INTERNATIONAL MONETARY FUND

Are Fund Staff Projections of Debt More Optimistic Under Program Contexts?

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I. INTRODUCTION

1.   Since 2002, the Fund has adopted a more systematic and standardized approach to debt sustainability analysis (DSA). In June 2002, the Executive Board endorsed a standard framework for external and public debt sustainability assessments for market borrowers, which was modified in 2003, and further enhanced in 2005.[1] For low-income countries, a separate framework was developed in cooperation with the World Bank and endorsed by the two Boards in 2005.[2] The Board has welcomed the standardization and discipline imposed by the DSA templates, with their clear enunciations of baselines, stress tests, and country-specific alternative scenarios.

2.   While the introduction and refinement of the debt sustainability templates is likely to have improved DSAs, a remaining concern is whether a program relationship—or prospect thereof—may give rise to unduly rosy projections; for instance, because debt sustainability must be demonstrated before Fund resources can be committed.[3] Evidence of an optimistic bias in debt projections in program contexts would raise questions about whether the current practice of country desks undertaking DSAs is the most appropriate, or whether alternative institutional structures to increase the independence of DSAs may be warranted.

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[1] See IMF, 2002, *Assessing Sustainability*; IMF, 2003, *Sustainability Assessments—Review of Application and Methodological Refinements*; IMF, 2005, *Information Note on Modifications to the Fund's Debt Sustainability Assessment Framework for Market Access Countries*.

[2] See IMF, 2005, *Operational Framework for Debt Sustainability Assessments in Low-Income Countries—Further Considerations*.

[3] Recognizing this possibility, the G-7 Communiqué of April 16, 2005, urged improving IMF surveillance "through independence of debt sustainability analysis from lending decisions."

3.   This note examines whether projections made in the context of a Fund-supported program are *systematically* more optimistic than those done for surveillance cases. Of particular interest in this regard is the assessment of external debt sustainability, as this underlies the "capacity to repay the Fund" analysis. Accordingly, this note examines debt projections over the period 1990-2004, with data for transition countries beginning in 1995.[4] Main findings are:

- While there is a statistically significant positive bias in external debt projections (the actual debt ratio is higher than projected), the bias is small, and seems to arise mainly from errors in the projection of the U.S. dollar value of GDP rather than the debt levels per se.

- There is no evidence of any *greater* bias in projections undertaken in the context of Fund-supported programs relative to surveillance cases.

- Similar results are obtained regarding the public finances.

II. DESCRIPTION OF SAMPLE

4.   This note is based on country desk projections, as recorded in the World Economic Outlook (WEO) submissions for October of each year.[5] Projections one-year-, three-years-, and five-years-ahead of gross external debt-to-GDP ratios are compared to the corresponding outturns. The sample consists of most middle- and low-income countries for the period 1990-2004, with data for transition economies beginning in 1995.[6] For its counterpart in the public sector, as the WEO coverage of public debt is not as widespread as that of external debt, the paper focuses on its key constituent factor, the general government balance, as well as its

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[4] While it would be desirable to examine whether the new DSA templates have improved debt sustainability analyses, there is insufficient experience for a statistically meaningful assessment.

[5] This note uses WEO projections—rather than the possible alternative, the Monitoring of Fund Arrangements (MONA) database—as the former contains projections for both program and non-program countries. Use of the WEO database also ensures direct comparability in the timing of projections across countries.

[6] The sample consists of 136 countries, of which 103 have had at least one Fund-supported program in the period covered. The sample includes 73 PRGF-eligible countries and 25 transition economies. Upper middle-income countries comprise one-quarter of the sample, with the rest roughly evenly distributed between lower middle- and low-income countries.

components—general government revenue (including grants) and general government expenditure.[7]

5.　　To examine whether program relationships color debt projections, this note undertakes two sets of comparisons: (i) projections during periods when a country has a Fund-supported program relative to periods in which it does not; and (ii) projections made during a Fund-supported program relative to projections made for countries without any program in the whole sample period—designated as "pure surveillance" cases.

III.　Bias in External Debt Projections

6.　　In the full sample—ignoring the distinction between program and surveillance contexts—there is a positive and statistically significant bias in the projection of external debt-to-GDP ratios. [8] Numerically, however, the bias is relatively small, at less than 1 percentage point of GDP at a one-year horizon, about 2 percentage points over three years, and a little over 3 percentage points of GDP over five years.[9] This difference between the actual and projected debt ratios can be disaggregated into errors in the level of debt, the real exchange rate (more precisely, the U.S. dollar value of the GDP deflator), and real GDP growth, respectively.[10] In the one-year-ahead projection, the bias seems to arise equally from

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[7] This approach does not allow an analysis of possible errors in public debt projections arising from below-the-line operations, such as privatization receipts and realization of contingent liabilities. The same approach was followed in the papers on the design of Fund-supported programs, also as a result of constraints on data availability. Consequently, this analysis is not as complete as that for external debt.

[8] In the discussion, bias is defined as actual minus projected, with a positive bias indicating the outturn being larger than projected. In order to reduce the influence of extreme outliers, the actual and projected value for each variable, z, is transformed according to:

$\tilde{z} = \dfrac{z}{1+z}$ if $z \geq 0$; $\tilde{z} = \dfrac{z}{1-z}$ if $z < 0$ where z is expressed as a decimal fraction (in percent per year or in percent of GDP, as applicable).

[9] The mean external debt-to-GDP ratio in the sample is around 37 percent, with a standard deviation of about 15 percent.

[10] This is identical to the method applied in *Policy Formulation, Analytical Framework, and Program Design* (IMF, 2004). As outlined in footnote 49 (on page 34) of the paper: "Define $\overline{y}^a_{t+k} = \prod_{i=0}^{k}(1 + g_{t+i})y^a_{t-1}$ as the actual level of GDP at a constant U.S. dollar value of the GDP deflator, where y^a_{t-1} is the U.S. dollar value of nominal GDP in year *t-1*, and *g* is the real GDP growth rate. Likewise, define $\overline{y}^p_{t+k} = \prod_{i=0}^{k}(1 + g^p_{t+i})y^a_{t-1}$ as the projected level of

larger-than-expected gross borrowing (leading to a higher level of debt than projected) and lower growth than expected (Table 1). Over longer horizons, errors in projecting borrowing become smaller, while the effects of greater real exchange rate depreciation than expected and lower GDP growth than expected become more important.[11]

Table 1. Projection errors in the external debt-to-GDP ratio: full sample

	Projection horizon		
	One year	Three years	Five years
Error in debt-to-GDP ratio 1/ 2/	0.8 ***	2.0 ***	3.1 ***
of which:			
Effect of borrowing	0.4 **	0.1	-0.6 *
Effect of real exchange rate depreciation	-0.3	0.5 *	1.2 ***
Effect of lower GDP growth	0.6 ***	1.4 ***	2.5 ***
Number of observations	1544	1272	962

1/ Projection error is defined as actual minus projected.

2/ *** denotes significance at 99%, ** denotes significance at 95%, and * denotes significance at 90%.

7. Projections for countries with different types of interaction with the Fund exhibit different biases. In pure surveillance cases, the average bias is statistically significant and rises from 1¾ percentage points of GDP at a one-year horizon to 5¼ percentage points over five years. In countries with at least one Fund-supported program in the sample, the average bias in external debt ratio projections is not statistically different from zero over a one-year

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GDP at a constant U.S. dollar value of the GDP deflator. Then the projection error in the debt ratio at any horizon *k* can be written:

$$\frac{d^a_{t+k}}{y^a_{t+k}} - \frac{d^p_{t+k}}{y^p_{t+k}} = \underbrace{\left(\frac{d^a_{t+k}}{y^a_{t+k}} - \frac{d^p_{t+k}}{y^a_{t+k}}\right)}_{gross\ borrowing} + \underbrace{\left(\frac{d^p_{t+k}}{y^a_{t+k}} - \frac{d^p_{t+k}}{\overline{y}^a_{t+k}}\right) - \left(\frac{d^p_{t+k}}{y^p_{t+k}} - \frac{d^p_{t+k}}{\overline{y}^p_{t+k}}\right)}_{real\ exchange\ rate} + \underbrace{\left(\frac{d^p_{t+k}}{\overline{y}^a_{t+k}} - \frac{d^p_{t+k}}{\overline{y}^p_{t+k}}\right)}_{real\ GDP\ growth},$$

where the first term represents the effects of larger than expected [gross borrowing], the second term is the effect of the real exchange rate (i.e., the U.S. dollar value of the GDP deflator) depreciation, and the third term is the effect of lower real GDP growth. This accounting decomposition does not identify the underlying shocks, driving these deviations from the projections, such as exogenous terms of trade shocks, unpredictable disbursements of foreign aid, or policy slippages."

[11] In this context, it should be recalled that one convention for the WEO projections is an unchanged real exchange rate, which may impart some bias.

horizon, and, while becoming statistically significant over five years, is about half the one estimated for pure surveillance cases.

8.   To examine whether external debt projections become more optimistic when a Fund-supported program is in place, errors in projections made during program periods are compared to those made at other times (Table 2). In the set of countries with at least one Fund-supported program during the sample period (1990-2004), a dummy variable is defined to indicate when the projection was made at the time a Fund-supported program was in place. The constant (which captures the bias for the non-program sample) is statistically insignificant at a one-year horizon, but becomes positive and statistically significant over longer horizons. The coefficient on the program dummy is typically insignificant, indicating that the bias does not change when projections are made when a Fund-supported program is in place.[12]

Table 2. Bias in countries with at least one Fund-supported program 1/

Variable: error in 2/	Constant	Program Dummy 3/	No. of observations
One-year-ahead projection			
Debt-to-GDP ratio	0.4	0.0	1162
o/w error in debt level	-0.2	0.7	1162
Three-years-ahead projection			
Debt-to-GDP ratio	1.4 ***	0.0	956
o/w error in debt level	-1.0 ***	0.9 *	956
Five-years-ahead projection			
Debt-to-GDP ratio	2.8 ***	-0.6	721
o/w error in debt level	-1.3 ***	-0.1	721

1/ These regressions exclude pure surveillance countries.

2/ Projection error is defined as actual minus projected.

3/ Program dummy equals 1 if there is a program in the year in which the projection is being made. *** denotes significance at 99%, ** denotes significance at 95%, and * denotes significance at 90%.

9.   One possibility is that even the *prospect* of a Fund-supported program could inject optimism in projections, thus yielding the results discussed above. An alternative test of the optimism hypothesis is therefore to compare projections made *during program periods* to

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[12] Only at the three-year horizon for the projection of the debt level is there a positive and statistically significant bias and only barely at the 90 percent confidence level.

those made in *pure surveillance cases* (i.e., for countries with no program at any time during the sample period). Under this hypothesis, if there is an "independence problem," then the bias in projections made during program periods should be greater than for pure surveillance cases. A program dummy is once again created to identify projections made when a Fund-supported program is in place. As shown in Table 3, however, the bias in projections made during a Fund-supported program is actually *lower* than the bias in surveillance cases. The coefficient on the program dummy is not only negative, but also statistically significant across all projection horizons.

Table 3. Bias relative to pure surveillance cases 1/

Variable: error in 2/	Constant	Program Dummy 3/	No. of observations
One-year-ahead projection			
Debt-to-GDP ratio	1.8 ***	-1.4 **	1090
o/w error in debt level	1.0 ***	-0.5	1090
Three-years-ahead projection			
Debt-to-GDP ratio	3.5 ***	-2.0 **	901
o/w error in debt level	1.5 ***	-1.6 ***	901
Five-years-ahead projection			
Debt-to-GDP ratio	5.3 ***	-3.1 ***	684
o/w error in debt level	1.6 ***	-3.0 ***	684

1/ These regressions include pure surveillance countries and projections made when a Fund-supported program is in place.

2/ Projection error is defined as actual minus projected.

3/ Program dummy equals 1 if there is a program in the year in which the projection is being made. *** denotes significance at 99%, ** denotes significance at 95%, and * denotes significance at 90%.

10.   These results suggest the following:

•   Among countries with at least one Fund-supported program in the sample, the bias when a program is in place does not differ from the bias when it is not.

•   Gross external debt-to-GDP projections for countries with no Fund-supported programs during the sample period actually have a *higher* bias than projections made during periods of Fund-supported programs.[13]

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[13] This result is maintained when outliers are dropped from the sample using the DFBETA single-row deletion technique for detecting influential observations and outliers, as outlined

(continued)

The conclusion seems to be that, rather than "optimism" in projections under program contexts, there may indeed be positive effects—in terms of forecasting ability—from closer scrutiny of projections in program situations.[14]

IV. BIAS IN FISCAL PROJECTIONS

11.   Findings for the fiscal aggregates are similar (Table 4). In the full sample, there is a negative bias in the projection of the general government balance (the actual balance is weaker than projected); country teams overpredict the fiscal balance by about 1 percentage point of GDP over a one-year horizon, and 2 and 2½ percentage points of GDP over three- and five-year horizons, respectively. Over the longer run, the bias in the projection of general government revenue turns out to be insignificantly different from zero, with expenditure overshooting being the main contributor to the weaker fiscal balance than expected.[15]

in Besley et al. (1980). While the null hypothesis of equality of coefficients between pure surveillance cases and program cases cannot be rejected for one-year-ahead and three-years-ahead projections, point estimates in the former remain higher than in the latter in all three cases. (For a discussion of the DFBETA procedure, see Besley, David, Edwin Kuh, and Roy Welsch, 1980, *Regression Diagnostics: Identifying Influential Data and Sources of Collinearity*, New York, NY: John Wiley and Sons.)

The results are also robust to various specifications, including allowing for country and time fixed effects, using clustering techniques to correct standard errors in the presence of overlapping observations, and to various subsamples of countries. While projections for program countries are not *better* than those for pure surveillance cases in some of the specifications, the main result—that they are *no worse*—remains

[14] These results are in line with those previously obtained. *Policy Formulation, Analytical Frameworks, and Program Design* (IMF, 2004) found biases of similar magnitudes among different types of programs; that paper did not, however, examine whether there were differences between projections undertaken in program context versus surveillance cases. Similar results were also obtained in the review of DSAs (Box 1 of IMF, 2003).

[15] Due to the technique outlined in footnote 6, used to reduce the effect of extreme outliers, coefficients on revenue and expenditure do not sum to that on balance. The finding in Table 4 may also result from a shortfall in GDP leading to a decrease in revenue, leaving unchanged the revenue-to-GDP ratio, but raising the expenditure-to-GDP ratio (as nominal expenditure remains unaffected by the GDP shortfall).

Table 4: Bias in the fiscal variables in the full sample

Variable: error in 1/	Projection horizon 2/		
	One year	Three years	Five years
General Government Balance	-1.0 ***	-2.0 ***	-2.5 ***
General Government Revenue	-0.3 ***	-0.1	0.0
General Government Expenditure	0.4 ***	1.2 ***	1.6 ***
Number of observations	964	723	483

1/ Projection error is defined as actual minus projected. All variables are expressed in percentage of GDP.

2/ *** denotes significance at 99%, ** denotes significance at 95%, and * denotes significance at 90%.

12.   Turning to the question of whether a program relationship colors country teams' projections for the general government balance, the evidence suggests not. In a sample of countries with at least one Fund-supported program, the program dummy (defined as above) remains statistically insignificant (Table 5).[16] Comparing projections made during program relationships to pure surveillance cases also shows the absence of a larger bias in program cases (Table 6). [17]

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[16] The current finding for the revenue-to-GDP ratio (over a one-year projection horizon) differs from that of Golosov and King (2002). This difference arises from, inter alia, their use of a shorter sample period (1993-1999), a small sample of countries (low-income only), and their use of the MONA database (examining only countries receiving supported under ESAF arrangements). See Golosov, Mikhail, and John King, 2002, "Tax-Revenue Forecasts in IMF-Supported Programs," IMF Working Paper No. 02/236.

[17] Note, however, that at longer horizons, both revenue and expenditure are higher than projected—by about 1 percentage point of GDP—in program cases.

Table 5. Bias in countries with at least one Fund-supported programs 1/

Variable: error in 2/	Constant	Program Dummy 3/	No. of observations
One-year-ahead projection			
General Government Balance	-0.9 ***	-0.1	750
General Government Revenue	-0.1	-0.2	750
General Government Expenditure	0.5 ***	-0.1	750
Three-years-ahead projection			
General Government Balance	-2.2 ***	0.2	562
General Government Revenue	0.1	0.0	562
General Government Expenditure	1.5 ***	-0.1	562
Five-years-ahead projection			
General Government Balance	-2.5 ***	0.3	375
General Government Revenue	0.1	0.3	375
General Government Expenditure	1.7 ***	0.2	375

1/ These regressions exclude pure surveillance countries.

2/ Projection error is defined as actual minus projected.

3/ Program dummy equals 1 if there is a program in the year in which the projection is being made. *** denotes significance at 99%, ** denotes significance at 95%, and * denotes significance at 90%.

Table 6. Bias relative to pure surveillance cases 1/

Variable: error in 2/	Constant	Program Dummy 3/	No. of observations
One-year-ahead projection			
General Government Balance	-1.2 ***	0.1	664
General Government Revenue	-0.8 ***	0.5 *	664
General Government Expenditure	0.0	0.4	664
Three-years-ahead projection			
General Government Balance	-2.0 ***	0.0	497
General Government Revenue	-0.8 ***	0.8 **	497
General Government Expenditure	0.4	0.9 ***	497
Five-years-ahead projection			
General Government Balance	-3.0 ***	0.8	334
General Government Revenue	-0.8 **	1.2 **	334
General Government Expenditure	0.9 **	1.0 *	334

1/ These regressions include pure surveillance countries and projections made when a Fund-supported program is in place.

2/ Projection error is defined as actual minus projected.

3/ Program dummy equals 1 if there is a program in the year in which the projection is being made. *** denotes significance at 99%, ** denotes significance at 95%, and * denotes significance at 90%.

V. CONCLUSIONS

13.   Are debt projections made when there is a program relationship with the Fund systematically more optimistic than projections made at other times? No. Projections of the external debt-to-GDP ratio do not seem to be different, at any projection horizon, in countries with on-going program relationships with the Fund than in those without. On the contrary, projections for countries that have never had a Fund-supported program in the sample are actually worse, perhaps indicating a beneficial effect—in terms of forecasting ability—of a closer relationship with the Fund. Likewise, biases in fiscal aggregates do not differ based on the type of engagement with the Fund. These results, which are robust to various specifications, may make moot discussions regarding institutional arrangements for an "independent" DSA.

14.   The note also finds that while overall biases exist, they are relatively small for external debt (although perhaps not so for fiscal balance). Furthermore, some of them seem to arise from the failure to predict the U.S. dollar value of GDP, possibly reflecting in part the WEO convention of assuming constant real exchange rates for the projection period. The more important factor seems to be the effect of a weaker real GDP growth than projected.[18] Batista and Zalduendo (2004) find that use of simple growth models may result in lower errors in Fund growth projections.[19] Applications of such techniques may be a more effective way to improve debt sustainability assessments in both program and surveillance contexts.[20]

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[18] This issue is examined more closely in a forthcoming RES paper that evaluates WEO projections of key economic variables.

[19] Batista, Catia, and Juan Zalduendo, 2004, "Can the IMF's Medium-Term Growth Projections Be Improved?" IMF Working Paper No. 04/203. Directors have encouraged a variety of approaches to improving growth projections; see the Public Information Notice of the Discussion at the Executive Board of the Design of Fund-supported Programs (PIN No. 05/16, available at http://www.imf.org/external/np/sec/pn/2005/pn0516.htm).

[20] Efforts are underway to address the issue of the *overall* bias as well, exploring ways to improve the analytical framework used to make fiscal and debt projections. See Abiad, Abdul, and Jonathan Ostry, 2005, "Primary Surpluses and Sustainable Debt Levels in Emerging Market Countries," IMF Policy Discussion Paper No. 05/6. Also see Celasun, Oya, Xavier Debrun, and Jonathan Ostry, forthcoming, "Primary Surplus Behavior and Risks to Fiscal Sustainability: A Fan Chart Approach."