15. Debt Sustainability: Medium-Term Scenarios and Debt Ratios

Introduction[1]

15.1 The creation of debt is a natural consequence of economic activity. At any time, some economic entities have income in excess of their current consumption and investment requirements, while other entities are deficient in this regard. Through the creation of debt, both sets of entities are better able to realize their consumption and output preferences, thus encouraging economic growth.

15.2 The creation of debt is premised on the assumption that the debtor will meet the requirements of the debt contract. But if the income of the debtor is insufficient or there is a lack of sufficient assets to call upon in the event of income proving insufficient, debt problems ensue; the stock of debt will be such that the debtor cannot meet its obligations. In such circumstances, or in the expectation of such circumstances, the benefits arising from international financial flows—for both creditors and debtors—may not be fully realized. Hence, the need at the country level for good risk-management procedures and the maintenance of external debt at sustainable levels.

15.3 This chapter considers tools for sustainability analysis such as medium-term scenarios and the role of debt indicators in identifying solvency and liquidity problems. This is preceded by a short discussion of the solvency and liquidity aspects of sustainability.

Solvency

15.4 From a national perspective, solvency can be defined as the country's ability to discharge its external obligations on a continuing basis. It is relatively easy, but not very helpful, to define a country's theoretical ability to pay. In theory, assuming debt can be rolled over (renewed) at maturity, countries are solvent if the present value of net interest payments does not exceed the present value of other current account inflows (primarily export receipts) net of imports.[2] In practice, countries stop servicing their debt long before this constraint is reached, at the point where servicing the debt is perceived to be too costly in terms of the country's economic and social objectives. Thus, the relevant constraint is generally the willingness to pay, rather than the theoretical macroeconomic ability to pay. To establish that a country is solvent and willing to pay is not easy. Solvency is "very much like honesty: it can never be fully certified, and proofs are slow to materialize."[3]

15.5 In analyzing solvency problems, it is necessary to take into account the different implications of public and private sector debt. If there is a risk that the public sector will cease to discharge its external obligations, this in itself is likely to sharply curtail financial inflows to all economic sectors because governments can issue moratoria on debt repayment and impose exchange restrictions. Sizable public external indebtedness may undermine the government's commitment to allowing private sector debt repayment. Also, if private defaults take place on a significant scale, this too is likely to lead to a sharp reduction in financial inflows, and government intervention may follow—in the form of exchange restrictions, a general debt moratorium, or bailouts. But problems of individual private sector borrowers may be contained to the concerned lenders.

[1]This chapter draws on IMF (2000b), *Debt- and Reserve-Related Indicators of External Vulnerability* (Washington: March 23, 2000), available on the Internet at *http://www.imf.org/external/np/pdr/debtres/index.htm,* as well as work at the World Bank.

[2]In considering imports, it is worth noting that these are endogenous and subject to potentially severe compression (reduction).

[3]Calvo (1996), p. 208.

Liquidity

15.6 Liquidity problems—that is, when a shortage of liquid assets affects the ability of an economy to discharge its immediate external obligations—almost always emerge in circumstances that give rise to insolvency or unwillingness to pay. But it is also possible for a liquidity problem to arise independently of a solvency problem, following a self-fulfilling "run" on a country's liquidity as creditors lose confidence and undertake transactions that lead to pressures on the international reserves of the economy.[4] Liquidity problems can be triggered, for example, by a sharp drop in export earnings, or an increase in interest rates (foreign and/or domestic),[5] or prices for imports. The currency and interest rate composition of debt, the maturity structure of debt, and the availability of assets to pay debts are all important determinants of the vulnerability of an economy to external liquidity crises; these are all considered in the next chapter. Mechanisms—such as creditor "councils"—by which creditors' actions can be coordinated can be useful in preventing or limiting the impact of liquidity crises by sharing information and coordinating responses.

Medium-Term Debt Scenarios

15.7 External-debt-sustainability analysis is generally conducted in the context of medium-term scenarios. These scenarios are numerical evaluations that take account of expectations of the behavior of economic variables and other factors to determine the conditions under which debt and other indicators would stabilize at reasonable levels, the major risks to the economy, and the need and scope for policy adjustment. Macroeconomic uncertainties, such as the outlook for the current account, and policy uncertainties, such as for fiscal policy, tend to dominate the medium-term outlook and feature prominently in the scenarios prepared by the IMF in the context of Article IV consultations and the design of IMF-supported adjustment programs.

15.8 The current account balance is important because, if deficits persist, the country's external position may eventually become unsustainable (as reflected by a rising ratio of external debt to GDP). In other words, financing of continually large current account deficits by the issuance of debt instruments will lead to an increasing debt burden, perhaps undermining solvency and leading to external vulnerability from a liquidity perspective, owing to the need to repay large amounts of debt.

15.9 One advantage of medium-term scenarios is that borrowing is viewed within the overall macroeconomic framework. However, such an approach can be very sensitive to projections for variables such as economic growth, interest and exchange rates, and, in particular, to the continuation of financial flows, which are potentially subject to sudden reversal.[6] Consequently, a range of various alternative scenarios may be prepared. Also, stress tests—"what if" scenarios that assume a major change in one or more variable—can be helpful in analyzing major risks stemming from fluctuations of these variables or from changes in other assumptions including, for example, changes in prices of imports or exports of oil. Stress tests are useful for liquidity analysis and provide the basis for developing strategies to mitigate the identified risks, such as enhancing the liquidity buffer by increasing international reserves, by establishing contingent credit lines with foreign lenders, or both.

Debt Ratios

15.10 Debt ratios have been developed mostly to help indicate potential debt-related risks, and thus to support sound debt management. Debt indicators in medium-term scenarios can usefully sum up important trends. They are used in the context of medium-term debt scenarios, as described above, preferably from a dynamic perspective, rather than as "snapshot" measures. Debt ratios should be considered in conjunction with key economic and financial variables, in particular expected growth and interest rates, which determine their trend in medium-term scenarios.[7] Another key factor to consider is the extent to which there is adequate contract

[4]For a discussion of self-fulfilling crises, see Krugman (1996) and Obstfeld (1994).

[5]Such as when domestic rates rise because of an economy's perceived deterioration in creditworthiness.

[6]An analysis of key indicators, such as the current account of the balance of payments, budget deficits, etc., can be particularly useful in identifying the possibility of reversals in financial flows.

[7]If barter trade is significant, and debt payments are in products that are not easily marketable, this could affect the interpretation of debt ratios, since the opportunity cost of this form of payment is different from a purely financial obligation.

enforcement—that is, creditor rights, bankruptcy procedures, etc.—that will help to ensure that private debt is contracted on a sound basis. More generally, the incentive structure within which the private sector operates could affect the soundness of borrowing and lending decisions; for example, whether there are incentives that favor short-term or foreign currency financing.

15.11 As a result, there are conceptual problems in defining on a general level what are the appropriate benchmarks for debt ratios; in other words, the scope for identifying critical ranges for debt indicators is rather limited. While an analysis over time, in relation to other macroeconomic variables, might help to develop a system of early warning signals for a possible debt crisis or debt-service difficulties, comparing the absolute value of overall debt ratios across heterogeneous countries is not very useful. For instance, a high or low debt-to-exports ratio in a particular year may have limited use as an indicator of external vulnerability; rather, it is the movement of the debt-to-exports ratio over time that reflects the debt-related risks.

15.12 For more homogeneous country groupings and for debt of the public sector, there is more potential to identify ranges for debt-related indicators that suggest that debt or debt-service ratios are approaching levels that in other countries have resulted in suspension or renegotiations of debt-service payments, or have caused official creditors to consider whether the debt burden may have reached levels that are too costly to support. For example, assistance under the HIPC Initiative is determined on the basis of a target for the ratio of public debt to exports (150 percent), or the ratio of debt to fiscal revenue (250 percent). In these ratios, the present value of debt is used, and only a subset of external debt is taken into consideration, namely medium- and long-term public and publicly guaranteed debt.[8]

15.13 Several widely used debt ratios are discussed in somewhat greater detail later. Table 15.1 provides a more comprehensive list. Broadly speaking, there are two sets of debt indicators: those based on flow variables (for example, related to exports or GDP)—these are called flow indicators because the numerator or denominator or both are flow variables; and those based on stock variables—that is, both numerator and denominator are stock variables.

Ratio of Debt to Exports and Ratio of Present Value of Debt to Exports

15.14 The debt-to-exports ratio is defined as the ratio of total outstanding debt at the end of the year to the economy's exports of goods and services for any one year. This ratio can be used as a measure of sustainability because an increasing debt-to-exports ratio over time, for a given interest rate, implies that total debt is growing faster than the economy's basic source of external income, indicating that the country may have problems meeting its debt obligations in the future.

15.15 Indicators that use the stock of debt have several shortcomings in common. First, countries that use external borrowing for productive investment with long gestation periods are more likely to exhibit high debt-to-exports ratios. But as the investments begin to produce goods that can be exported, the country's debt-to-exports ratio may start to decline. So for these countries, the debt-to-exports ratio may not be too high from an intertemporal perspective even if in any given year it may be perceived as large. Therefore, arguably this indicator can be based on exports after the average gestation lag—that is, using projected exports one or several time periods ahead as a denominator.[9] More generally, this also highlights the need to monitor debt indicators in medium-term scenarios to overcome the limitations of a "snapshot."

15.16 Second, some countries may benefit from highly concessional debt terms, while others pay high interest rates. For such countries, to better capture the implied debt burden—in terms of the opportunity cost of capital—it is useful to report and analyze the average interest rate on debt or to calculate the present value of debt by discounting the projected stream of future amortization payments including interest, with a risk-neutral commercial reference rate. As noted above, in analyzing debt

[8]See Andrews and others (1999); available on the Internet at http://www.imf.org/external/pubs/cat/longres.cfm?sk=3448.0. Appendix V discusses the HIPC approach and includes information on the debt ratios monitored.

[9]To average out idiosyncratic or irregular swings in export performance, multiyear period averages are frequently used, such as the three-year averages used in the debt-sustainability analysis for HIPCs.

Table 15.1. Overview of Debt Indicators

Indicator	Evaluation/Use
Solvency	
Interest service ratio	Ratio of average interest payments to export earnings indicates terms of external indebtedness and thus the debt burden
External debt to exports	Useful as trend indicator closely related to the repayment capacity of a country
External debt over GDP	Useful because relates debt to resource base (for the potential of shifting production to exports so as to enhance repayment capacity)
Present value of debt over exports	Key sustainability indicator used, for example, in HIPC Initiative assessments comparing debt burden with repayment capacity
Present value of debt over fiscal revenue	Key sustainability indicator used, for example, in HIPC Initiative assessments comparing debt burden with public resources for repayment
Debt service over exports	Hybrid indicator of solvency and liquidity concerns
Liquidity	
International reserves to short-term debt	Single most important indicator of reserve adequacy in countries with significant but uncertain access to capital markets; ratio can be predicted forward to assess future vulnerability to liquidity crises
Ratio of short-term debt to total outstanding debt	Indicates relative reliance on short-term financing; together with indicators of maturity structure allows monitoring of future repayment risk
Public sector indicators	
Public sector debt service over exports	Useful indicator of willingness to pay and transfer risk
Public debt over GDP or tax revenues	Solvency indicator of public sector; can be defined for total debt or for external debt
Average maturity of nonconcessional debt	Measure of maturity that is not biased by long repayment terms for concessional debt
Foreign currency debt over total debt	Foreign currency debt including foreign currency indexed debt; indicator of the impact of a change in the exchange rate on debt
Financial sector indicators	
Open foreign exchange position	Foreign currency assets minus liabilities plus net long positions in foreign currency stemming from off-balance-sheet items; indicator for foreign exchange risk, but normally small because of banking regulations
Foreign currency maturity mismatch	Foreign currency liabilities minus foreign currency assets as percent of these foreign currency assets at given maturities; indicator for pressure on central bank reserves in case of a cutoff of financial sector from foreign currency funding
Gross foreign currency liabilities	Useful to the extent that assets are not usable to offset withdrawals in liquidity
Corporate sector indicators	
Leverage	Nominal (book) value of debt over equity (assets minus debt and derivatives liabilities); key indicator of sound financial structure; high leverage aggravates vulnerability to other risks (for example, low profitability, high ratio of short-term debt/total debt)
Interest over cash flow	Total prospective interest payments over operational cash flow (before interest and taxes); key cash flow indicator for general financial soundness
Short-term debt over total term debt (both total and for foreign currency only)	In combination with leverage, indicator of vulnerability to temporary cutoff from financing
Return on assets (before tax and interest)	Profit before tax and interest payments over total assets; indicator of general profitability
Net foreign currency cash flow over total cash flow	Net foreign currency cash flow is defined as prospective cash inflows in foreign currency minus prospective cash outflows in foreign currency; key indicator for unhedged foreign currency exposure
Net foreign currency debt over equity	Net foreign currency debt is defined as the difference between foreign currency debt liabilities and assets; equity is assets minus debt and net derivatives liabilities; indicator for balance sheet effect of exchange rate changes

sustainability for HIPCs, the IMF and World Bank use such a present value of debt measure—notably present value of debt to exports, and to fiscal revenue (see below). A high and rising present value of the debt-to-exports ratio is considered to be a sign that the country is on an unsustainable debt path.

Ratio of Debt to GDP and Ratio of Present Value of Debt to GDP

15.17 The debt-to-GDP ratio is defined as the ratio of the total outstanding external debt at the end of the year to annual GDP. By using GDP as a denomi-

nator, the ratio may provide some indication of the potential to service external debt by switching resources from production of domestic goods to the production of exports. Indeed, a country might have a large debt-to-exports ratio but a low debt-to-GDP ratio if exportables comprise a very small proportion of GDP.

15.18 While the debt-to-GDP ratio is immune from export-related criticisms that mainly focus on the differing degree of value added in exports and price volatility of exports, it may be less reliable in the presence of over- or undervaluations of the real exchange rate, which could significantly distort the GDP denominator. Also, as with the debt-to-exports ratio, it is important to take account of the country's stage of development and the mix of concessional and nonconcessional debt.

15.19 In the context of debt ratios, the numerator in the present value of debt-to-GDP ratio is again estimated using future projections of debt-service payments discounted by market-based interest rates (that is, a risk-neutral commercial reference rate).

Ratio of Present Value of Debt to Fiscal Revenue

15.20 The ratio of the present value of debt to fiscal revenue is defined as the ratio of future projected debt-service payments discounted by market-based interest rates (a risk-neutral commercial reference rate) to annual fiscal revenue. This ratio can be used as a measure of sustainability in those countries with a relatively open economy facing a heavy fiscal burden of external debt. In such circumstances, the government's ability to mobilize domestic revenue is relevant and will not be measured by the debt-to-exports or debt-to-GDP ratios. An increase in this indicator over time indicates that the country may have budgetary problems in servicing its debt.

Ratio of Debt Service to Exports[10]

15.21 This ratio is defined as the ratio of external debt-service payments of principal and interest on long-term and short-term debt to exports of goods and services for any one year. The debt-service-to-exports ratio is a possible indicator of debt sustainability because it indicates how much of a country's export revenue will be used up in servicing its debt and thus, also, how vulnerable the payment of debt-service obligations is to an unexpected fall in export proceeds. This ratio tends to highlight countries with significant short-term external debt. A sustainable level is determined by the debt-to-exports ratio and interest rates, as well as by the term structure of debt obligations. The latter may affect creditworthiness because the higher the share of short-term credit is in overall debt, the larger and more vulnerable is the annual flow of debt-service obligations.

15.22 By focusing on payments, the debt-service-to-exports ratio takes into account the mix of concessional and nonconcessional debt, while its evolution over time, especially in medium-term scenarios, can provide useful information on lumpy repayment structures. Moreover, a narrow version of the debt-service ratio, focused on government and government-guaranteed debt service, can be a useful indicator of government debt sustainability and transfer risk (the risk that exchange rate restrictions are imposed that prevent the repayment of obligations) because it may provide some insight into the political cost of servicing debt.[11]

15.23 The debt-service-to-exports ratio has some limitations as a measure of external vulnerability, in addition to the possible variability of debt-service payments and export revenues from year to year. First, amortization payments on short-term debt are typically excluded from debt service,[12] and the coverage of private sector data can often be limited, either because the indicator is intentionally focused on the public sector or because data on private debt service are not available.

15.24 Second, many economies have liberalized their trade regimes and are now exporting a larger proportion of their output to the rest of the world. But at the same time they are importing more, and

[10]This ratio, in addition to the total debt-to-exports and the total debt-to-GNP (national output) ratios, is provided for individual countries in the World Bank's annual *Global Development Finance* publication.

[11]A version of this indicator that focuses on official debt is used, for instance, in the HIPC Initiative.

[12]This is the approach taken in the World Bank's *World Development Report* and *Global Development Finance,* and the IMF's *World Economic Outlook.* Lack of data, as well as the assumption that short-term debt mainly constituted trade credit that was easy to roll over, contributed to this practice. As experience shows, this assumption is in some cases questionable.

the import content of exports is rising. Thus, a debt-service-to-exports ratio not corrected for the import intensity of exports is biased downward for economies with a higher propensity to export;[13] this argument applies similarly to the debt-to-exports ratio.

15.25 Finally, the concept summarizes both liquidity and solvency issues, which may make it analytically less tractable than measures that track only solvency (such as the ratio of interest payments to exports) or liquidity (the ratio of reserves to short-term debt).

Ratio of International Reserves to Short-Term Debt

15.26 This ratio is a pure liquidity indicator that is defined as the ratio of the stock of international reserves available to the monetary authorities to the short-term debt stock on a remaining-maturity basis. This could be a particularly useful indicator of reserve adequacy, especially for countries with significant, but not fully certain, access to international capital markets.[14]

15.27 The ratio indicates whether international reserves exceed scheduled amortization of short-, medium-, and long-term external debt during the following year; that is, the extent to which the economy has the ability to meet all its scheduled amortizations to nonresidents for the coming year using its own international reserves. It provides a measure of how quickly a country would be forced to adjust if it were cut off from external borrowing—for example, because of adverse developments in international capital markets. All scheduled debt amortization payments on both private and public debt to nonresidents over the coming year are covered in such a ratio under short-term debt, regardless of the instrument or currency denomination. A similar ratio can be calculated focusing on the foreign currency debt of the government (and banking sector) only. This may be especially relevant for economies with very open capital markets, and significant public sector foreign currency debt.

15.28 Interestingly, in most theoretical models the maturity structure of public debt is irrelevant because it is assumed that markets are complete.[15] But markets are rarely complete, even in developed countries. And, as several currency crises in developing and emerging market countries in the mid-to-late 1990s have shown, the risk associated with an excessive buildup of the stock of short-term debt relative to international reserves can be quite severe, even in countries that were generally regarded as solvent. One conclusion drawn has been that countries with excessively large short-term debt in relation to international reserves are more susceptible to liquidity crisis.[16]

15.29 However, various factors need to be taken into account when interpreting the ratio of international reserves to short-term debt. First, a large stock of short-term debt relative to international reserves does not necessarily lead to a crisis. Many advanced economies have higher ratios of short-term debt to reserves than many emerging economies, which have shown vulnerability to financial crisis. Factors such as an incentive structure that is conducive to sound risk management, and a proven track record of contract enforcement, can help develop credibility, and help to explain this difference. Moreover, macroeconomic fundamentals, in particular the current account deficit and the real exchange rate, play an important role. Consideration should also be given to the exchange rate regime. For example, a flexible regime can reduce the likelihood and costs of a crisis. Finally, the ratio assumes that measured international reserves are indeed available and can be used to meet external obligations; this has not always been true historically.

[13]See Kiguel (1999) for more reasons why the ratio of debt service to exports may not be a highly reliable indicator of the external vulnerability of a country under special circumstances.

[14]The potential importance of other residents' external assets in relation to debt is highlighted in the table for the net external debt position presented in Chapter 7 (Table 7.11).

[15]See Lucas and Stokey (1983) and Calvo and Guidotti (1992).

[16]See Berg and others (1999); Bussière and Mulder (1999); and Furman and Stiglitz (1998).