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External and Fiscal Sustainability of the Czech Economy: A Quick Look Through the IMF's Night-Vision Goggles

Aleš Bulíř[*]

Abstract

The paper presents the rationale for spreadsheet-based debt sustainability assessments. Policymakers can use these exercises in two ways. First, assessments of possible debt developments provide "reality checks" of macroeconomic projections. Second, the financial stability exercise may indicate vulnerability to crises. Empirically, using the IMF debt sustainability template, the paper finds that the external position of the Czech Republic appears sustainable under most plausible history-based scenarios. However, a deep, two-year recession coupled with fiscal indiscipline might double the 2002 stock of foreign debt by the end of the decade. The fiscal position is significantly more fragile and the fiscal debt-to-GDP ratio quickly approaches 60 percent under some of the more pronounced shocks.

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If something cannot go on forever, it will stop.
Herbert Stein

1. Introduction

This paper lays out the rationale for financial stability (debt sustainability) assessments and uses the International Monetary Fund (IMF) methodology to assess the external and domestic fiscal debt sustainability of the Czech economy.[1] It argues that medium-term macroeconomic forecasts tend to be overly optimistic and ought to be evaluated in the light of plausible, if not necessarily likely, shocks. Ideally, a combination of mechanical, history-based and alternative scenarios should be used in these exercises.

Policymakers benefit from such exercises in two ways. First, if presented jointly with macroeconomic forecasts, assessments of vulnerabilities provide "reality checks" thereof. For example, high-growth macroeconomic scenarios may end up being crisis-prone. Second, the financial stability exercise—if done frankly—may sound warning bells well before a crisis strikes. We know, however, that different developments have triggered financial crises in different countries.

Empirically, focusing on aggregate series of gross financing needs, the paper finds that the external position of the Czech Republic appears sustainable under most plausible history-based scenarios. However, a deep, two-year recession coupled with fiscal indiscipline might double the 2002 stock of foreign debt by the end of the decade. Alternatively, a different set of assumptions vis-à-vis current account developments may bring gross external financing needs to more than 20 percent of GDP. The fiscal position is significantly more fragile than the external position and the fiscal debt-to-GDP ratio quickly approaches 60 percent under some of the more pronounced shocks.

The paper is organized as follows. First, we discuss the motivation for the debt sustainability exercises. Second, we outline some alternative approaches to this assessment. Third, we describe the results for the external and fiscal sectors. Finally, we propose a routine of regular updates to be executed by the staff of the Czech National Bank.

2. Why Are the Official Forecasts Not Good Enough to Assess Financial Stability?

The IMF's difficulty in making adequate and timely assessments of the domestic and external vulnerabilities first in Asia and subsequently in Argentina and other emerging markets prompted the institution to adopt a framework that would bring some degree of consistency and discipline to external and fiscal debt sustainability analyses (International Monetary Fund, 2004a). Specifically, such a framework should lay bare the basis on which projections are made and subject them to well-defined and transparent sensitivity tests. Sustainability analysis ought to force discipline and some degree of realism into the projection process.

[1] This paper should be read jointly with International Monetary Fund (2002) and (2003).

2.1 Two Problems

Typically, two problems with macroeconomic projections have been reported. First, forecasters are insufficiently constrained in their choice of underlying assumptions, and projections change considerably even in the absence of new information. Alternatively, the lack of constraint may mean that projections do not change at all after new information is received and forecasters incorporate any such information with a lag only. Of course, volatility of projections does not imply that more "stable" projections would be better than more volatile ones, or *vice versa*. It only implies that the assumptions behind the central forecast need to be scrutinized carefully and exposed to sensitivity tests to determine the central forecast's robustness vis-à-vis plausible developments and shocks (see, for example, Chapter IV of International Monetary Fund, 1999, which discusses alternative medium-term fiscal scenarios for the Czech Republic).

Figure 1 demonstrates the issue of fast changing projections by comparing the two most recent vintages of the World Economic Outlook (WEO) projections prepared for the Czech Republic, which paint a quite different picture of the economy. For example, between the fall 2003 and spring 2004 projection rounds, the 2008 Czech current account balance was projected to worsen by an additional 2.5 percentage points of GDP and total external debt was projected to increase by an additional US$12 billion. While both revisions can be explained—by revised methods of estimating reinvested profits and fiscal contingent liabilities respectively—the main point is that both factors were known before and only during the spring 2004 projection round were these assumptions incorporated into the central, medium-term forecast. On the one hand, it is a side issue which of these forecasts would be closer to reality in 2008. On the other hand, and this is the key message from the debt sustainability exercise, it is clear that the revised data paint a more vulnerable picture of the Czech economy. Policymakers are more likely to make informed decisions if they also know the results of less favorable projection exercises.

Second, macroeconomic projections tend to be overly optimistic, be they produced by national authorities or international institutions (Musso and Phillips, 2002, and Batista and Zalduendo, 2004).[2] The reasons for the optimistic bias are known. Forecasters do not want to impose arbitrarily cyclical downturns in their projections. Policymakers would certainly object to a rule of thumb that would mechanically impose a recession, say, after an average-length economic expansion. Moreover, typical macroeconomic projection models are of the general equilibrium type, ensuring that the economy returns sooner or later to equilibrium. Therefore, explosive dynamics is excluded in these robust models *ex ante* and, as a result, they tend to underestimate the costs of unsustainable policies. The proper, if difficult-to-interpret, remedy is known: policymakers need to use the full expected distribution of medium-term outcomes, as opposed to the central forecast only.

[2] For example, WEO medium-term GDP growth projection errors are positive on average and range from ¾ to 1 percentage point per year, as the typical period-average growth projection reflects uninterrupted expansion. Lowering the *average* growth rate would not necessarily help, however, as the flat rate would imply an unrealistic trajectory of other variables. Clearly, five-year fiscal balances or imports would differ between a scenario of high growth and a recession as compared to flat mediocre growth, even if the five-year average growth rates were identical for both scenarios.

2.2 Why Should Policymakers Care?

What does the lack of certainty of projections imply for financial stability and debt sustainability analyses? On the one hand, the literature devoted to crises modeling is extensive[3] and several sets of "early warning indicators" have been proposed. On the other hand, all the models to date—although generally successful in explaining past crises—fared poorly in predicting the new ones. Two recent examples of non-predicted crises come to mind: the ERM crisis in the early 1990s and the Asian crisis in the late 1990s. At the same time, the model(s) made numerous false alarms, predicting emerging market crises left and right (see Figure 2). Malaysia is a good example, as it should have experienced at least 10 crises between 1970 and 1998. Predictably, when you cry wolf too often, nobody pays attention to you anymore.

Moreover, the lessons from past crises seem to be forgotten quickly. Who would remember that the debt sustainability of Italy, the second- or third-largest European economy in 1991, was seriously questioned during the ERM crisis in the early 1990s? Korea, which at end-2003 boasted official reserves of more than US$155 billion, or nine months of imports of goods and services, had had in December 1997 reserves equivalent to less than 10 days of scheduled payments and was on the verge of default. When crisis risks are discussed in accession countries, it is habitually assumed that the disciplinary effects of joining the eurozone offset other potential risks. It is not clear, however, that the discipline brought about by the ERM I and Stability Pact will be emulated by the new accession countries during the 2000s. In addition to macroeconomic shocks, the accession countries will be faced with a sizable demographic shock that may be quantitatively more important than the former shocks.[4]

How important are sustainability exercises for policymakers? We argue that they benefit in two ways. First, if presented jointly with macroeconomic forecasts, broad evaluations of financial and macroeconomic vulnerabilities provide "reality checks" thereof. For example, a high-growth macroeconomic scenario financed by external borrowing may end up being crisis-prone in the short or medium run. We would not stretch this point too far into the future by projecting the long-run impact of selected vulnerabilities. In our view, "test driving" macroeconomic forecasts is the key function of sustainability exercises.

Second, the financial stability exercise—if done frankly—may sound warning bells well before a crisis strikes. Of course, there are no silver bullets available, as different developments can trigger financial crises in different countries and vulnerability assessments tend to provide a fair number of false alarms. As a result, policymakers would be better off evaluating multiple variables as opposed to focusing on a single one. Although important, this in our view is the less important of the two benefits of these exercises.

To summarize, the robustness of macroeconomic forecasts has been limited both because the central forecasts themselves fluctuate as a result of changes in underlying assumptions and because these forecasts suffer from "optimistic bias." In our view, it is not plausible to call for more stable and unbiased forecasts. It is operationally more useful to expose the existing forecasts to robustness tests and prepare a battery of alternative scenarios. Indeed, the key policy question

[3] See Berg and Pattillo (1998) and Berg, Borensztein, and Pattillo (2004) for a review.

[4] The fiscal implications of the shock of a rapidly ageing population were discussed in a series of papers by Bezděk *et al.* (2003).

to be answered by the financial stability exercise is simple: what are the risks associated with the existing forecast? These risks can be evaluated in terms of the rate of growth, fiscal or current account balances, the rate of inflation and so on. However, the preferable variables in emerging economies are those of public and external debt. The precise definitions of those variables can be tailored to country-specific needs.

3. How to Assess Macroeconomic Sustainability?

The literature does not offer any definitive answers, but instead suggests several alternatives conditional on the level of sophistication of the analyst and his/her primary objective. The basic choice is between a model-based, multisectoral analysis versus aggregated debt series in a partial-equilibrium framework. We argue that the latter approach may suffice in the short run, but that the CNB should gradually develop further expertise in model-based sustainability exercises, utilizing its forecasting models.

3.1 A Full-Blown Structural Model

Ideally, each national central bank would have developed a large, structural model that could be exposed to selected, country-specific shocks and scenarios. If sufficiently detailed, the model would expose weak sectors (households, banks, and so on) under alternative underlying assumptions and provide a rough assessment of the second-round effects of those shocks.[5] For example, one may be interested in knowing what would be the first-round impact of a large interest rate shock on household balances and how would they adjust. In the second round, one may ask how the household balances would affect the banking system, capital inflows and outflows, and so on. With such a model in hand, one could then extend it to allow for testing of multiple equilibria and regime switching in order to test the impact of various shocks on the behavior of the exchange rate and private capital flows.

The advantages of a complex model are obvious. First, the authorities would have a comprehensive picture of all potentially vulnerable sectors, ensuring stock-flow consistency. Second, second-round (or spillover) effects could be assessed and compared in a unified framework. Finally, competing vulnerabilities could be explored and tailored to regime-specific needs. For example, the staff may want to test the possibility of nonlinear or asymmetric responses to shocks.

However, the cons of a full-blown model are considerable as well. Most importantly, it is time consuming to build such a model and run it on a regular basis. The size of the model tends to negatively affect its versatility: the higher the level of detail of the model, the fewer alternative scenarios can be produced and compared in the short run. At present, the CNB does not have a model with stock-flow consistency and its prediction team relies on a reduced-form, gap-based macroeconomic model. A larger model with the above characteristics is being built, however, and the possibility of using the model for financial stability exercises should be considered during the process of model preparation. Finally, large macroeconomic models have a tendency to underestimate the costs of unsustainable policies, as they have built-in mechanisms ensuring that the model economy returns to equilibrium.

[5] See Allen *et al.* (2002) for a discussion of the sectoral-based balance-sheet approach.

3.2 A Collection of Reduced-Form Models

In the absence of a complex structural model, the central bank could rely on a few reduced-form models to provide key macroeconomic results and use them in succession to assess a range of sector-specific developments. For example, a model of the household sector might be shocked with inputs obtained from a reduced-form macroeconomic model. While such alternative scenarios can be produced much faster than with a full-blown model, researchers may obtain inconsistent results from a bundle of *ad hoc* models, especially when the initial shocks are large.

The most obvious advantage of such a simplified approach is the simplicity with which the models can be constructed and used. Indeed, most models needed for the exercise are already in place. Second, if carefully built, these models can ensure basic stock-flow consistency and allow for separation of key sectors in the economy.

The key adverse concern to be addressed is that of inconsistency—a bundle of partial-equilibrium models is much less reliable than a general-equilibrium model. Repeated pass-through from one model to another is likely to exacerbate the biases inherent in the individual models, making it difficult to evaluate multiple scenarios. The assessment of second-round effects is problematic, too, owing to potential consistency problems with unrelated underlying models, although some "back-of-the-envelope" calculations are certainly possible.

3.3 A "Probabilistic" Approach

An attractive approach in the absence of well-formulated macroeconomic models is to build a series of consistent, highly aggregated medium-term scenarios of debt and financing developments and subject them to a sensitivity analysis. The staff of the International Monetary Fund have developed a spreadsheet that does precisely that (see Appendix I for a detailed description of the spreadsheet).[6] In building the spreadsheet, the Fund was motivated by two competing demands. First, the staff were asked to have a simple and comparable output for all its member countries, with limited country-specific customization. To this end, the spreadsheet concentrates on national-currency and US-dollar gross financing needs. Second, the country teams need to be able to prepare a variety of easily manipulated scenarios in order to discuss medium-term risks to external and fiscal sustainability. These typically include a baseline scenario, a market-based scenario, and one or more alternative scenarios.

The baseline scenario is built around medium-term macroeconomic projections agreed with the national authorities and is then exposed to temporary shocks based on past developments (typically two standard deviations based on historical 10-year data). It is worth noting that the medium-term projections—published twice-yearly in the IMF World Economic Outlook (WEO)—already assume sustainable medium-term policies. Hence, unless the recent history has been extremely volatile, mild recent-history shocks cannot be expected to provide a shock comparable to, say, the recent "capital account" crises in Asian or Latin American countries. Therefore, the baseline scenario does not typically test the limits of the economy's sustainability.

[6] The Fund staff presents these scenarios in the context of regular annual consultations. In the case of the Czech Republic, the 2003 Article IV Consultations were conducted in May 2003 and the results are summarized in Annex I of the Czech Republic Article IV Consultations Staff Report (International Monetary Fund, 2004b).

For this reason, alternative scenarios assuming more (or less) adverse external conditions and worse (or better) policies are usually prepared.

The framework provides insights into the first-round impacts of certain typical shocks on a few financing variables. These calculations are less constrained than large-scale models and can be manipulated much more easily—the whole exercise is essentially a sensitivity test of a simplified macroeconomic framework. The various scenarios can reflect official macroeconomic forecasts or market-based macroeconomic predictions (such as Consensus Forecast).

The obvious weaknesses of the probabilistic approach—the lack of second-round effects in the baseline scenario—can be either amplified or reduced by those running the exercise.[7] Regarding the former, the researcher may rely exclusively on an overly optimistic baseline scenario, underestimating potential vulnerabilities. Regarding the latter, by preparing alternative macroeconomic scenarios with estimates of second-round effects, the final output can approximate the results from a full-blown model.

In the end, the chosen approach—a structural model, a collection of reduced-form models, or a "probabilistic" approach—will depend on the level of sophistication of the analyst (institution) and his/her primary objective. The basic choice is between a slow/detailed analysis versus a fast/aggregated framework. These options are not mutually exclusive: while the simplest, probabilistic, debt-centered approach would suffice in the short run, most institutions will strive to develop further expertise in more complex financial stability exercises.

4. Empirical Results

We have used the IMF "debt sustainability" spreadsheet to explore the vulnerability of the external and domestic developments of the Czech Republic in 2004–2008. In the following section we provide the baseline scenario (based on fall 2003 WEO projections), an alternative scenario (assuming a sharp economic slowdown in 2004–2005), and a scenario based on the most recent (spring 2004) WEO projection. All scenarios serve a simple goal—to demonstrate the use of the template in the context of a debt sustainability exercise even when using outdated projections. In particular, the alternative scenario of a "perfect storm" type of crisis serves illustrative purposes only and should not be construed as a real-life forecast.

4.1 External Debt Sustainability

Under the fall 2003 baseline scenario, the Czech Republic's external debt stock (both public and private) is projected to stabilize at 33 percent of GDP, from about 38 percent of GDP in 2002 (Figure 3 and Tables 1 and 2). The country can afford to run current account deficits in excess of 5 percent of GDP without an increase in external debt.[8] This reflects numerous positive

[7] By mechanically shocking a baseline-scenario variable, say, GDP or the exchange rate, all other variables are left unchanged.

[8] A long-run, constant balance that stabilizes the debt ratio assuming that key variables (real GDP growth, nominal interest rate, dollar deflator growth, and both non-interest current account and non-debt inflows in percent of GDP) remain at their levels of the last projection year.

developments under the baseline WEO scenario: robust FDI inflows, stable real GDP growth supported by fast-expanding exports, and koruna appreciation.

Debt sustainability should also be tested by a flow measure of upcoming payments (Table 2). For example, a large debt stock with a minimal debt service will have less adverse sustainability implications than a small debt stock at high interest rates and/or a bunched-up repayment schedule. Some financial crises may have been linked to unsustainable debts, while others have been triggered by liquidity concerns. In countries with liberalized financial markets, crises tend to erupt well before a "safe" level of debt or debt service is breached as risk-averse investors try to exit early. Research on "early warning indicators" and other crisis predictors shows clearly that no single variable can predict financial crises in all economies and under alternative shocks.

To this end, the framework uses what is termed the overall gross external financing need, defined as the sum of the current account deficit, amortization on medium- and long-term debt, and the outstanding stock of short-term debt. Arguably, the gross external financing need is a crude measure of financial stability. However, it is available at higher frequencies than its more sophisticated alternatives such as the net investment position, and it can be forecasted and interpreted easily. This measure is projected to increase somewhat in U.S. dollar terms. However, relative to GDP, this ratio is expected to decline from 27 percent in 2002 to 22 ½ percent in 2008.

To assess the robustness of the baseline scenario, we conducted several bound tests, based on various adverse shocks (see B1–B6 in Table 1).[9] The results indicate that the stock of external debt of the Czech Republic remains manageable at around 40 percent of GDP under the baseline scenario with shocks assuming some 95 percent of potential adverse outcomes.[10] The financing needs decline in percent of GDP.

Alternative Scenarios

We modified the baseline scenario in several ways. First, the key variables are set at their historical (1991–2001) averages in 2004–08 (A1). Second, we build an alternative, everything-goes-wrong scenario (A2). The "historical" scenario is of little interest, primarily owing to historically small current account deficits (2 ½ percent of GDP) that bring down both external debt and gross financing needs.

The hypothetical, everything-goes-wrong scenario is more interesting, rendering the external position explosive. We assumed the following: (i) a sharp recession in 2004–05 with a cumulative decline of some 8 percent; (ii) additional fiscal borrowing in foreign currency, equivalent to US$3 billion per annum; (iii) some slowdown in FDI; and (iv) sharp nominal depreciation in 2004, followed by further gradual depreciation throughout the period. It is worth reminding the reader

[9] The shocks were as follows: (i) nominal interest rate at historical average plus two standard deviations in 2004 and 2005; (ii) real GDP growth at historical average minus two standard deviations in 2004 and 2005; (iii) change in U.S. dollar GDP deflator at historical average minus two standard deviations in 2004 and 2005; (iv) non-interest current account at historical average minus two standard deviations in 2004 and 2005; (v) combination of shocks (i)-(iv) using one standard deviation shocks, providing the most severe shock of all; and (vi) one-time 30 percent nominal depreciation in 2004.

[10] This conclusion is conditional on the traditional view of what is manageable in developed countries. Reinhart *et al*. (2003) have shown, however, that a "safe" level of debt for a highly vulnerable developing/emerging economy is lower, perhaps as low as 30 percent of GDP.

that these adjustments to the original WEO projections were done in an *ad hoc* fashion, without a consistency check of the WEO spreadsheet.

Under these conditions, the external debt-to-GDP ratio explodes to 60 percent by 2008, even though the current account deficits decline somewhat owing to lower domestic demand. Gross external financing needs increase to 36 ½ percent of GDP, or by about 50 percent in U.S. dollar terms, as compared to 2002. Moreover, the debt-stabilizing noninterest current account deficit narrows by almost 4 percentage points to less than 2 percent of GDP.

We show another scenario based on the spring 2004 WEO projection. Although U.S. dollar GDP is higher, so is the average current account deficit. As a result, the debt stock in percent of GDP is somewhat lower compared to the fall 2003 WEO projection (Table 1). However, larger capital inflows to finance the current account deficits imply larger financing needs, which reach US$30 billion or 22 percent of GDP (Table 2). The debt-stabilizing noninterest current account deficit remains comfortable at around 5 ¾ percent of GDP.

4.2 Domestic Fiscal Debt Sustainability

Under the fall 2003 baseline scenario, the Czech Republic's public sector debt is projected to double from about 20 percent of GDP in 2002 to less than 40 percent of GDP in 2008 (Figure 4 and Tables 3 and 4).[11] Debt is driven by persistent deficits, although these start to narrow toward the end of the decade to about 3 percent of GDP. The overall gross public financing need (defined here as the public sector deficit plus amortization of medium- and long-term public sector debt plus short-term debt at the end of the previous period) is projected to decline in U.S. dollar terms and, relative to GDP, this ratio is expected to halve, primarily on account of low real interest rates.

While the primary fiscal deficit (noninterest expenditure *minus* revenue) was around 4 percent and 6 percent of GDP in 2002 and 2003 respectively, domestic debt during 2004–2008 would have been stabilized at a hypothetical primary *deficit* of 0.5 percent of GDP. In other words, to keep the level of public debt in percent of GDP at the 2003 level would require a fiscal tightening of almost 5 percentage points of GDP. Even this could be an optimistic result—these calculations omit long-term trends of population ageing and its negative impact on employment, total factor productivity, and fiscal balances (fewer taxable resources and higher pension and health expenditures).

To assess the robustness of the baseline scenario, we conducted several bound tests, based on various adverse shocks (see B1–B6 in Table 2).[12] The results indicate that the public debt will at least double under all scenarios. In the case of the most severe shock, that is, if the rate of growth were to become negative in 2004–05 for a cumulative decline of some 5 percent of GDP, the debt would quickly spiral out of control, exceeding the Maastricht criterion of 60 percent in 2007.

[11] The stock of debt estimate was revised substantially in early 2004 and, as a result, the presented estimates of debt stocks and flows are purely illustrative.

[12] The shocks were as follows: (i) real interest rate at historical average plus two standard deviations in 2004 and 2005; (ii) real GDP growth at historical average minus two standard deviations in 2004 and 2005. This is the most severe shock of all; (iii) primary balance at historical average minus two standard deviations in 2004 and 2005; (iv) combination of (ii)–(iv) using one standard deviation shocks; (v) one-time 30 percent real depreciation in 2004; (vi) 10 percent of GDP increase in other debt-creating flows in 2004.

Alternative Scenarios

We modified the baseline scenario to make it comparable to the external scenario.[13] First, the key variables were set at their historical (1991–2001) averages in 2004–08 (A1). Second, the primary balance was kept with no policy changes (A2). Third, we build an alternative, everything-goes-wrong scenario (A3). Similar to the external exercise, the "historical" scenario is of little interest, primarily owing to historic primary balance surpluses during the 1990s, which are unlikely to materialize again in the near future. Finally, we checked the spring 2004 WEO projections, but they produce an essentially identical fiscal outturn as the baseline.

The alternative, everything-goes-wrong scenario is again more interesting, rendering the public position explosive. We assumed the following: (i) a sharp recession in 2004–05 with a cumulative decline of some 8 percent; (ii) fiscal revenue growing at 5 percent per annum as compared to expenditures growing at 8 percent per annum; (iii) sharp nominal depreciation in 2004, followed by further gradual depreciation throughout the period; (iv) a delayed nominal interest rate increase as a result of an increasing country risk premium.[14] Under these conditions, the public debt-to-GDP ratio explodes to almost 90 percent by 2008 and gross financing needs exceed 40 percent of GDP. To stabilize public debt under these macroeconomic assumptions would require running a primary fiscal surplus of some 0.5 percent of GDP, that is, an additional fiscal adjustment of 1 percentage point of GDP as compared to the baseline scenario.

5. Conclusions

The paper presented the rationale for financial stability assessments and used the IMF methodology to assess recent projections of the Czech economy. It argues that policymakers benefit from sustainability assessments of medium-term macroeconomic forecasts in two ways. First, such vulnerability assessments provide "reality checks" of excessively optimistic macroeconomic projections. Second, a frank financial stability exercise may point out vulnerabilities to a crisis well before it strikes.

Using a simple probabilistic approach under baseline and alternative scenarios, the paper assessed the medium-term external and fiscal sustainability of the Czech economy. Under the baseline scenario—which assumes improved policies compared to those of 2000–03—both the external and public stance appear to be sustainable. If a reasonable range of shocks is applied, however, the outcome is much less encouraging. Significant growth deceleration is likely to result in serious problems in both the external and public sectors.

[13] The buildup of this scenario was considerably more difficult than the external scenario, as multiple *ad hoc* assumptions regarding real interest rates, GDP growth and so on, had to be made in order to complete the exercise.

[14] The same consistency caveats apply as in the alternative scenario for the external sector.

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Appendix

Debt Sustainability Template Guidance Note[15]

The framework described in the main text consists of two templates: one covering the public sector and one covering the external sector. While the underlying logic of the templates is similar, there are important differences between them, as described in the subsequent sections. Both templates consist of a baseline scenario articulating the authorities' intended policies as discussed with the staff in a surveillance context. A series of model-independent sensitivity tests are also applied to the baseline scenario, producing probabilistic upper bounds for the debt dynamics. In addition, the templates also contain additional scenarios which may further inform the staff's judgments about vulnerabilities. The output table that is produced contains the results of these exercises.

These templates are intended to provide a historical "reality check" on the staff's baseline projections and to identify the main risks to public sector and external sector debt sustainability. In formulating the baseline projections, several issues need to be considered, including the definition of debt, the coverage of the public sector, and the treatment of contingent liabilities. In general, it is recommended that the definition of debt be based on gross liabilities and that the coverage of public debt be as broad as possible (that is, including, where feasible, public enterprises as well as local governments).[16] The risks are assessed on the basis of standardized stress tests to check whether debt remains sustainable under a variety of plausible negative shocks to the economy.

While these templates provide greater uniformity and discipline to sustainability exercises, they do not preclude appropriate modifications based on certain country-specific circumstances. Possible modifications may include the choice of the period over which the stress-test parameters are calibrated (the template uses averages and standard deviations over the past 10 years), the choice of the period over which projections are made (the template uses five-year WEO projections), or the use of net, as opposed to gross, debt.

The framework is not designed to provide probabilities for debt crises, as such probabilities depend on country-specific factors such as the maturity and currency structure of the debt and various other aspects of vulnerability which cannot be adequately captured in a standardized template. The templates, however, yield other information: the debt-stabilizing primary balance (for the fiscal template) and the non-interest current account balance (for the external template), both calculated at the end of the projection horizon, assuming that key macroeconomic variables remain constant from that point on. Furthermore, the framework also yields gross financing needs under different scenarios and sensitivity tests. Information contained in the scenarios and sensitivity tests—as well as the debt-stabilizing public balance and non-interest current account balance derived by the framework—should inform the country teams in making their judgments.

[15] This appendix is based on the IMF staff guidance note.

[16] It is important to ensure, however, that the concept of public sector used for the debt corresponds to the concept used for the deficit.

This appendix is organized as follows: The next two sections describe the debt equations in the fiscal and external templates, highlighting the formulation of the different concepts present in the framework. The subsequent section discusses various alternative scenarios that were endorsed in the latest Board discussion. The appendix concludes with a brief overview of the operation of the template.

The Public Sector Debt Equation

The fiscal sustainability template analyzes debt incurred by the public sector, expressed in domestic-currency terms. Here, the debt dynamics are modeled by the following process:

$$d_{t+1} - d_t = \frac{1}{(1+g+\pi+g\pi)}(\hat{r} - \pi(1+g) - g + \varepsilon\alpha(1+\hat{r}))d_t - pb_{t+1}$$

where d is the debt-to-GDP ratio, pb is the primary balance, $\hat{r}$ is a weighted average of domestic and foreign interest rates, α is the share of foreign-currency denominated public debt, π is the change in the domestic GDP deflator, and g the real GDP growth rate.[17] Changes in the exchange rate (local currency per U.S. dollar) are denoted by ε, with $\varepsilon > 0$ indicating a depreciation of the local currency.

Based on the above equation, the fiscal template separates between the different channels that contribute to the evolution of the debt-to-GDP ratio: the primary deficit and the endogenous/automatic factors, which include the real interest rate, real GDP growth, and exchange rate movements. The contribution of the real interest rate to the evolution of the debt ratio is defined in the template as $\frac{\hat{r} - \pi(1+g)}{(1+g+\pi+g\pi)} d_t$, the contribution of the real growth rate as $-\frac{g}{(1+g+\pi+g\pi)} d_t$, and that of exchange rate depreciation as $\frac{\varepsilon\alpha(1+\hat{r})}{(1+g+\pi+g\pi)} d_t$.[18] The separation of the different factors allows an assessment of their relative importance for the evolution of the debt ratio. It also serves as the basis for stress tests, which consist of a number of temporary shocks to these variables (isolated and combined) based on historical averages and standard deviations. The shock to the variable is assumed to apply in the first two years of the projection, after which it returns to the baseline path. All other parameters follow the baseline path.

The template also includes other debt-creating or debt-reducing flows, e.g., from recognition of contingent liabilities or privatization receipts. Gross debt can also change as a result of other below-the-line operations (such as repayment of debt financed by a reduction in financial assets) as well as cross-currency movements. These are included in a residual.

[17] The fourth term in the numerator would correctly include the interest rate on foreign-currency denominated debt instead of the weighted average rate. The latter is used in the template for simplicity, since a breakdown between interest payments on domestic and foreign-currency debt is often not available. However, the template allows for a separate treatment of interest payments on foreign and domestic debt, which is recommended when the two interest rates differ considerably to avoid large residuals.

[18] Note that a clear separation between the different channels in the debt equation is not possible. As a result, the terms defined as exchange rate and interest contributions, while dominated by these respective variables, are also affected by some of the other variables.

In addition to the debt-to-GDP ratio (and the implicit path of the debt-to-revenue ratio) the template pays explicit attention to the gross financing needs of the public sector (defined as the public sector deficit plus all maturing debt). This variable is derived, for all the scenarios as well as for the sensitivity tests, in percent of GDP and in billions of dollars. The template also calculates the debt-stabilizing primary balance: this is the primary balance required to keep the debt level (as a ratio of GDP) constant if all the relevant variables in the debt dynamics equation stated earlier remained at the level reported in the last year of projection.

The External Sector Debt Equation

The external sustainability template analyzes debt incurred externally by domestic residents (both the public and the private sector). While the variables in the template are expressed in U.S. dollar terms, they could be expressed in euros as well. On this basis, the external debt dynamics are modeled by the following process:

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

where α is (now) the share of domestic-currency debt in total external debt, ε is the change in the exchange rate, now expressed in U.S. dollars per local currency unit (with $\varepsilon > 0$ indicating appreciation of the domestic currency), *tb* is the non-interest current account balance in percent of GDP, and ρ is the change in the domestic GDP deflator, expressed in U.S. dollar terms, with $(1+\rho) = (1+\pi)(1+\varepsilon)$. All other variables are defined as in the public sector debt analysis.

The external template, too, separates the different channels affecting the evolution of the debt ratio. The "automatic debt-dynamics" resulting from interest rate, growth and exchange rate movements are split between the interest rate contribution $\frac{\hat{r}}{(1+g+\rho+g\rho)} d_t$, the contribution of real GDP growth $-\frac{g}{(1+g+\rho+g\rho)} d_t$, and that of price and exchange rate changes $\frac{-\rho(1+g)+\varepsilon\alpha(1+\hat{r})}{(1+g+\rho+g\rho)} d_t$.[19]

As current account deficits are generally financed not only by debt-creating flows, but partly by the equity component of FDI and portfolio investment, the template explicitly subtracts such flows from the changes in the debt ratio. Other factors that affect the debt ratio, such as valuation changes linked to cross-currency movements and changes in foreign assets (which leave net debt unchanged), are captured in the residual.

Scenarios and Sensitivity Tests

In addition to the baseline scenario discussed with the authorities, the framework also incorporates other scenarios as reality checks on these projections:

[19] Similarly to the public debt analysis, the separation is not "clean", as the last term also includes interest and growth rate effects. Note that there is an interest rate component here as well; this could alternatively have been included in the interest rate contribution.

Historical Average Scenario: This scenario presents an alternative evolution of the debt ratio under the assumption that all key variables are at their historical averages throughout the projection period. The templates calculate averages over the ten-year period and use that information to project five years ahead.

Alternative Scenario: The framework introduces an additional scenario to be applied when the baseline scenario and various stress tests give rise to questions about the sustainability of the debt ratio. The staff are at liberty to design this scenario based on the particulars of the country, deriving key parameters from the macroeconomic model.

Market Forecast Scenario: For countries where market forecasts of key macroeconomic variables are available, the economist should include them in the template as well. This could serve as a useful check on optimism regarding policies that might be inherent in baseline projections.

Current Policies Scenarios: For the public sector debt sustainability framework, country teams are also asked to develop a scenario that would arise if current policies regarding revenue and expenditure were maintained. As program negotiations entail indications to raise revenue and cut expenditure, it would be instructive to compare the baseline projections thus obtained against an admittedly less sanguine scenario.

In addition to these scenarios, the baseline projection is also subjected to various stress tests, that is, shocks to parameters that yield ratios akin to a 95 percent confidence interval around the baseline. The templates automatically calculate these numbers and create relevant figures, showing debt ratio and gross financing needs under the baseline and alternative country scenarios, as well as the two most extreme stress tests.

Public Sector Debt Derivation

The underlying equation for the evolution of public debt is:

$$D_{t+1} = [(1+\varepsilon)(1+r_f)DF_t] + (1+r_d)DD_t - PB_{t+1}$$

where D_{t+1} is the total stock of debt at time *t+1*, and *PB* is the primary balance. The debt stock is composed of debts denominated in domestic as well as foreign currencies. Domestic-currency debt (DD_t) evolves according to the interest rate in the market (r_d), while the evolution of the foreign-currency debt (DF_t), expressed in domestic currency, is affected not just by the foreign interest rate (r_f) but also by changes in the exchange rate ($\varepsilon = \frac{e_{t+1} - e_t}{e_t}$, with *e* defined as *units of local currency per U.S. dollar*).[20] A depreciation of the local currency ($\varepsilon > 0$) leads to an increase

[20] Foreign-currency debt at the end of time *t+1* is equal to: $DF^{\$}_{t+1} = (1+r_f)DF^{\$}_t$. Using the end-of-period exchange rates at *t* and *t+1*, this equation can be expressed as: $\frac{DF^{LC}_{t+1}}{e_{t+1}} = (1+r_f)\frac{DF^{LC}_t}{e_t}$, where *LC* refers to Local Currency. Solving for $DF^{LC}_{t+1} = \frac{e_{t+1}}{e_t}(1+r_f)DF^{LC}_t$ leads to the term inside the square brackets in the equation.

in foreign currency debt, expressed in local currency terms. In the template all foreign-currency debt is assumed to be in U.S. dollars. However, if this is not an appropriate assumption in a particular country, one could feasibly derive ε as a weighted average, or express it in terms of the dominant currency in the debt stock, if this is not the U.S. dollar.

The analysis looks at debt stocks relative to GDP. Therefore, defining lower-case variables as upper-case variables expressed as a proportion of GDP (e.g., $d_{t+1} = \frac{D_{t+1}}{Y_{t+1}}$), the above equation can be expressed, in percent of GDP, as:

$$d_{t+1} = \left[\frac{(1+\varepsilon)(1+r_f)}{(1+g)(1+\pi)} df_t \right] + \frac{(1+r_d)}{(1+g)(1+\pi)} dd_t - pb_{t+1}$$

with π representing the change in the domestic GDP deflator, and g the real GDP growth rate. Simple algebra yields:

$$d_{t+1}(1+g+\pi+g\pi) = (1+\varepsilon)(1+r_f)df_t + (1+r_d)dd_t - (1+g+\pi+g\pi)pb_{t+1}$$

Expanding terms and rearranging, with $d_t = df_t + dd_t$, we get:

$$d_{t+1}(1+g+\pi+g\pi) = d_t + \varepsilon(1+r_f)df_t + (r_f df_t + r_d dd_t) - (1+g+\pi+g\pi)pb_{t+1}$$

Since data on domestic and foreign interest rates may not be consistently available, the equation is further simplified. Letting α represent the *share of total public sector debt that is incurred in foreign currency* ($df_t = \alpha d_t$), the third term on the right-hand side of the equation can be rewritten as $\hat{r}d_t$, where $\hat{r}$ is a weighted average of domestic and foreign interest rates ($\hat{r} = \alpha r_f + (1-\alpha)r_d$).

Adding and subtracting $(g+\pi+g\pi)d_t$ to the right-hand side, allowing r_f to be approximately equal to $\hat{r}$, and rearranging the equation leads to the following equation, which forms the basis for the fiscal template:

$$d_{t+1} - d_t = \frac{1}{(1+g+\pi+g\pi)}(\hat{r} - \pi(1+g) - g + \varepsilon\alpha(1+\hat{r}))d_t - pb_{t+1}$$

External Sector Debt Derivation

External debt evolves according to:

$$D_{t+1} = (1+r_f)DF_t + [(1+r_d)(1+\varepsilon)DD_t] - TB_{t+1}$$

with *TB* denoting the non-interest current account balance. The change in the exchange rate ε is now defined in terms of U.S. dollars per local currency, with $\varepsilon > 0$ representing appreciation of the domestic currency.[21] All other variables are defined as before.

As before, defining lower case variables as upper case variables as a proportion of GDP, debt evolution can be written as:

$$d_{t+1} = \frac{(1+r_f)}{(1+g)(1+\rho)} df_t + \frac{(1+r_d)(1+\varepsilon)}{(1+g)(1+\rho)} dd_t - tb_{t+1}$$

where ρ is the change in the domestic GDP deflator (π) expressed in U.S. dollar terms. It is derived as $\rho = (1+\pi)(1+\varepsilon) - 1$. Once again, further algebra yields:

$$(1+g+\rho+g\rho)d_{t+1} = (1+r_f)df_t + (1+r_d)(1+\varepsilon)dd_t - (1+g+\rho+g\rho)tb_{t+1}$$

Letting $d_t = df_t + dd_t$, and rearranging terms:

$$(1+g+\rho+g\rho)d_{t+1} = d_t + \varepsilon(1+r_d)dd_t + (r_d dd_t + r_f df_t) - (1+g+\rho+g\rho)tb_{t+1}$$

Letting α now represent the *share of domestic currency-denominated debt in total external debt* (i.e., $dd_t = \alpha d_t$), and setting $\hat{r}$ to be the weighted average of domestic and foreign interest rates, we get:

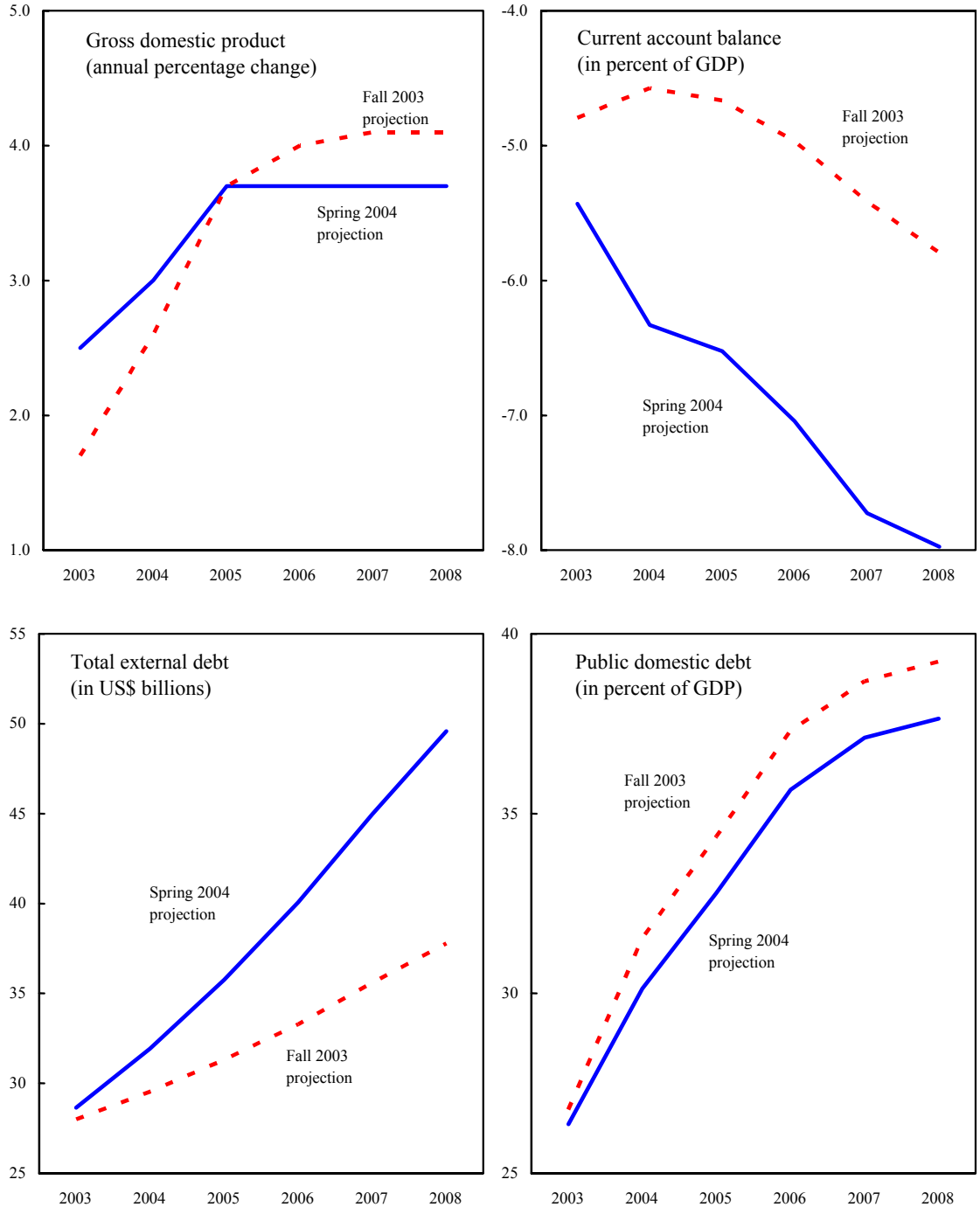
$$(1+g+\rho+g\rho)d_{t+1} = d_t + \varepsilon(1+r_d)dd_t + \hat{r}d_t - (1+g+\rho+g\rho)tb_{t+1}$$

In a manner analogous to the fiscal template, adding and subtracting $(g+\rho+g\rho)d_t$ to the right-hand side, allowing r_d to be approximately equal to $\hat{r}$, and rearranging leads to the following debt equation, which is used in the external debt sustainability template:

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

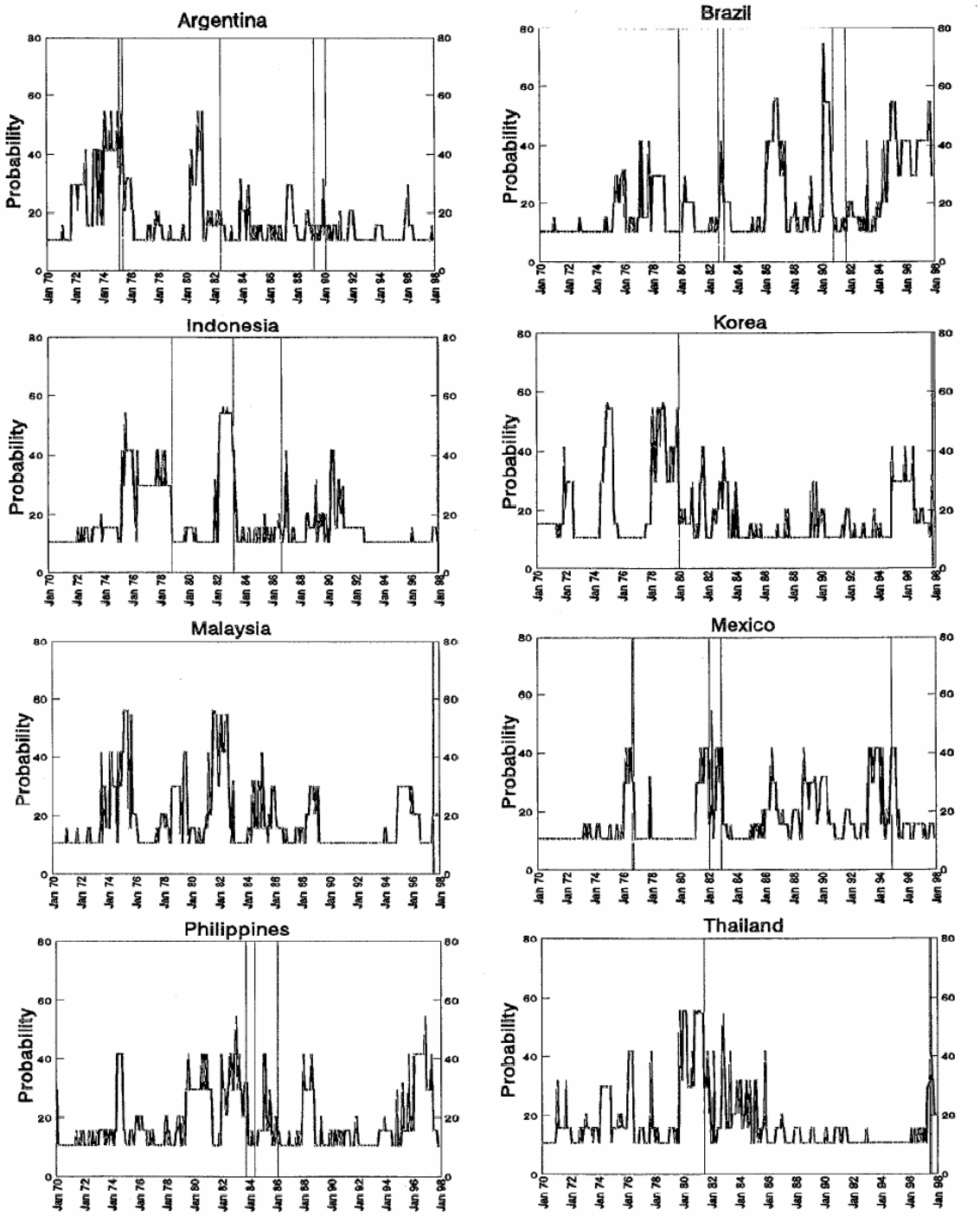
[21] While it would be correct to use end-of-period exchange rates, the template is based on average rates, which are used at the same time to convert the denominator into U.S. dollars.

Figure 1. Recent Changes in Czech Projections Paint a More Vulnerable Economy
(Comparison of the Czech Republic Fall 2003 and Spring 2004 WEO Projections)



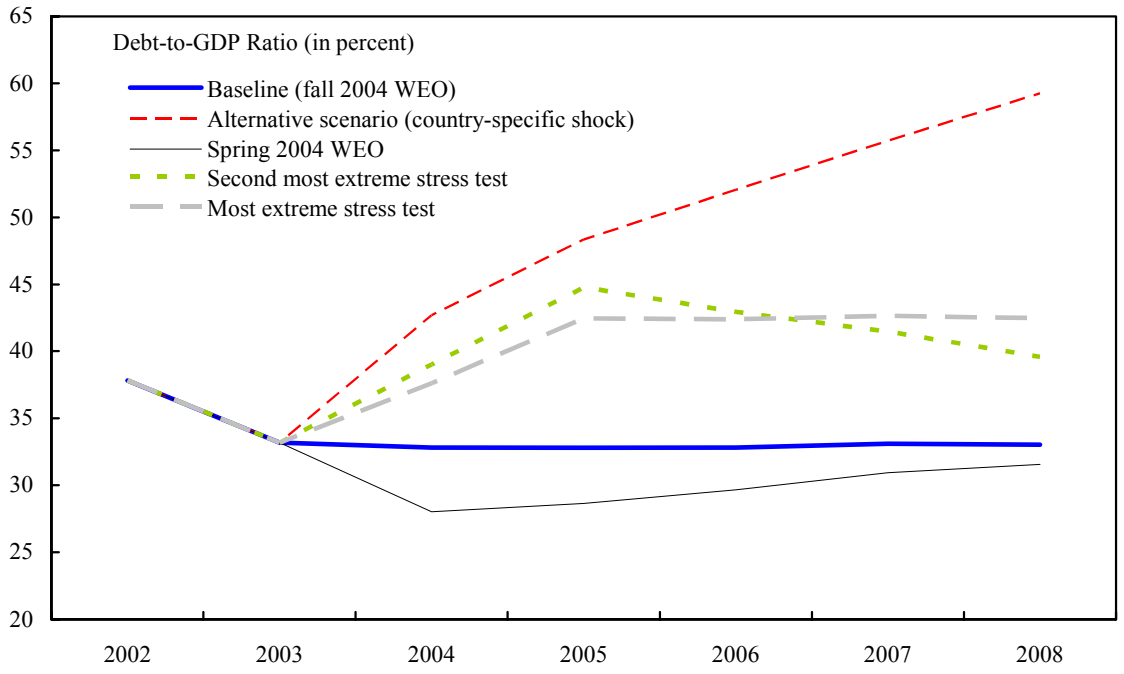
Source: World Economic Outlook, IMF

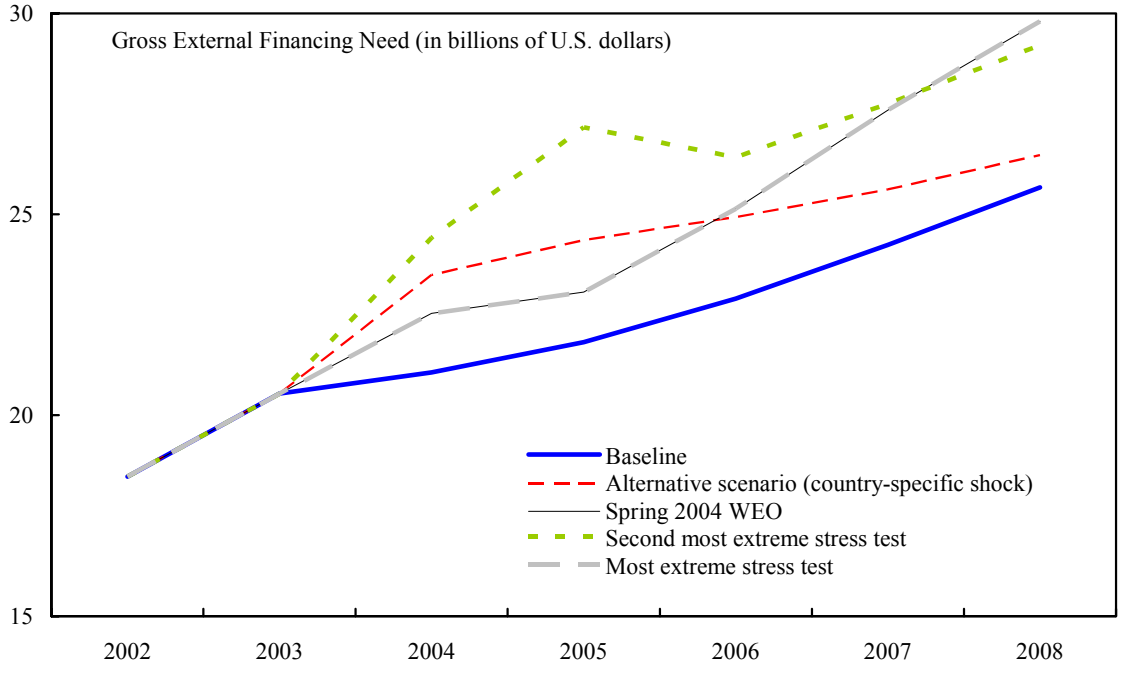
Figure 2. Weighted-Sum Crisis Probabilities for Selected Countries[1/]



Source: Berg and Pattillo (1998).

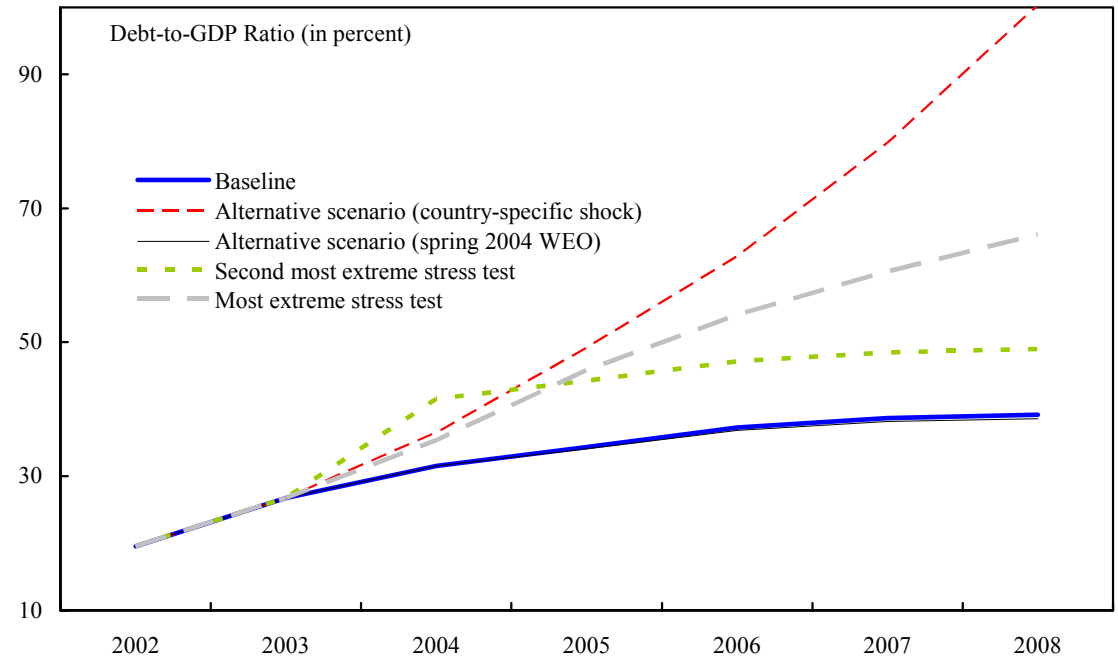
Figure 3. Czech Republic: External Debt Ratio and Gross External Financing Need, 2002-08

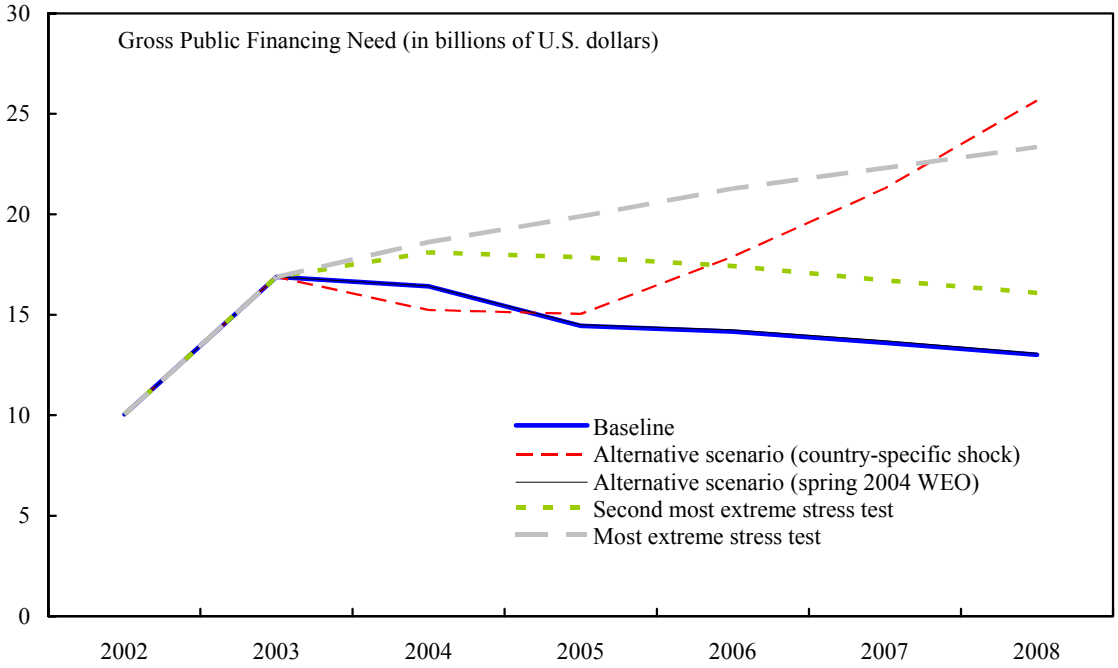




Source: Own calculations.

Figure 4. Czech Republic: Public Debt Ratio and Gross Public Financing Need, 2002-08





Source: Own calculations.

Table 1. Czech Republic: External Debt Sustainability Framework, 2003-2008
(In percent of GDP, unless otherwise indicated)

		Projections					
	2003	2004	2005	2006	2007	2008	
			I. Baseline Projections				**Debt-stabilizing non-interest current account 6/**
External debt	**33.2**	**32.8**	**32.8**	**32.8**	**33.1**	**33.0**	**-5.5**
Change in external debt	-4.6	-0.4	0.0	0.0	0.3	-0.1	
Identified external debt-creating flows (4+8+9)	-6.2	-1.7	-2.2	-1.1	-0.8	-0.9	
Current account deficit, excluding interest payments	4.9	4.4	4.3	4.4	4.5	4.6	
Deficit in balance of goods and services	1.5	1.0	0.7	0.7	0.4	0.3	
Exports	66.6	66.9	68.4	69.6	70.9	72.1	
Imports	68.1	67.9	69.1	70.2	71.3	72.4	
Net non-debt creating capital inflows (negative)	-5.3	-4.7	-5.2	-4.1	-3.9	-4.1	
Automatic debt dynamics 1/	-5.9	-1.4	-1.3	-1.4	-1.4	-1.5	
Contribution from nominal interest rate	0.8	0.7	0.6	0.5	0.5	0.5	
Contribution from real GDP growth	-0.5	-0.8	-1.1	-1.2	-1.3	-1.3	
Contribution from price and exchange rate changes 2/	-6.1	-1.3	-0.7	-0.7	-0.6	-0.7	
Residual, incl. change in gross foreign assets (2-3)	1.6	1.3	2.2	1.1	1.1	0.9	
External debt-to-exports ratio (in percent)	49.8	49.0	48.0	47.2	46.7	45.8	
Gross external financing need (in billions of US dollars) 3/	20.5	21.1	21.8	22.9	24.2	25.7	
in percent of GDP	24.4	23.4	22.9	22.6	22.5	22.5	
							Projected Average
Key Macroeconomic Assumptions							
Real GDP growth (in percent)	1.7	2.6	3.7	4.0	4.1	4.1	3.4
GDP deflator in US dollars (change in percent)	19.3	4.0	2.3	2.1	1.9	2.1	5.3
Nominal external interest rate (in percent)	2.5	2.2	1.9	1.7	1.6	1.5	1.9
Growth of exports (US dollar terms, in percent)	24.2	7.2	8.3	8.1	8.1	8.1	10.7
Growth of imports (US dollar terms, in percent)	22.5	6.4	7.9	8.0	7.7	7.8	10.1
Current account balance, excluding interest payments	-4.9	-4.4	-4.3	-4.4	-4.5	-4.6	-4.5
Net non-debt creating capital inflows	5.3	4.7	5.2	4.1	3.9	4.1	4.5
			II. Stress Tests for External Debt Ratio				**Debt-stabilizing non-interest current account 6/**
A. Alternative Scenarios							
A1. Key variables are at their historical averages in 2004-08 4/	**33.2**	**29.1**	**26.0**	**22.0**	**18.1**	**14.2**	**-4.7**
A2. Country-specific shock in 2004-2005 5/	**33.2**	**42.7**	**48.3**	**52.1**	**55.7**	**59.3**	**-1.7**
A3. Selected variables are consistent with spring 2004 WEO forecast	**33.2**	**28.0**	**28.7**	**29.7**	**30.9**	**31.6**	**-5.5**
B. Bound Tests							
B1. Nominal interest rate is at historical average plus two standard deviations in 2004 and 2005	**33.2**	**33.9**	**35.1**	**35.0**	**35.2**	**35.0**	**-5.6**
B2. Real GDP growth is at historical average minus two standard deviations in 2004 and 2005	**33.2**	**34.3**	**36.0**	**35.5**	**35.4**	**34.8**	**-6.1**
B3. Change in US dollar GDP deflator is at historical average minus two standard deviations in 2004 and 2005	**33.2**	**39.0**	**44.8**	**42.9**	**41.5**	**39.6**	**-7.7**
B4. Non-interest current account is at historical average minus two standard deviations in 2004 and 2005	**33.2**	**36.0**	**39.1**	**38.9**	**38.9**	**38.6**	**-5.8**
B5. Combination of 2-5 using one standard deviation shocks	**33.2**	**37.6**	**42.4**	**42.4**	**42.6**	**42.5**	**-6.9**
B6. One time 30 percent nominal depreciation in 2004	**33.2**	**45.2**	**43.4**	**41.7**	**40.3**	**38.6**	**-7.6**

1/ Derived as [r - g - □ℵ□g) + □ℵ(1+r)]/(1+g+□+g□) times previous period debt stock, with r = nominal effective interest rate on external debt; □ℵ change in domestic GDP deflator in US dollar terms, g = real GDP growth rate, e = nominal appreciation (increase in dollar value of domestic currency), and a = share of domestic-currency denominated debt in total external debt.

2/ The contribution from price and exchange rate changes is defined as [-□ℵ□g□□□□□r□ℵ□1+g+□+g□) times previous period debt stock. □ℵncreases with an appreciating domestic currency (□ℵ 0) and rising inflation (based on GDP deflator).

3/ Defined as current account deficit, plus amortization on medium- and long-term debt, plus short-term debt at end of previous period.

4/ 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.

5/ The implied change in other key variables under this scenario is discussed in the text.

6/ Long-run, constant balance that stabilizes the debt ratio assuming that key variables (real GDP growth, nominal interest rate, dollar deflator growth, and both non-interest current account and non-debt inflows in percent of GDP) remain at their levels of the last projection year.

Table 2. Czech Republic: External Sustainability Framework--Gross External Financing Need, 1998-2008

	Projections					
	2003	2004	2005	2006	2007	2008
	I. Baseline Projections					
Gross external financing need in billions of U.S. dollars 1/	20.5	21.1	21.8	22.9	24.2	25.7
in percent of GDP	24.4	23.4	22.9	22.6	22.5	22.5
	II. Stress Tests					
Gross external financing need in billions of U.S. dollars 2/						
A. Alternative Scenarios						
A1. Key variables are at their historical averages in 2004-08	20.5	19.5	18.9	18.3	17.2	15.8
A2. Country-specific shock in 2004-2005 5/	20.5	23.5	24.4	24.9	25.6	26.5
A3. Selected variables are consistent with spring 2004 WEO forecast	20.5	22.5	23.1	25.1	27.6	29.8
B. Bound Tests						
B1. Nominal interest rate is at historical average plus two standard deviations in 2004 and 2005	20.5	22.2	23.8	24.2	25.5	27.0
B2. Real GDP growth is at historical average minus two standard deviations in 2004 and 2005	20.5	20.8	21.2	22.0	23.0	24.1
B3. Change in US dollar GDP deflator is at historical average minus two standard deviations in 2004 and 2005	20.5	20.2	19.9	20.1	20.5	20.9
B4. Non-interest current account is at historical average minus two standard deviations in 2004 and 2005	20.5	24.4	27.2	26.4	27.8	29.2
B5. Combination of 2-5 using one standard deviation shocks	20.5	22.1	23.3	23.9	25.2	26.7
B6. One time 30 percent nominal depreciation in 2004	20.5	19.7	19.7	19.9	20.3	20.8
Gross external financing need in percent of GDP 2/						
A. Alternative Scenarios						
A1. Key variables are at their historical averages in 2004-08	24.4	21.2	18.7	16.6	14.2	11.9
A2. Country-specific shock in 2004-2005	24.4	32.4	34.7	35.1	35.7	36.5
A3. Selected variables are consistent with market forecast in 2004-08	24.4	22.3	21.1	21.3	21.9	22.0
B. Bound Tests						
B1. Nominal interest rate is at historical average plus two standard deviations in 2004 and 2005	24.4	24.7	24.9	23.8	23.7	23.6
B2. Real GDP growth is at historical average minus two standard deviations in 2004 and 2005	24.4	24.4	24.9	24.3	23.9	23.6
B3. Change in US dollar GDP deflator is at historical average minus two standard deviations in 2004 and 2005	24.4	27.4	30.4	28.9	27.8	26.7
B4. Non-interest current account is at historical average minus two standard deviations in 2004 and 2005	24.4	27.1	28.5	26.0	25.8	25.5
B5. Combination of 2-5 using one standard deviation shocks	24.4	27.3	29.9	28.9	28.8	28.6
B6. One time 30 percent nominal depreciation in 2004	24.4	31.4	29.6	28.2	27.1	26.1

1/ Defined as non-interest current account deficit, plus interest and amortization on medium- and long-term debt, plus short-term debt at end of previous period.
2/ Gross external financing under the stress-test scenarios is derived by assuming the same ratio of short-term to total debt as in the baseline scenario and the same average maturity on medium- and long term debt. Interest expenditures are derived by applying the respective interest rate to the previous period debt stock under each alternative scenario.

Table 3. Czech Republic: Public Sector Debt Sustainability Framework, 2003-2008
(In percent of GDP, unless otherwise indicated)

	Projections						
	2003	2004	2005	2006	2007	2008	
			I. Baseline Projections				**Debt-stabilizing primary balance 10/**
Public sector debt 1/	**26.8**	**31.5**	**34.4**	**37.3**	**38.7**	**39.2**	**-0.5**
o/w foreign-currency denominated	0.1	0.1	0.1	0.1	0.1	0.1	
Change in public sector debt	7.2	4.8	2.8	2.9	1.4	0.5	
Identified debt-creating flows (4+7+12)	7.3	3.2	2.9	1.9	1.1	0.2	
Primary deficit	6.4	4.7	3.5	2.5	1.6	0.7	
Revenue and grants	40.2	40.6	41.2	41.1	41.1	41.0	
Primary (noninterest) expenditure	46.6	45.3	44.7	43.6	42.6	41.7	
Automatic debt dynamics 2/	0.2	-0.3	-0.2	-0.2	-0.2	-0.1	
Contribution from interest rate/growth differential 3/	0.2	-0.3	-0.2	-0.2	-0.2	-0.1	
Of which contribution from real interest rate	0.5	0.3	0.9	1.1	1.3	1.3	
Of which contribution from real GDP growth	-0.3	-0.7	-1.1	-1.3	-1.4	-1.5	
Contribution from exchange rate depreciation 4/	0.0	0.0	0.0	0.0	0.0	0.0	
Other identified debt-creating flows	0.8	-1.2	-0.4	-0.3	-0.3	-0.3	
Privatization receipts (negative)	-0.4	-3.0	-0.4	-0.3	-0.3	-0.3	
Recognition of implicit or contingent liabilities	0.0	0.0	0.0	0.0	0.0	0.0	
Other (specify, e.g. bank recapitalization)	1.2	1.8	0.0	0.0	0.0	0.0	
Residual, including asset changes (2-3)	-0.1	1.5	0.0	1.0	0.3	0.3	
Public sector debt-to-revenue ratio 1/	66.6	77.7	83.4	90.8	94.2	95.6	
Gross financing need 5/	20.0	18.2	15.1	14.0	12.6	11.4	
in billions of U.S. dollars	16.9	16.4	14.4	14.2	13.6	13.0	
Key Macroeconomic and Fiscal Assumptions							Projected Average
Real GDP growth (in percent)	1.7	2.6	3.7	4.0	4.1	4.1	3.4
Average nominal interest rate on public debt (in percent) 6/	5.2	4.8	5.9	6.1	6.1	6.4	5.7
Average real interest rate (nominal rate minus change in GDP deflator, in percent)	2.7	1.3	3.0	3.5	3.7	3.8	3.0
Nominal appreciation (increase in US dollar value of local currency, in percent)	7.2	0.5	-0.6	-0.4	-0.5	-0.5	0.9
Inflation rate (GDP deflator, in percent)	2.5	3.5	2.9	2.6	2.4	2.6	2.7
Growth of real primary spending (deflated by GDP deflator, in percent)	9.1	-0.1	2.2	1.4	1.9	1.8	2.7
Primary deficit	6.4	4.7	3.5	2.5	1.6	0.7	3.2
			II. Stress Tests for Public Debt Ratio				**Debt-stabilizing primary balance 10/**
A. Alternative Scenarios							
A1. Key variables are at their historical averages in 2004-08 7/	**26.8**	**27.5**	**27.5**	**28.6**	**29.0**	**29.3**	**-0.4**
A2. Primary balance under no policy change in 2004-08	**26.8**	**31.5**	**34.4**	**37.3**	**38.7**	**39.2**	**-0.5**
A3. Country-specific shock in 2004-2005 8/	**26.8**	**36.5**	**49.2**	**62.8**	**79.8**	**100.3**	**0.4**
A4. Selected variables are consistent with spring 2004 WEO	**26.8**	**31.5**	**34.1**	**36.8**	**38.2**	**38.6**	**-0.5**
B. Bound Tests							
B1. Real interest rate is at historical average plus two standard deviations in 2004 and 2005	**26.8**	**33.2**	**37.5**	**40.4**	**41.8**	**42.3**	**-0.5**
B2. Real GDP growth is at historical average minus two standard deviations in 2004 and 2005	**26.8**	**35.4**	**45.8**	**54.1**	**60.6**	**66.1**	**-0.6**
B3. Primary balance is at historical average minus two standard deviations in 2004 and 2005	**26.8**	**31.9**	**36.3**	**39.2**	**40.6**	**41.1**	**-0.5**
B4. Combination of 2-4 using one standard deviation shocks	**26.8**	**31.2**	**35.1**	**38.1**	**39.5**	**40.0**	**-0.5**
B5. One time 30 percent real depreciation in 2004 9/	**26.8**	**31.6**	**34.4**	**37.3**	**38.7**	**39.3**	**-0.5**
B6. 10 percent of GDP increase in other debt-creating flows in 2004	**26.8**	**41.5**	**44.3**	**47.2**	**48.5**	**49.0**	**-0.5**

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 $[(r - p(1+g) - g + ae(1+r))/(1+g+p+gp))$ times previous period debt ratio, with r = interest rate; p = growth rate of GDP deflator; g = real GDP growth rate; a = share of foreign-currency denominated debt; and e = 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 $ae(1+r)$.

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

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

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

8/ The implied change in other key variables under this scenario is discussed in the text.

9/ Real depreciation is defined as nominal depreciation (measured by percentage fall in dollar value of local currency) minus domestic inflation (based on GDP deflator).

10/ Assumes that key variables (real GDP growth, real interest rate, and primary balance) remain at the level in percent of GDP/growth rate of the last projection year.

Table 4. Czech Republic: Public Sector Debt Sustainability Framework--Gross Public Sector Financing Need, 1998-2008
(In percent of GDP, unless otherwise indicated)

	Projections					
	2003	2004	2005	2006	2007	2008
	I. Baseline Projections					
Gross financing need 1/	20.0	18.2	15.1	14.0	12.6	11.4
in billions of U.S. dollars	16.9	16.4	14.4	14.2	13.6	13.0
	II. Stress Tests					
Gross financing need 2/						
A. Alternative Scenarios						
A1. Key variables are at their historical averages in 2003-08	20.0	13.4	10.1	9.2	8.5	8.0
A2. Primary balance under no policy change in 2003-08	20.0	18.2	15.1	14.0	12.6	11.4
A3. Country-specific shock in 2004-2005	20.0	22.9	24.9	29.4	34.8	41.7
A4. Selected variables are consistent with market forecast in 2003-08	20.0	18.3	15.1	13.8	12.5	11.2
B. Bound Tests						
B1. Real interest rate is at historical average plus two standard deviations in 2004 and 2005	20.0	20.2	17.4	15.0	13.6	12.2
B2. Real GDP growth is at historical average minus two standard deviations in 2004 and 2005	20.0	21.8	23.4	23.5	23.2	22.9
B3. Primary balance is at historical average minus two standard deviations in 2004 and 2005	20.0	18.6	17.0	14.6	13.2	11.9
B4. Combination of 2-4 using one standard deviation shocks	20.0	17.3	15.3	14.2	12.9	11.6
B5. One time 30 percent real depreciation in 2004 3/	20.0	18.3	15.1	14.0	12.7	11.4
B6. 10 percent of GDP increase in other debt-creating flows in 2004	20.0	20.1	18.7	17.2	15.5	14.1
Gross financing need in billions of U.S. dollars 2/						
A. Alternative Scenarios						
A1. Key variables are at their historical averages in 2003-08	16.9	12.0	9.5	8.9	8.5	8.4
A2. Primary balance under no policy change in 2003-08	16.9	16.4	14.4	14.2	13.6	13.0
A3. Country-specific shock in 2004-2005	16.9	15.2	15.0	17.9	21.3	25.7
A4. Selected variables are consistent with market forecast in 2003-08	16.9	16.4	14.5	14.2	13.7	13.1
B. Bound Tests						
B1. Real interest rate is at historical average plus two standard deviations in 2004 and 2005	16.9	18.2	16.6	15.2	14.6	14.0
B2. Real GDP growth is at historical average minus two standard deviations in 2004 and 2005	16.9	18.6	19.9	21.3	22.3	23.3
B3. Primary balance is at historical average minus two standard deviations in 2004 and 2005	16.9	16.8	16.3	14.8	14.2	13.6
B4. Combination of 2-4 using one standard deviation shocks	16.9	15.2	13.6	13.5	12.9	12.4
B5. One time 30 percent real depreciation in 2004	16.9	10.9	9.6	9.4	9.0	8.6
B6. 10 percent of GDP increase in other debt-creating flows in 2004	16.9	18.1	17.9	17.4	16.7	16.1

1/ Defined as public sector deficit, plus amortization of medium and long-term public sector debt, plus short-term debt at end of previous period.
2/ Gross financing under the stress test scenarios is derived by assuming the same ratio of short-term to total debt as in the baseline scenario and the same average maturity on medium- and long term debt. Interest expenditures are derived by applying the respective interest rate to the previous period debt stock under each alternative scenario.
3/ Real depreciation is defined as nominal depreciation (measured by percentage fall in dollar value of local currency) minus domestic inflation (based on GDP deflator).

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