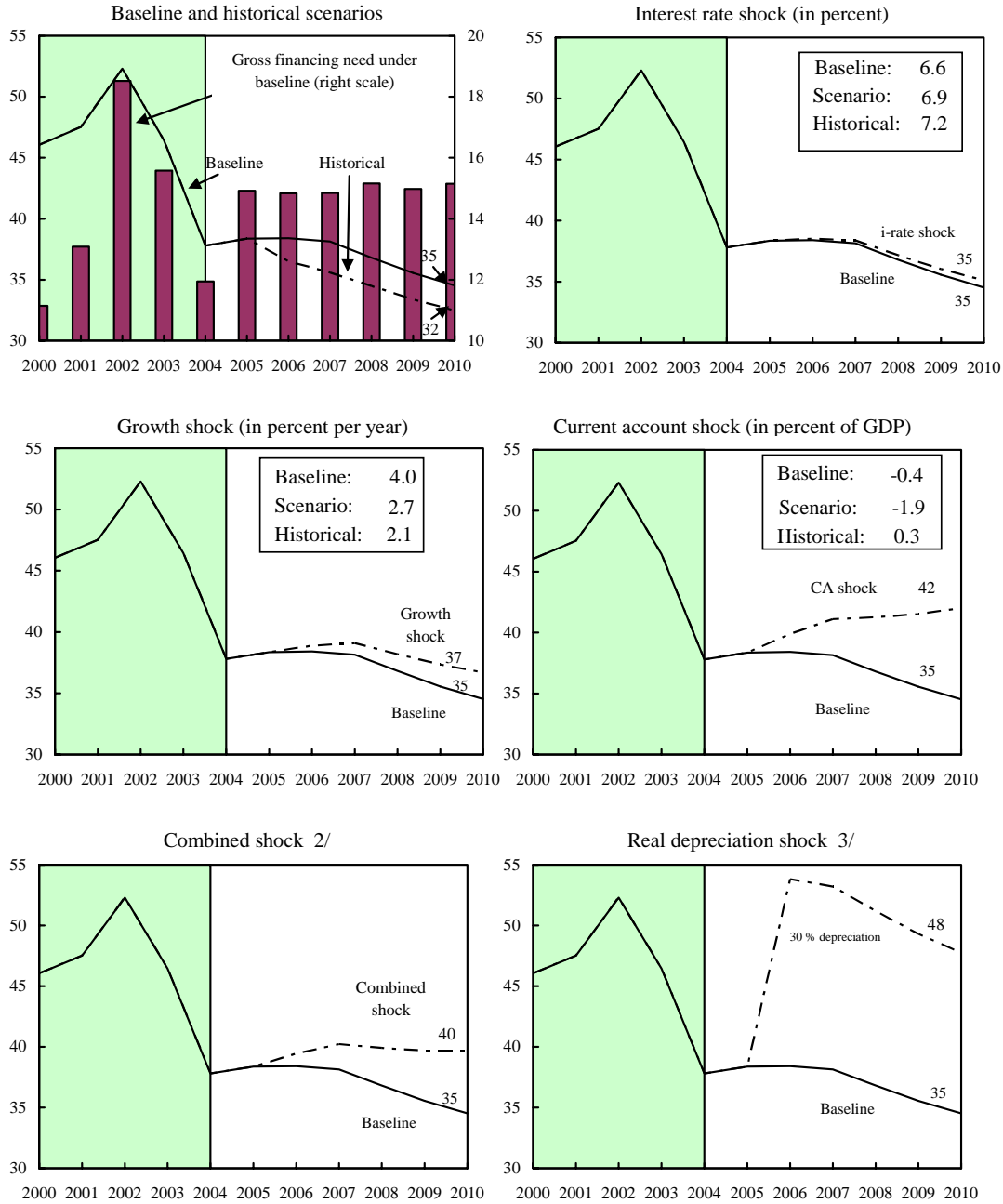


Baseline and historical scenarios

Gross financing need under baseline (right scale)

Baseline

Historical

35

32

Interest rate shock (in percent)

| Baseline: | 6.6 |
| Scenario: | 6.9 |
| Historical: | 7.2 |

i-rate shock

35

Baseline

35

Growth shock (in percent per year)

| Baseline: | 4.0 |
| Scenario: | 2.7 |
| Historical: | 2.1 |

Growth shock

37

35

Baseline

Current account shock (in percent of GDP)

| Baseline: | -0.4 |
| Scenario: | -1.9 |
| Historical: | 0.3 |

CA shock          42

35

Baseline

Combined shock  2/

Combined shock

40

35

Baseline

Real depreciation shock  3/

30 % depreciation          48

Baseline          35

Sources: International Monetary Fund, Country desk data, and staff estimates.
1/ Shaded areas represent actual data. Individual shocks are permanent one-half standard deviation shocks.
Figures in the boxes represent average projections for the respective variables in the baseline and scenario being
presented. Ten-year historical average for the variable is also shown.
2/ Permanent 1/4 standard deviation shocks applied to real interest rate, growth rate, and current account
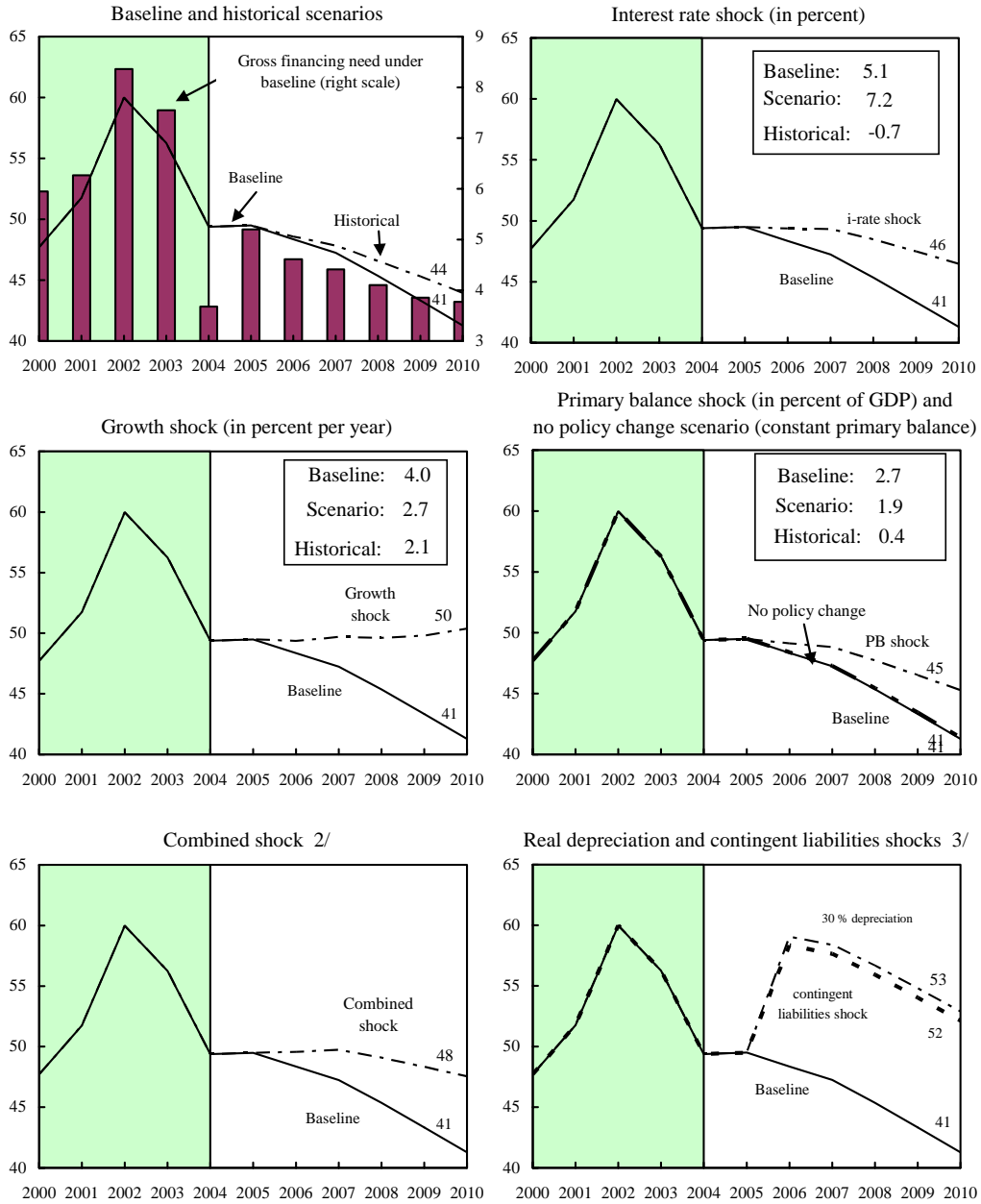balance.
3/ One-time real depreciation of 30 percent occurs in 2006.

Table 2. Country: Public Sector Debt Sustainability Framework, 2000-2010
(In percent of GDP, unless otherwise indicated)

| | Actual | | | | | Projections | | | | | | Debt-stabilizing primary balance 9/ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | |
| **1 Baseline: Public sector debt 1/** | 47.7 | 51.8 | 60.0 | 56.3 | 49.4 | **49.5** | **48.3** | **47.2** | **45.3** | **43.3** | **41.3** | **0.5** |
| o/w foreign-currency denominated | 26.3 | 28.5 | 31.9 | 29.9 | 24.4 | 24.7 | 24.0 | 24.0 | 22.9 | 22.0 | 21.2 | |
| 2 Change in public sector debt | 6.4 | 4.1 | 8.2 | -3.7 | -6.9 | 0.1 | -1.1 | -1.1 | -1.9 | -2.0 | -2.0 | |
| 3 Identified debt-creating flows (4+7+12) | 1.9 | 0.9 | 7.1 | -4.1 | -7.1 | -1.5 | -2.1 | -2.2 | -2.4 | -2.4 | -2.3 | |
| 4 Primary deficit | -0.9 | -1.3 | -0.5 | -2.0 | -2.9 | -2.7 | -2.7 | -2.7 | -2.7 | -2.7 | -2.7 | |
| 5 Revenue and grants | 28.0 | 29.5 | 29.3 | 30.6 | 32.5 | 32.9 | 32.3 | 32.1 | 32.3 | 32.2 | 32.1 | |
| 6 Primary (noninterest) expenditure | 27.1 | 28.2 | 28.9 | 28.6 | 29.6 | 30.2 | 29.5 | 29.5 | 29.6 | 29.6 | 29.5 | |
| 7 Automatic debt dynamics 2/ | 3.3 | 2.3 | 7.5 | -2.2 | -4.3 | 1.2 | 0.6 | 0.5 | 0.4 | 0.2 | 0.3 | |
| 8 Contribution from interest rate/growth differential 3/ | -1.1 | 1.6 | 0.4 | -1.3 | -0.2 | 1.2 | 0.6 | 0.5 | 0.4 | 0.2 | 0.3 | |
| 9 Of which contribution from real interest rate | -0.1 | 2.2 | 1.3 | 0.8 | 1.7 | 3.0 | 2.4 | 2.3 | 2.1 | 1.9 | 1.9 | |
| 10 Of which contribution from real GDP growth | -1.0 | -0.7 | -0.9 | -2.1 | -2.0 | -1.8 | -1.8 | -1.8 | -1.8 | -1.7 | -1.6 | |
| 11 Contribution from exchange rate depreciation 4/ | 4.4 | 0.7 | 7.1 | -0.9 | -4.1 | ... | ... | ... | ... | ... | ... | |
| 12 Other identified debt-creating flows | -0.5 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| 13 Privatization receipts (negative) | -0.5 | 0.0 | 0.1 | 0.1 | 0.1 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| 14 Recognition of implicit or contingent liabilities | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| 15 Other (specify, e.g. bank recapitalization) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| 16 Residual, including asset changes (2-3) 5/ | 4.5 | 3.1 | 1.1 | 0.4 | 0.3 | 1.6 | 1.0 | 1.1 | 0.5 | 0.4 | 0.3 | |
| Public sector debt-to-revenue ratio 1/ | 170.3 | 175.4 | 204.4 | 184.1 | 151.8 | 150.6 | 149.9 | 147.1 | 140.3 | 134.5 | 128.5 | |
| **Gross financing need 6/** | 5.9 | 6.3 | 8.4 | 7.5 | 3.7 | 5.2 | 4.6 | 4.4 | 4.1 | 3.9 | 3.8 | |
| in billions of U.S. dollars | 5.0 | 5.1 | 6.8 | 6.0 | 3.5 | 5.6 | 5.0 | 4.9 | 4.8 | 4.7 | 4.9 | |
| **Scenario with key variables at their historical averages 7/** | | | | | | 49.5 | 48.6 | 47.8 | 46.6 | 45.3 | 43.9 | -1.0 |
| **Scenario with no policy change (constant primary balance) in 2005-2010** | | | | | | 49.5 | 48.4 | 47.3 | 45.4 | 43.4 | 41.4 | 0.5 |
| **Key Macroeconomic and Fiscal Assumptions Underlying Baseline** | | | | | | | | | | | | |
| Real GDP growth (in percent) | 2.9 | 1.5 | 1.9 | 3.8 | 3.8 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | |
| Average nominal interest rate on public debt (in percent) 8/ | 12.3 | 11.3 | 9.4 | 9.0 | 9.1 | 11.1 | 10.6 | 9.1 | 8.1 | 7.7 | 7.9 | |
| Average real interest rate (nominal rate minus change in GDP deflator, in percent) | 0.2 | 5.1 | 2.9 | 1.7 | 3.6 | 6.8 | 5.5 | 5.3 | 4.9 | 4.7 | 4.9 | |
| Nominal appreciation (increase in US dollar value of local currency, in percent) | -15.9 | -2.7 | -20.0 | 3.1 | 16.3 | ... | ... | ... | ... | ... | ... | |
| Inflation rate (GDP deflator, in percent) | 12.1 | 6.2 | 6.4 | 7.2 | 5.5 | 4.3 | 5.1 | 3.8 | 3.2 | 3.0 | 3.0 | |
| Growth of real primary spending (deflated by GDP deflator, in percent) | -5.5 | 5.5 | 4.5 | 2.8 | 7.6 | 6.0 | 1.7 | 3.7 | 4.5 | 3.9 | 3.7 | |

1/ Indicate coverage of public sector, e.g., general government or nonfinancial public sector. Also whether net or gross debt is used.

2/ Derived as $[(r - \pi(1+g) - g + \alpha\varepsilon(1+r)]/(1+g+\pi+g\pi))$ times previous period debt ratio, with r = interest rate; $\pi$ = growth rate of GDP deflator; g = real GDP growth rate; $\alpha$ = share of foreign-currency denominated debt; and $\varepsilon$ = nominal exchange rate depreciation (measured by increase in local currency value of U.S. dollar).

3/ The real interest rate contribution is derived from the denominator in footnote 2/ as r - $\pi$ (1+g) and the real growth contribution as -g.

4/ The exchange rate contribution is derived from the numerator in footnote 2/ as $\alpha\varepsilon(1+r)$.

5/ For projections, this line includes exchange rate changes.

6/ Defined as public sector deficit, plus amortization of medium and long-term public sector debt, plus short-term debt at end of previous period.

7/ The key variables include real GDP growth; real interest rate; and primary balance in percent of GDP.

8/ Derived as nominal interest expenditure divided by previous period debt stock.

9/ Assumes that key variables (real GDP growth, real interest rate, and other identified debt-creating flows) remain at the level of the last projection year.

Figure 2. Country: Public Debt Sustainability: Bound Tests  1/
(Public debt in percent of GDP)

Baseline and historical scenarios

Gross financing need under
baseline (right scale)

Baseline

Historical

Baseline

44

41

2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010

Interest rate shock (in percent)

| Baseline: | 5.1 |
| Scenario: | 7.2 |
| Historical: | -0.7 |

i-rate shock

46

Baseline

41

2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010

Growth shock (in percent per year)

| Baseline: | 4.0 |
| Scenario: | 2.7 |
| Historical: | 2.1 |

Growth
shock 50

Baseline

41

2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010

Primary balance shock (in percent of GDP) and
no policy change scenario (constant primary balance)

| Baseline: | 2.7 |
| Scenario: | 1.9 |
| Historical: | 0.4 |

No policy change

PB shock

45

Baseline

41

2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010

Combined shock  2/

Combined
shock

48

Baseline

41

2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010

Real depreciation and contingent liabilities shocks  3/

30 % depreciation

53

contingent
liabilities shock

52

Baseline

41

2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010

Sources: International Monetary Fund, Country desk data, and staff estimates.
1/ Shaded areas represent actual data.Individual shocks are permanent one-half standard deviation shocks.
Figures in the boxes represent average projections for the respective variables in the baseline and scenario being
presented. Ten-year historical average for the variable is also shown.
2/ Permanent 1/4 standard deviation shocks applied to real interest rate, growth rate, and primary balance.
3/ One-time real depreciation of 30 percent and 10 percent of GDP shock to contingent liabilities occur in 2006,
with real depreciation defined as nominal depreciation (measured by percentage fall in dollar value of local
currency) minus domestic inflation (based on GDP deflator).

Table 3. Country: External Debt Sustainability Framework, 1999-2009: Previous Template
(In percent of GDP, unless otherwise indicated)

### I. Baseline Projections

| | Actual 2000 | 2001 | 2002 | 2003 | 2004 | Proj. 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Debt-stabilizing non-interest current account 7/ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1 External debt** | 46.1 | 47.5 | 52.3 | 46.4 | 37.8 | 38.4 | 38.4 | 38.1 | 36.8 | 35.6 | 34.5 | **-1.8** |
| 2 Change in external debt | 0.6 | 1.5 | 4.8 | -5.9 | -8.6 | 0.6 | 0.0 | -0.3 | -1.3 | -1.3 | -1.0 | |
| 3 Identified external debt-creating flows (4+8+9) | -2.2 | -3.8 | 7.4 | -6.3 | -11.5 | -0.7 | -0.8 | -0.7 | -0.9 | -0.9 | -0.8 | |
| 4 Current account deficit, excluding interest payments | -4.1 | -2.0 | -1.6 | -1.5 | -1.5 | 0.4 | 0.6 | 0.6 | 0.3 | 0.2 | 0.3 | |
| 5 Deficit in balance of goods and services | -10.2 | -7.8 | -7.6 | -7.0 | -6.4 | -4.2 | -4.3 | -3.5 | -3.5 | -3.6 | -3.8 | |
| 6 Exports | 20.1 | 18.3 | 19.9 | 19.0 | 18.2 | 18.0 | 18.5 | 18.0 | 18.5 | 19.0 | 19.7 | |
| 7 Imports | 9.9 | 10.5 | 12.2 | 12.0 | 11.8 | 13.8 | 14.2 | 14.5 | 15.0 | 15.3 | 15.9 | |
| 8 Net non-debt creating capital inflows (negative) | -2.6 | -3.0 | -1.8 | -1.0 | -2.5 | -2.2 | -2.0 | -2.2 | -2.2 | -2.2 | -2.1 | |
| 9 Automatic debt dynamics 1/ | 4.6 | 1.2 | 10.8 | -3.8 | -7.5 | 1.1 | 0.6 | 0.8 | 1.0 | 1.1 | 1.1 | |
| 10 Contribution from nominal interest rate | 3.1 | 3.4 | 3.5 | 2.9 | 2.4 | 2.6 | 2.2 | 2.3 | 2.4 | 2.5 | 2.4 | |
| 11 Contribution from real GDP growth | -1.4 | -0.6 | -1.1 | -1.7 | -1.4 | -1.5 | -1.5 | -1.5 | -1.4 | -1.4 | -1.3 | |
| 12 Contribution from price and exchange rate changes 2/ | 2.8 | -1.5 | 8.3 | -5.0 | -8.6 | … | … | … | … | … | … | |
| 13 Residual, incl. change in gross foreign assets (2-3) 3/ | 2.8 | 5.3 | -2.6 | 0.5 | 2.9 | 1.3 | 0.8 | 0.5 | -0.4 | -0.3 | -0.2 | |
| External debt-to-exports ratio (in percent) | 229.1 | 260.1 | 263.3 | 244.5 | 207.8 | 212.9 | 207.5 | 211.9 | 199.1 | 187.6 | 175.2 | |
| **Gross external financing need (in billions of US dollars) 4/** | 8.7 | 10.8 | 13.2 | 12.8 | 12.5 | 15.7 | 15.7 | 16.3 | 17.6 | 18.4 | 19.7 | |
| in percent of GDP | 11.1 | 13.1 | 18.5 | 15.6 | 11.9 | 14.9 | 14.8 | 14.8 | 15.2 | 15.0 | 15.1 | |

**Key Macroeconomic Assumptions**

| | 2000 | 2001 | 2002 | 2003 | 2004 | 10-Year Historical Average | 10-Year Standard Deviation | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Projected Average |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Real GDP growth (in percent) | 2.9 | 1.5 | 1.9 | 3.8 | 3.8 | 2.1 | 2.6 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| GDP deflator in US dollars (change in percent) | -5.8 | 3.4 | -14.9 | 10.6 | 22.6 | 1.1 | 12.1 | -2.9 | -3.6 | -0.2 | 1.7 | 1.7 | 2.0 | -0.2 |
| Nominal external interest rate (in percent) | 6.7 | 7.7 | 6.4 | 6.5 | 6.7 | 7.2 | 0.6 | 6.9 | 5.7 | 6.3 | 6.8 | 7.1 | 7.2 | 6.7 |
| Growth of exports (US dollar terms, in percent) | 12.8 | -4.6 | -5.7 | 9.8 | 21.9 | 6.3 | 9.4 | 0.0 | 3.0 | 0.9 | 8.6 | 8.4 | 10.3 | 5.2 |
| Growth of imports (US dollar terms, in percent) | 9.0 | 11.4 | 1.1 | 12.8 | 24.4 | 1.1 | 21.1 | 18.5 | 2.9 | 6.1 | 9.2 | 8.5 | 9.9 | 9.2 |
| Current account balance, excluding interest payments | 4.1 | 2.0 | 1.6 | 1.5 | 1.5 | 0.3 | 2.9 | -0.4 | -0.6 | -0.6 | -0.3 | -0.2 | -0.3 | -0.4 |
| Net non-debt creating capital inflows | 2.6 | 3.0 | 1.8 | 1.0 | 2.5 | 2.4 | 1.1 | 2.2 | 2.0 | 2.2 | 2.2 | 2.2 | 2.1 | 2.2 |

### II. Stress Tests for External Debt Ratio

| | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Debt-stabilizing non-interest current account 7/ |
|---|---|---|---|---|---|---|---|
| **A. Alternative Scenarios** | | | | | | | |
| A1. Key variables are at their historical averages in 2005-09 5/ | 38.4 | 36.5 | 35.6 | 34.5 | 33.4 | 32.5 | -1.2 |
| A2. Country-specific shock in 2005, with reduction in GDP growth (relative to baseline) of one standard deviation 6/ | 38.4 | 38.4 | 38.1 | 36.8 | 35.6 | 34.5 | -1.8 |
| A3. Selected variables are consistent with market forecast in 2005-09 | 38.4 | 38.4 | 38.1 | 36.8 | 35.6 | 34.5 | -1.8 |
| **B. Bound Tests** | | | | | | | |
| B1. Nominal interest rate is at historical average plus two standard deviations in 2005 and 2006 | 38.4 | 39.5 | 40.0 | 38.7 | 37.5 | 36.5 | -1.8 |
| B2. Real GDP growth is at historical average minus two standard deviations in 2005 and 2006 | 38.4 | 41.2 | 43.8 | 42.2 | 40.7 | 39.5 | -2.1 |
| B3. Change in US dollar GDP deflator is at historical average minus two standard deviations in 2005 and 2006 | 38.4 | 48.0 | 61.4 | 59.1 | 56.9 | 55.0 | -2.9 |
| B4. Non-interest current account is at historical average minus two standard deviations in 2005 and 2006 | 38.4 | 43.3 | 48.2 | 46.9 | 45.8 | 44.9 | -1.7 |
| B5. Combination of B1-B4 using one standard deviation shocks | 38.4 | 46.3 | 56.6 | 54.9 | 53.3 | 52.0 | -2.3 |
| B6. One time 30 percent nominal depreciation in 2005 | 38.4 | 50.1 | 49.6 | 47.8 | 46.0 | 44.6 | -2.3 |

1/ Derived as $[r - g - \rho(1+g) + \varepsilon\alpha(1+r)]/(1+g+\rho+g\rho)$ times previous period debt stock, with r = nominal effective interest rate on external debt; $\rho$ = change in domestic GDP deflator in US dollar terms, g = real GDP growth rate,
$\varepsilon$ = nominal appreciation (increase in dollar value of domestic currency), and $\alpha$ = share of domestic-currency denominated debt in total external debt.
2/ The contribution from price and exchange rate changes is defined as $[-\rho(1+g) + \varepsilon\alpha(1+r)]/(1+g+\rho+g\rho)$ times previous period debt stock. $\rho$ increases with an appreciating domestic currency ($\varepsilon > 0$) and rising inflation (based on GDP deflator).
3/ For projection, line includes the impact of price and exchange rate changes.
4/ Defined as current account deficit, plus amortization on medium- and long-term debt, plus short-term debt at end of previous period.
5/ The key variables include real GDP growth; nominal interest rate; dollar deflator growth; and both non-interest current account and non-debt inflows in percent of GDP.
6/ The implied change in other key variables under this scenario is discussed in the text.
7/ Long-run, constant balance that stabilizes the debt ratio assuming that key variables (real GDP growth, nominal interest rate, dollar deflator growth, and non-debt inflows in percent of GDP) remain at their levels

Table 4. Country: Public Sector Debt Sustainability Framework, 2000-2010: Previous Template
(In percent of GDP, unless otherwise indicated)

| | Actual 2000 | 2001 | 2002 | 2003 | 2004 | 10-Year Historical Average | 10-Year Standard Deviation | Projections 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Debt-stabilizing primary balance 11/ |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | **I. Baseline Projections** | | | | | | |
| **1 Public sector debt 1/** | **47.7** | **51.8** | **60.0** | **56.3** | **49.4** | | | **49.5** | **48.3** | **47.2** | **45.3** | **43.3** | **41.3** | **0.5** |
| o/w foreign-currency denominated | 26.3 | 28.5 | 31.9 | 29.9 | 24.4 | | | 24.7 | 24.4 | 24.0 | 22.9 | 22.0 | 21.2 | |
| 2 Change in public sector debt | 6.4 | 4.1 | 8.2 | -3.7 | -6.9 | | | 0.1 | -1.1 | -1.1 | -1.9 | -2.0 | -2.0 | |
| 3 Identified debt-creating flows (4+7+12) | 1.9 | 0.9 | 7.1 | -4.1 | -7.1 | | | -1.5 | -2.1 | -2.2 | -2.4 | -2.4 | -2.3 | |
| 4 Primary deficit | -0.9 | -1.3 | -0.5 | -2.0 | -2.9 | | | -2.7 | -2.7 | -2.7 | -2.7 | -2.7 | -2.7 | |
| 5 Revenue and grants | 28.0 | 29.5 | 29.3 | 30.6 | 32.5 | | | 32.9 | 32.3 | 32.1 | 32.3 | 32.2 | 32.1 | |
| 6 Primary (noninterest) expenditure | 27.1 | 28.2 | 28.9 | 28.6 | 29.6 | | | 30.2 | 29.5 | 29.5 | 29.6 | 29.6 | 29.5 | |
| 7 Automatic debt dynamics 2/ | 3.3 | 2.3 | 7.5 | -2.2 | -4.3 | | | 1.2 | 0.6 | 0.5 | 0.4 | 0.2 | 0.3 | |
| 8 Contribution from interest rate/growth differential 3/ | -1.1 | 1.6 | 0.4 | -1.3 | -0.2 | | | 1.2 | 0.6 | 0.5 | 0.4 | 0.2 | 0.3 | |
| 9 Of which contribution from real interest rate | -0.1 | 2.2 | 1.3 | 0.8 | 1.7 | | | 3.0 | 2.4 | 2.3 | 2.1 | 1.9 | 1.9 | |
| 10 Of which contribution from real GDP growth | -1.0 | -0.7 | -0.9 | -2.1 | -2.0 | | | -1.8 | -1.8 | -1.8 | -1.8 | -1.7 | -1.6 | |
| 11 Contribution from exchange rate depreciation 4/ | 4.4 | 0.7 | 7.1 | -0.9 | -4.1 | | | ... | ... | ... | ... | ... | ... | |
| 12 Other identified debt-creating flows | -0.5 | 0.0 | 0.1 | 0.1 | 0.1 | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| 13 Privatization receipts (negative) | -0.5 | 0.0 | 0.1 | 0.1 | 0.1 | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| 14 Recognition of implicit or contingent liabilities | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| 15 Other (specify, e.g. bank recapitalization) | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | | | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | |
| 16 Residual, including asset changes (2-3) 5/ | 4.5 | 3.1 | 1.1 | 0.4 | 0.3 | | | 1.6 | 1.0 | 1.1 | 0.5 | 0.4 | 0.3 | |
| Public sector debt-to-revenue ratio 1/ | 170.3 | 175.4 | 204.4 | 184.1 | 151.8 | | | 150.6 | 149.9 | 147.1 | 140.3 | 134.5 | 128.5 | |
| Gross financing need 6/ | 5.9 | 6.3 | 8.4 | 7.5 | 3.7 | | | 5.2 | 4.6 | 4.4 | 4.1 | 3.9 | 3.8 | |
| in billions of U.S. dollars | 5.0 | 5.1 | 6.8 | 6.0 | 3.5 | | | 5.6 | 5.0 | 4.9 | 4.8 | 4.7 | 4.9 | |
| **Key Macroeconomic and Fiscal Assumptions** | | | | | | | | | | | | | | Projected Average |
| Real GDP growth (in percent) | 2.9 | 1.5 | 1.9 | 3.8 | 3.8 | 2.1 | 2.6 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 | 4.0 |
| Average nominal interest rate on public debt (in percent) 7/ | 12.3 | 11.3 | 9.4 | 9.0 | 9.1 | 11.1 | 1.6 | 11.1 | 10.6 | 9.1 | 8.1 | 7.7 | 7.9 | 9.1 |
| Average real interest rate (nominal rate minus change in GDP deflator, in percent) | 0.2 | 5.1 | 2.9 | 1.7 | 3.6 | -0.7 | 4.3 | 6.8 | 5.5 | 5.3 | 4.9 | 4.7 | 4.9 | 5.3 |
| Nominal appreciation (increase in US dollar value of local currency, in percent) | -15.9 | -2.7 | -20.0 | 3.1 | 16.3 | -9.3 | 12.4 | ... | ... | ... | ... | ... | ... | ... |
| Inflation rate (GDP deflator, in percent) | 12.1 | 6.2 | 6.4 | 7.2 | 5.5 | 11.7 | 5.1 | 4.3 | 5.1 | 3.8 | 3.2 | 3.0 | 3.0 | 3.7 |
| Growth of real primary spending (deflated by GDP deflator, in percent) | -5.5 | 5.5 | 4.5 | 2.8 | 7.6 | 5.2 | 6.6 | 6.0 | 1.7 | 3.7 | 4.5 | 3.9 | 3.7 | 3.9 |
| Primary deficit | -0.9 | -1.3 | -0.5 | -2.0 | -2.9 | -0.4 | 1.5 | -2.7 | -2.7 | -2.7 | -2.7 | -2.7 | -2.7 | -2.7 |

| | Projections 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | Debt-stabilizing primary balance 11/ |
|---|---|---|---|---|---|---|---|
| **II. Stress Tests for Public Debt Ratio** | | | | | | | |
| **A. Alternative Scenarios** | | | | | | | |
| A1. Key variables are at their historical averages in 2005-09 8/ | **49.5** | **48.6** | **47.8** | **46.6** | **45.3** | **43.9** | **-1.0** |
| A2. No policy change (constant primary balance) in 2005-09 | **49.5** | **49.8** | **50.1** | **50.3** | **50.5** | **50.8** | **0.6** |
| A3. Country-specific shock in 2005, with reduction in GDP growth (relative to baseline) of one standard deviation 9/ | **49.5** | **48.3** | **47.2** | **45.3** | **43.3** | **41.3** | **0.5** |
| A4. Selected variables are consistent with market forecast in 2005-09 | **49.5** | **48.3** | **47.2** | **45.3** | **43.3** | **41.3** | **0.5** |
| **B. Bound Tests** | | | | | | | |
| B1. Real interest rate is at historical average plus two standard deviations in 2005 and 2006 | **49.5** | **49.5** | **49.8** | **47.9** | **45.9** | **43.9** | **0.5** |
| B2. Real GDP growth is at historical average minus two standard deviations in 2005 and 2006 | **49.5** | **54.2** | **61.9** | **64.7** | **67.4** | **70.2** | **0.9** |
| B3. Primary balance is at historical average minus two standard deviations in 2005 and 2006 | **49.5** | **53.7** | **58.1** | **56.4** | **54.5** | **52.6** | **0.6** |
| B4. Combination of B1-B3 using one standard deviation shocks | **49.5** | **53.6** | **58.1** | **56.4** | **54.5** | **52.6** | **0.6** |
| B5. One time 30 percent real depreciation in 2005 10/ | **49.5** | **59.1** | **58.4** | **56.7** | **54.8** | **52.9** | **0.7** |
| B6. 10 percent of GDP increase in other debt-creating flows in 2005 | **49.5** | **58.3** | **57.6** | **55.9** | **54.0** | **52.1** | **0.6** |

1/ Indicate coverage of public sector, e.g., general government or nonfinancial public sector. Also whether net or gross debt is used.
2/ Derived as $[(r - \pi(1+g) - g + \alpha\varepsilon(1+r)]/(1+g+\pi+g\pi))$ times previous period debt ratio, with r = interest rate; $\pi$ = growth rate of GDP deflator; g = real GDP growth rate; $\alpha$ = share of foreign-currency denominated debt; and $\varepsilon$ = nominal exchange rate depreciation (measured by increase in local currency value of U.S. dollar).
3/ The real interest rate contribution is derived from the denominator in footnote 2/ as r - $\pi$ (1+g) and the real growth contribution as -g.
4/ The exchange rate contribution is derived from the numerator in footnote 2/ as $\alpha\varepsilon(1+r)$.
5/ For projections, this line includes exchange rate changes.
6/ Defined as public sector deficit, plus amortization of medium and long-term public sector debt, plus short-term debt at end of previous period.
7/ Derived as nominal interest expenditure divided by previous period debt stock.
8/ The key variables include real GDP growth; real interest rate; and primary balance in percent of GDP.
9/ The implied change in other key variables under this scenario is discussed in the text.
10/ Real depreciation is defined as nominal depreciation (measured by percentage fall in dollar value of local currency) minus domestic inflation (based on GDP deflator).
11/ Assumes that key variables (real GDP growth, real interest rate, and other identified debt-creating flows) remain at the level of the last projection year.