

Some Tools for Public Sector Debt Analysis

This chapter presents some specific analytical tools that are used to analyze public sector debt statistics in three areas: (i) debt sustainability analysis (DSA), (ii) portfolio analysis, and (iii) fiscal risk and vulnerability analysis.

A. Introduction

9.1 Significant work is underway in the statistics and accounting professions to add considerations of sustainability to measurements of public sector debt. Although the adoption of standards in this area is likely to take some time, some applications are gradually becoming broadly accepted. This chapter provides an introduction to debt sustainability analysis, portfolio analysis, and fiscal risk and vulnerability analysis—which are at different stages of definition and development.¹ These forms of analysis use debt statistics in an attempt to answer various “what if” questions related to sustainability and vulnerability.

B. Debt Sustainability Analysis

9.2 The objective of debt sustainability analysis (DSA) is to evaluate a country’s **capacity to finance its policy agenda and service the ensuing debt without unduly large adjustments** that may compromise its macroeconomic stability and/or that of its economic partners (see Box 9.1). As part of the IMF’s efforts to better detect, prevent, and resolve potential crises, a formal framework for conducting public sector and external debt sustainability analyses was introduced in 2002.² The framework aims to bring greater accuracy, effectiveness, discipline, and transparency to DSAs.

¹These approaches are used for purposes of IMF surveillance and use of Fund resources.

²See IMF 2003.

Box 9.1. Definition of debt sustainability

Debt is sustainable when a borrower is expected to be able to continue servicing its debts without an unrealistically large correction to its income and expenditure balance. Debt sustainability, thus, reflects a country’s solvency, liquidity, and adjustment capacity:

- A government is **solvent** if the present value (PV) of its current and future primary expenditure (net of interest) is no greater than the PV³ of its current and future stream of income receipts.
- A government is **liquid** if it is able to rollover its maturing debt obligations in an orderly manner.
- Debt sustainability also captures the notion that there are social and political **limits to adjustments** in spending and revenue that determine a country’s willingness (as opposed to its economic ability) to pay.

1. The debt sustainability analysis (DSA) framework

9.3 The DSA framework consists of **two complementary assessments of the sustainability of (i) total public sector debt and (ii) total external (i.e., public and private) debt.** It focuses on gross rather than net debt, to facilitate comparability of information across countries—since data on asset positions are usually not available on a consistent and/or timely basis. For both

³A common way to represent the solvency condition is through the government’s inter-temporal budget constraint, which is the ability of the general government to meet the costs of servicing its debt through future revenues, measured at present value (PV):

$$D_{t_0} - \sum_{t=t_0+1}^{\infty} \frac{PB_t}{(1+r)^{t-t_0}} = 0$$

where D_{t_0} is gross debt as a share of GDP in the year before the long-term projections, PB_t is the structural primary balance (revenue minus expenditure excluding net interest expense) as a share of GDP at time t , and r is the differential between the nominal interest rate and the nominal GDP growth rate.

public sector debt and external debt, the assessment is made by comparing the path of debt indicators in a baseline scenario and in a series of sensitivity tests. The **baseline scenario** is based on a set of macroeconomic projections that articulate the government's intended policies. The framework requires an explicit specification of the main assumptions and parameters underlying the baseline scenario and the **stress tests**. The paths of debt indicators in the baseline and the stress tests permit an assessment of the **vulnerability of the country to shocks**.

9.4 The objective of the assessment is threefold:

- Assess the current debt situation, including the outstanding stock position, its maturity structure, the fixed or variable interest rate composition, currency composition, and by debt holder;

Box 9.2. Assessing debt sustainability

Debt sustainability can be assessed on the basis of different debt and debt-service indicators relative to measures of repayment capacity. Repayment capacity can be measured in terms of GDP, export proceeds, or fiscal revenue:

- GDP ratios allows the indicators to be adjusted by the size of the economy;
- Export ratios indicate whether the country can be expected to generate sufficient foreign exchange to meet its external debt obligations in the future;
- Revenue ratios measure the government's ability to mobilize domestic resources to reimburse debt.

The most relevant measure of repayment capacity depends on the constraints that are the most binding for a specific country. Ratios of debt stock relative to repayment capacity measures indicate the burden represented by the future obligations of a country and thus reflect long-term risks to solvency, while the time path of debt-service ratios indicates the likelihood and possible timing of liquidity problems.

While debt sustainability ratios are generally based on the nominal value of debt, for countries with access to concessional finance, the present value (PV) of debt provides a better measure of the burden of future debt-service payments.

The design of appropriate borrowing strategies also needs to take into account country-specific circumstances. A country's capacity to absorb new financing productively and eventually to repay its debt depends on a variety of elements, many of them of a structural nature. They include the savings propensity of the private sector; the degree of financial development of the economy; productivity growth; the government's ability to expand the tax base, raise tax rates, and compress public spending; and demographic developments.

- Identify vulnerabilities in the debt structure or the policy framework so that policy corrections can be introduced before payment difficulties arise; and
- In cases where such difficulties have emerged, or are about to emerge, examine the impact of alternative debt-stabilizing policy paths.

9.5 DSA results should not be interpreted in a mechanistic or rigid fashion, but should be assessed against relevant country characteristics, including the country's policy track record and policy space. For instance, a certain path for the primary balance (which has critical implications for the trajectory of debt ratios) might be politically difficult to sustain in one country but not in another country. The degree of exposure to various market risks (for example, interest rate risk or rollover risk) is also a critical consideration in assessing debt sustainability (see Box 9.2). Thus, DSAs provide valuable inputs for macroeconomic policy design but cannot, in isolation, determine an optimal borrowing path.

2. The debt sustainability analysis (DSA) framework for low-income countries

9.6 The DSA framework described above is more suitable for countries other than low-income countries⁴ (LICs). LICs differ in that their development needs are large relative to their resource envelope; they rely to an important extent on external aid; they have a higher susceptibility to external and domestic shocks and more uncertain returns on public investments; narrow production and export bases, often concentrated in a limited number of primary commodities, for which prices are determined in world markets; and a tendency to weaker policies and institutions, including in project implementation and debt management.

9.7 To ensure these characteristics are adequately taken into account in DSAs, the World Bank and IMF jointly introduced a **debt sustainability framework for low-income countries (DSF⁵)** in 2005. The DSF modifies the general framework for debt sustainability analysis described above to reflect low-income countries' circumstances. For instance, it uses a 20-year projection horizon as opposed to the five-year period applicable in DSAs for other countries, reflecting the longer maturity of LICs debt. Also, debt indicators for

⁴As defined by the World Bank.

⁵An appropriate acronym would probably be DSF LIC or LIC DSF. However, in practice the shorter acronym DSF is widely used for the debt sustainability analysis framework for low-income countries.

LICs are expressed in present value terms because their debt is predominantly concessional. Finally, for LICs, the DSA framework is extended to include an explicit rating of the risk of external debt distress. Usually, a large component of external debt is public sector debt.

9.8 The DSF is mainly a tool to **help policymakers strike a balance between achieving development objectives and maintaining debt sustainability.** It guides the design of policies that help prevent the emergence, or reemergence, of debt distress in low-income countries.⁶ It is built on three pillars:

- A standardized forward-looking analysis of public sector and external debt and its vulnerability to shocks (baseline scenario, alternative scenarios, and standardized stress test scenarios are computed);
- A debt sustainability assessment, including an explicit rating of the risk of external debt distress; and
- Recommendations for a borrowing (and lending) strategy that limits the risk of debt distress.

9.9 Under the DSF, countries are classified into **three policy performance groups:** strong, medium, and weak (see Table 9.1).⁷ Different indicative thresholds are used for debt burdens depending on the performance category. Thresholds corresponding to the strongest policy performers are the highest, indicating that in countries with good policies debt accumulation is less risky.

9.10 Currently, ratings are compiled only for external debt distress. While it is possible to compile similar ratios for public sector debt, there are no generally accepted thresholds for the risk of total public sector debt distress. In part, this is due to the conceptual differences between external and domestic debt. However, the DSF also takes into account the risk posed by the accumulation of domestic debt and acknowledges the different nature of these risks.⁸

Table 9.1. External Debt Burden Thresholds under the Debt Sustainability Framework (DSF)

	Present value (PV) of debt in percent of			Debt service in percent of	
	Exports	GDP	Revenue	Exports	Revenue
Weak policy	100	30	200	15	25
Medium policy	150	40	250	20	30
Strong policy	200	50	300	25	35

9.11 The risk of external debt distress is assessed by comparing external debt burden indicators with indicative policy-dependent debt burden thresholds.⁹ The thresholds reflect the empirical findings that the external debt levels that LICs can sustain are influenced by the quality of their policies and institutions,¹⁰ which are measured by the Country Policy and Institutional Assessment (CPIA) index, compiled annually by the World Bank.

9.12 There are four ratings of external debt distress in the DSF¹¹:

- **Low risk:** all debt burden indicators are well below the thresholds.
- **Moderate risk:** debt burden indicators are below the thresholds in the baseline scenario, but stress tests indicate that the thresholds are breached if there are external shocks or abrupt changes in macroeconomic policies.
- **High risk:** one or more debt burden indicators breach the thresholds under the baseline scenario.
- **Debt distress:** the country is already having repayment difficulties.

9.13 Since its inception in 2005, the DSF has become an effective tool for debt sustainability analysis in LICs. Many donors, lenders, and borrowers use the DSF actively to determine the amount and types of financing that are consistent with long-term public sector or external debt sustainability and progress toward achiev-

⁶The objectives of the DSF differ from those of DSAs carried out under the Heavily Indebted Poor Countries (HIPC) Initiative in that the latter focus on the reduction of an existing debt burden to sustainable levels.

⁷The World Bank's Country Policy and Institutional Assessment (CPIA) index is used.

⁸See IMF and IDA 2006b.

⁹For SDRs, only net debt interest obligations—that is, when SDR holdings are less than cumulative allocations—are captured in the DSA.

¹⁰See Kraay and Nehru 2006, IMF and IDA, 2004a, 2004b, 2004c, 2005, and 2008.

¹¹See IMF and IDA 2008.

ing development objectives. The DSF also helps other lenders coordinate and implement sustainable lending policies. For example, the OECD Working Party on Export Credits and Guarantees agreed in January 2008 on a set of principles and guidelines for sustainable lending to LICs.¹²

9.14 The DSF enhances access, quality, comparability, and timeliness of information on the debt situation of LICs. LIC DSAs are published annually on the external Web sites of the IMF and the World Bank.¹³ Regular updates of the DSAs allow stakeholders to base their decisions on the most recent developments and help detect and monitor emerging vulnerabilities at an early stage. Since late 2009, the design of debt limits in IMF-supported programs relies extensively on the results of DSAs. More specifically, countries with lower debt vulnerabilities (according to the DSA) have more flexibility in setting their borrowing strategies, including with regard to nonconcessional borrowing.

9.15 The effectiveness of the DSF depends on its adaptability and its broad use. The IMF and the World Bank are continuously monitoring the evolving pattern in LIC financing, adapting the elements of the framework as appropriate to meet new challenges. For example, the DSF takes into account the impact of public sector investment on growth and the role of remittances as a source of external financing, and adopts a flexible approach in the treatment of the external debt of public corporations.¹⁴

C. Portfolio Analysis and Medium-Term Debt Strategy (MTDS)

9.16 The MTDS, designed by the World Bank and the IMF, provides a **framework for developing an effective public sector debt management strategy**—that is, to achieve a desired composition of the public sector debt portfolio that reflects a cost-risk analysis and captures the government’s preferences with regard to the cost-risk trade-off. It is a tool for evaluating and managing the risk involved in different debt compositions; facilitating coordination with fiscal and monetary management; and enhancing transparency. It

operationalizes country authorities’ debt management objectives—for example, ensuring the government’s financing needs and payment obligations are met at the lowest possible cost consistent with a prudent degree of risk. The MTDS framework underscores the need for sound public sector debt management data.¹⁵

9.17 Developing effective medium-term debt management strategies requires a number of important interlinkages to be recognized (see Figure 9.1). Ideally, the medium-term debt strategy should be embedded in an overall framework that includes:

- debt sustainability analysis;
- considerations of the wider economic framework;
- a cost-risk analysis of the various financing strategies available;
- an annual borrowing plan to operationalize the strategy in the immediate budgetary period; and
- market development plans.

9.18 To determine the appropriate debt management strategy, the performance of alternative strategies should be evaluated in terms of their impact on costs and risks (see Box 9.3 and Figure 9.1). The cost of following each strategy should be assessed under a baseline scenario for key macroeconomic and market variables, and under various risk scenarios. For the choice of strategy and associated future borrowing decisions to be robust, it is crucial that the risk scenarios are appropriately identified and reflect a sound understanding of the macro framework. For example, it would be important to have the correct understanding of how the interaction between nominal interest and exchange rates and inflation affects key ratios, such as Interest/GDP or Present Value Debt/GDP.

9.19 Data needs for specification of an MTDS are relatively demanding. Countries should have in place a robust debt recording system to provide an accurate, consistent and comprehensive database of domestic, external and guaranteed debt of the government. A good debt recording system would readily provide the following:¹⁶

- An accurate breakdown of the outstanding nominal debt by various characteristics, including currency composition, creditor composition, original

¹²See OECD 2008.

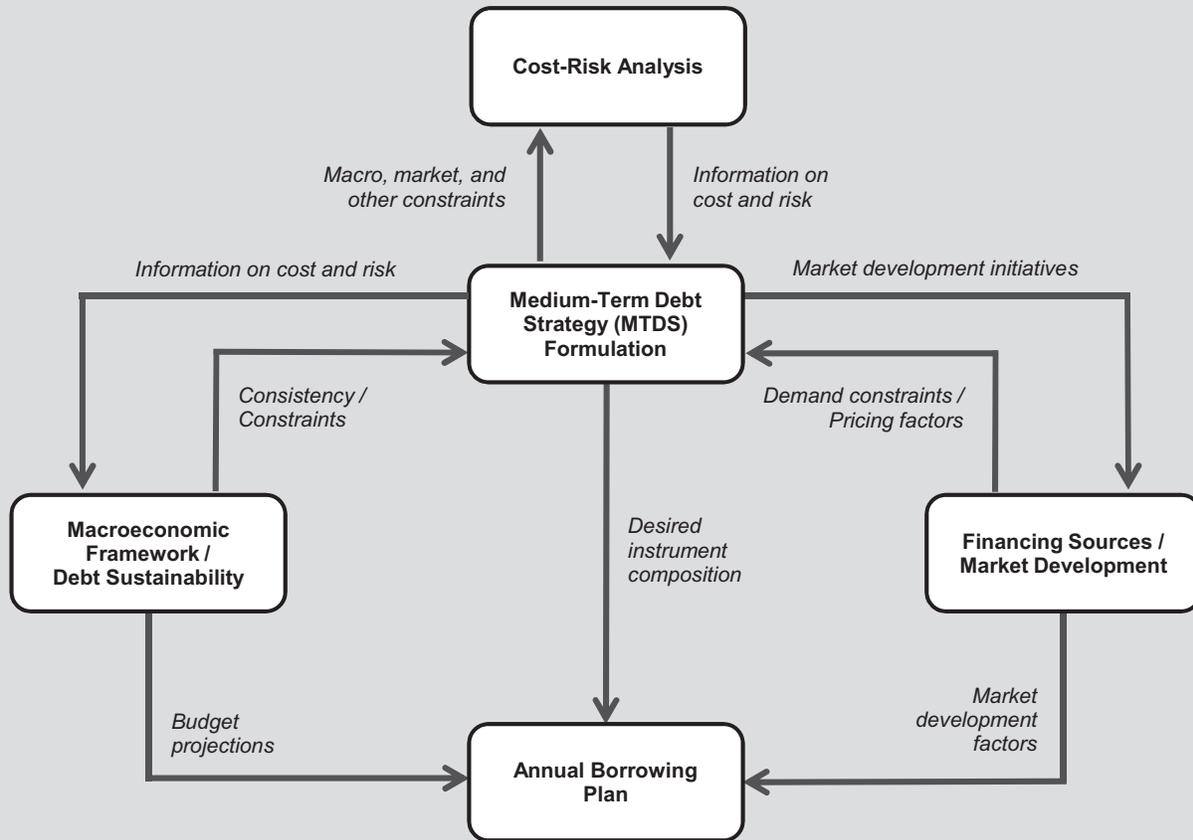
¹³See <http://www.imf.org/external/pubs/ft/dsa/lic.aspx> and <http://www.worldbank.org/debt>.

¹⁴See relevant documents at: <http://www.imf.org/external/pubs/ft/dsa/lic.aspx>.

¹⁵The framework was adopted by the Boards of the IMF and World Bank in March 2009; it is described in “*Developing a Medium-term Debt Management Strategy (MTDS): Guidance Note for Country Authorities*.”

¹⁶See also Chapter 10 of this *Guide*.

Figure 9.1. Interlinkages to be Recognized in Developing Effective Medium-Term Debt Management Strategies



The medium-term debt strategy (MTDS) involves an eight step process:

1. Identify the objectives for public sector debt management and scope of the MTDS.
2. Identify the current debt management strategy and analyze cost and risk of the existing debt.
3. Identify and analyze potential funding sources, including cost and risk characteristics.
4. Identify baseline projections and risks in key policy areas—fiscal, monetary, external, and market.
5. Review key longer term structural factors.
6. Identify the cost-risk trade-offs, and assess and rank alternative strategies.
7. Review implications of candidate debt management strategies with fiscal and monetary policy authorities, and for market conditions.
8. Submit and secure agreement on the MTDS.

Box 9.3. Assessing cost-risk trade-offs

Specification of a medium-term debt strategy (MTDS) requires detailed analysis of cost and risk in the debt portfolio. For this, the debt manager should identify clear and relevant definitions of both cost and risk. Key measures of cost are the following:

- Interest cost—key for budget preparation;
- Interest/GDP or Interest/Revenues (with interest adjusted for the capitalization and indexation effects)—captures the economic burden of debt; and
- Present value of Debt/GDP (or Debt/GDP, if the debt is nonconcessional) also captures the extent of the debt burden.

Key portfolio risk measures relevant for debt managers are described in “*Developing a Medium-term Debt Management Strategy: Guidance Note for Country Authorities*,” IMF and World Bank (March 2009).

To assess the cost-risk trade-off, the focus is typically on market risk (i.e. the exposure to shifts in interest and exchange rates), where risk is measured as the potential for the cost to deviate from its expected outcome. However, effective debt management means managing a spectrum of risks that also include refinancing/roll-over, and operational risk. For example, the materialization of refinancing (or rollover) risk—that is, the risk that debt will have to be rolled over at unusually high cost, or, in extreme cases, cannot be rolled over at all, can lead to exceptionally large increases in government funding costs, or to inability to refinance loans coming due. This risk can be aggravated by excessive reliance on certain creditors or market segments for financing, or by the choice of exchange rate regime. For example, under a fixed exchange rate regime rollover risk is much more important as the exchange rate cannot adjust to market conditions.

and remaining maturity, type of concessionality, and instrument composition (including by interest rate type).

- Repayment and interest payment schedules aggregated across various categories of debt.
- Some basic portfolio indicators, such as average time to maturity,¹⁷ average time to refixing,¹⁸ pro-

¹⁷The average time to maturity measures the weighted average time to maturity of all the principal payments in the portfolio. It shows how long it takes on average to rollover the debt portfolio. A shortening of this indicator suggests that the portfolio is being rolled over more frequently therefore is more exposed to refinancing shocks.

¹⁸The average time to refixing is a measure of weighted average time until all the principal payments in the debt portfolio become subject to a new interest rate. For zero-coupon bonds and bonds with fixed coupons, it corresponds to the residual life of the bond.

portion of foreign currency debt, share of debt with variable interest rates, etc.

- Payment schedules for interest and amortization of individual loans and securities, along with the associated payment notices.

9.20 Ideally, the system would interface with other key systems including (i) the payments system used to make debt servicing payments; (ii) the transaction management system (where relevant); (iii) the auction system (if separate from the transaction management system); and (iv) the government’s financial management information and accounting system(s).

D. Fiscal Risk and Vulnerability

9.21 The fiscal risks that contribute to vulnerability of the public finances go beyond those that can be captured in the portfolio analysis framework described above. *At the most general level, fiscal risks may be defined as any potential differences between actual and expected fiscal outcomes* (for example, fiscal balances and public sector debt). Such deviations can occur, for instance, because budgets are based on assumptions that, in the end, may not materialize, or because operations were initially conducted off-budget.

9.22 Sources of risk include unforeseen shocks to macroeconomic variables (economic growth, commodity prices, interest rates, or exchange rates) as well as calls on several types of contingent liabilities (i.e., obligations triggered by an uncertain event). These contingent liabilities may be explicit (i.e., defined by law or contract, for example, debt guarantees) or implicit (i.e., moral or expected obligations for the government, based on public expectations or pressures, for example, bailouts of banks or public sector entities). Implicit contingent liabilities include potential fiscal costs from banking crises and natural disasters, covering public corporations or local government losses, or calls on guarantees, notably in the case of public-private partnerships (PPPs), and long-term future obligations for social security benefits.

For floating rate notes, it corresponds to the time until the next coupon is refixed. As an average measure, this indicator provides information over time of the changes in the portfolio’s average time to refixing. A shortening of this indicator suggests that the portfolio is, on average, facing a new interest rate more frequently and therefore is more exposed to refixing shocks.

I. The statement of fiscal risks

9.23 As a first step toward comprehensive fiscal risk analysis and management, the IMF recommends the preparation and publication of a **Statement of Fiscal Risks**, to be submitted to the legislature as part of the annual budget.¹⁹ A main function of this statement is to provide a framework for understanding and managing contingent liabilities and, more generally, to help governments decide how much risk to take on.

9.24 The Statement of Fiscal Risks should include a comprehensive enumeration of the risks facing government, together with a probability or other evaluation of each risk's materializing—to the extent that such information exists and its disclosure does not create moral hazard. Such a statement is of necessity open-ended and partly qualitative (rather than purely statistical), since varying amounts of information are available on the different kinds of risks.

9.25 Even mere identification of fiscal risks will contribute to more informed risk-management decisions and will promote earlier and smoother policy responses (for example, offsetting measures can be identified in advance).

9.26 Although risks may be adequately identified in the absence of disclosure, a commitment to making information on fiscal risks publicly available subjects the evaluation of the risks to additional scrutiny. A transparent disclosure policy should strengthen the accuracy and coverage of information on risks.

2. Fiscal risk analysis

9.27 An evaluation of fiscal risks is an input to helping governments define a strategy for managing whatever debt (and other liabilities and assets) they have chosen to hold and for deciding which should be part of a long-term portfolio and which should be disposed of.²⁰ While fiscal risks may be analyzed individually, different risks may partially offset each other or may occur under different circumstances.

9.28 To get a sense of the overall risk to public sector solvency, it is important to conduct an assessment covering the different risks at the same time. This should be done by **analyzing alternative scenarios**. Like DSAs, these should include the implications of

changes in macroeconomic variables, but they should also explore the implications of assumptions regarding: the probability of occurrence of various contingent liabilities; and prices and recovery rates of financial assets on the government's balance sheet.

9.29 Compilation of accurate public sector statistics is a crucial step in conducting such an assessment:

- The **institutional coverage** of statistics used to assess fiscal risks should be as broad as possible, so as to encompass all activities with potential implications for the public finances (including quasi-fiscal activities). The statistics should, therefore, also cover, to the extent possible, other public sector entities (for example, extrabudgetary funds, nonfinancial public corporations, the central bank, and other public financial corporations) that may be excluded from the central or general government definition but may generate significant fiscal risks.
- The **scope** of these statistics should also be as broad as possible, covering data on flows, as well as stock positions presented on a detailed balance sheet of the public sector (using an integrated framework, such as the Government Finance Statistics [GFS] system). Also, information should be disseminated on implicit and explicit contingent liabilities (as an example, see Table 5.12 for a presentation of explicit contingent liabilities and net obligations of future social security benefits).
- To provide an accurate assessment of the public sector's financial situation, particular attention should be attached to the **quality of the statistics**, including with regard to the **estimation of the market value of assets and liabilities**.

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¹⁹See "Fiscal Risks: Sources, Disclosure, and Management," IMF's Departmental Paper No. 09/01, January 2009.

²⁰See "Disclosing Fiscal Risks in the Post-Crisis World"; IMF Staff Position Note SPN/09/18; July 2009.

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