DEBT MANAGEMENT
LEARNING & TRAINING NOTES

1

Government Debt Management: Designing Debt Management Strategies

The World Bank Treasury - Public Debt Management Advisory

THE WORLD BANK

Treasury | IBRD • IDA

Washington, D.C., August 2017

Table of Contents

List of Boxes

Preface

The World Bank Treasury, which manages World Bank Group's multi-billion-dollar debt and asset portfolios, issuing bonds and notes in more than 31 currencies, has substantial experience and knowledge in asset and liability management, hence uniquely positioned to act in an advisory capacity to its member countries.

After the introduction of the Guidelines for Public Debt Management and the Accompanying Document with country case studies in 2001 and the identification of key challenges in developing sound debt management through a 12-country pilot program, the Treasury identified a need for training in core debt management issues, centered around the design of debt management strategies.

The first Designing Debt Management Strategies (GDM1) training course took place in Washington DC in December 2005. The weeklong course has since been held one to three times per year, and more than 600 debt managers from more than 110 countries have participated in the course. The workshop continues to be a mix of presentations, discussions, and hands-on work by the participants culminating in the presentation of a specific country strategy or case study, based on what has been learned during the week and prepared and presented by groups.

In 2008, a supplementary course was introduced, Implementing Debt Management Strategies (GDM2). In general, the courses are offered back-to-back, and many GDM1 participants have also participated in the course focusing on implementation.

The GDM1 and GDM2 courses have been designed and prepared by the World Bank Treasury's expert advisors who were practitioners in public debt offices in member countries before joining the WBG.

This publication was prepared by Lars Jessen, based on the background papers produced by Phillip Anderson, Elizabeth Currie, Lars Jessen, Tomas Magnusson, Eriko Togo, Antonio Velandia, and Dimitri Vittasand in 2005. Since then the document was updated several times and reworked. The individual chapters were peer reviewed by Cigdem Aslan, Fritz Bachmair, Jean Paule Blardony, Sebastien Boitreaud, Rodrigo Cabral, Indhu Raghavan, Anderson Silva, and Antonio Velandia. Susan Wilder, Colleen Keenan, Amira Amat and Banu Turhan Kayaalp delivered invaluable input on the design and structure of the publication. Philip Anderson provided guidance and reviewed all sections. The publication is cleared by M. Coskun Cangoz.

Introduction

The target audience for this publication are previous and future participants of the Designing Debt Management Strategies (GDM1) training course. The background notes serve as preparation before attending the training course, and as reference material for debt managers who have already participated.

Learning objectives are outlined at the start of each. Boxes supplement the main text and provide more detail and examples of the issues being discussed. Chapters are concluded with recommendations for further reading. At the end, a glossary provides a list of key terms and phrases with brief explanations.

The first chapter introduces the overall concepts and objectives of government debt management, and familiarizes the reader with choices about risk exposure.

The second chapter explains why managing government debt is a critical public policy function, and describes asset liability management and tax smoothing as a background for designing a debt management strategy.

The third chapter defines the concepts of cost and risk, their role in debt management strategy development, and their measurement, with an emphasis on market risk - interest rate and exchange rate risk – and refinancing risk.

The fourth chapter outlines the risk exposure indicators for interest rate risk, foreign exchange risk, and refinancing risk as well as their interpretation in developing a debt management strategy.

The fifth chapter introduces the use of quantitative models in cost and risk analysis and discusses the benefits and shortcomings of scenario analysis.

The sixth chapter focuses on baseline and risk scenarios for market variables such as interest rates and exchange rates, and explains alternative approaches for defining them.

The seventh chapter investigates the links between debt management and fiscal and monetary policies, emphasizing the need for policy coordination.

The eight chapter explores the link between debt management and domestic capital market development, as well as describes the role of the debt manager in developing an efficient government securities market.

The ninth chapter describes the need for clear and strong governance arrangements; both surrounding the debt management organization and the functionalities within the internal organization.

The final chapter provides a summary of the key concepts covered before and how the different pieces are put together for the development of a sound and comprehensive debt management strategy.

Chapter 1: Government debt management – an introduction

Learning objectives

- Understand the objectives for government debt management, and that debt management is focused on the composition and risk exposure of the debt, not its size
- Recognize that developing a debt management strategy means making choices; understand the nature and potential implications of the choices that are being made, and that these choices may be constrained by the macroeconomic environment and the level of domestic market development
- Understand that the government debt is exposed to future changes in interest rates and exchange rates; understand that borrowing decisions are made under uncertain conditions

1.1. Introduction

The process of developing a debt management strategy involves establishing debt management objectives, understanding the cost and risk implications of different strategies, and having in place a strong governance framework, including ensuring that debt managers are accountable for implementing the strategy efficiently. Equally important is recognizing that a strategy cannot be developed in isolation: the macroeconomic framework and the level of development of the domestic market have implications for which strategies are feasible and can be implemented in practice.

Government debt management has developed substantially in recent decades, and it is increasingly recognized that debt management, while having close links to fiscal and monetary policy, has separate objectives and instruments.

Public debt management

Public debt management is the process of establishing and executing a strategy for managing the government's debt in order to raise the required amount of funding at the lowest possible cost over the medium to long run, consistent with a prudent degree of risk. It should also meet any other public debt management goals the government may have set, such as developing and maintaining an efficient market for government securities.

Revised Guidelines for Public Debt Management (2014)

1.2. Objectives for government debt management

The objectives for government debt management are often framed in terms of ensuring that the government's financing needs and payment obligations are met on a timely basis, and at the lowest possible cost in the medium term, consistent with a prudent degree of risk. Often a secondary objective is supporting domestic debt market development. Central to the primary objective is the trade-off of cost and risk, since low cost typically is associated with high risk, and vice versa.

As discussed further in chapter 9, the objectives should ideally be stated in the debt management law. In countries where this is not the case, the objectives can be included in the debt management strategy document, they should be clearly defined and formally approved by the authority, typically the Minister of Finance or the Cabinet, as an integral part of the strategy.

Box 1. Examples of government debt management objectives

Brazil: To minimize long-term financing costs, while maintaining risks at prudent levels and contributing to the well-functioning of the public bond market.

Egypt: To provide the Government's budget funding requirements at the lowest long term cost relative to general level of interest rates, at an examined degree of risk consistent with prudent fiscal and monetary policies frameworks.

Latvia: To provide the necessary financial resources at the lowest possible costs, hedging the financial risks and taking into account the developments concerning the Latvian capital market and the entire financial system.

1.3. The debt management strategy

The debt management strategy is a rolling, medium-term plan outlining how the government will meet the debt management objectives. Developing a strategy essentially means identifying the preferred composition of the debt, e.g. domestic versus external, fixed versus variable interest rate, redemption profile etc. The composition will define the degree of risk exposure of the debt. For instance, a high share of short-term debt will imply a high exposure to an increase in interest rates, since maturing debt will have to be refinanced at unknown future interest rates. Issues related to defining and identifying cost and risk on debt portfolios are discussed in chapters 3 and 4.

Since governments make borrowing decisions on an ongoing basis, it can be argued that all governments have a debt management strategy. However, when the strategy is implicit and not publicly available, it fails to provide the governance and accountability benefits that accompany a well-defined process where cost and risk are systematically analyzed, the environment for debt management is taken into account, and the strategy is made public.

Box 2. Debt management is distinct from fiscal policy

Debt management: focuses on the structure of the debt, cost and risk of the debt portfolio within acceptable tolerances. Determines the composition of the debt.

Fiscal policy: focuses on aggregate government spending and taxation, the microeconomic impact of individual tax and spending policies. Determines the level of debt.

1.4. Analyzing cost and risk

The government's funding need is a function of the primary budget balance, payments of interest on outstanding debt, and debt maturing. The role of the debt manager, therefore, is centered around decisions on what and when to borrow, but not how much. The decisions on how to cover the funding need will have implications for the risk exposure of the debt. If only long-term fixed interest rate domestic debt is issued, the resulting portfolio will have low risk, since changes in market rates will only have limited impact on the cost of the debt. Note, however, that even such debt will be exposed to risk when the long-term debt matures and have to be refinanced at rates will only be known at the time of the new borrowing. If only short term foreign debt is issue, on the other hand, the resulting portfolio will be exposed to both interest rate changes, changes in the foreign exchange rate, and refinancing risk.

An increase in interest rates and/or a weakening of the domestic currency will have potential impact on the government's budget and the size of the outstanding debt. The impact will depend on the composition of the debt. The fact that the government is exposed to future changes in market rates is the topic for chapter 5 where an analytical tool that allows analyzing alternative debt management strategies is introduced. A key input to this type of analysis is assumption about future market rates. Alternative methodologies for defining such assumptions is the focus of chapter 6.

1.5. Links to macroeconomic policies and market development

A sound debt management strategy cannot be designed in isolation. Identifying constraints and options related to macroeconomic policies and the domestic financial markets is a precondition for strategy development.

Fiscal policy, expressed in the Medium-Term Fiscal Framework (MTFF), provides projections of the main macroeconomic variables, in particular, forecasts of the primary balance that will be important for estimating future funding needs. Debt sustainability analysis, a key input of the MTFF, provides a long-term analysis of the development of the size of the debt.

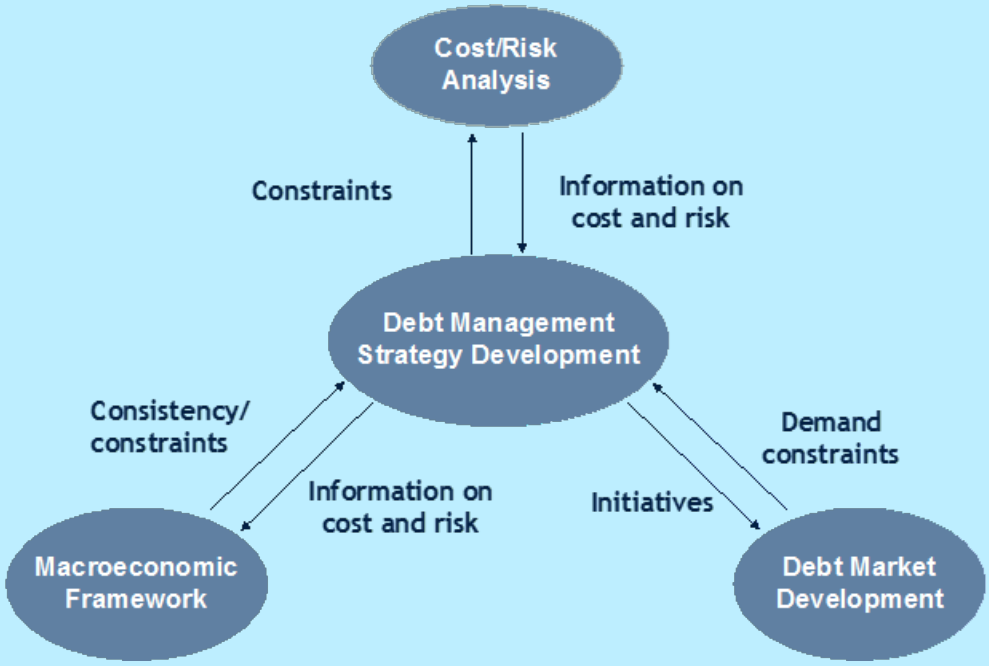
The monetary policy stance offers useful information on the future paths of the exchange rate and the short-term interest rate in local currency, which are essential for the cost-risk analysis. In addition, the exchange rate regime and the projections of the balance of payments may be critical inputs to the mix between foreign and local currency debt, while the credibility of the CB's anti-inflationary policy help determine the debt manager's ability to place long-term fixed-rate instruments in local currency and the risk of exchange rate adjustments.

The debt manager should inform the fiscal and monetary policy authorities about potential implications from debt management on macroeconomic policies. This could include fears that the debt manager will not be able to cover the annual funding need at the reasonable cost, or that level of external funding for balance of payments need may not be achievable. Links between debt management and macroeconomic policies are discussed in chapter 7.

Debt management plays a key role in the development of the domestic financial market by providing a domestic yield curve that serves as a reference for the pricing of products such as corporate bonds and mortgages thereby opening access to financing to corporates and households and a significant stimulus to economic growth. Furthermore, the development of the government bond market is central to delink government financing from the banking system, providing institutional investors such as pension funds, mutual funds, insurance companies and non-residents of a risk free vehicle to mobilize the domestic financial savings.

As issuer of government securities the debt manager designs and executes a domestic borrowing plan. The manner in which the plan is executed plays a crucial role in market development as it involves deciding on the degree of predictability and transparency of debt issuance, choosing of debt instruments, and deciding how securities are issued and who can participate in the primary auctions. While the most important role relates to the primary market, the debt manager is often a driving force in secondary market development plans. For debt managers, a deep and active secondary market expands access to funding in a variety of instruments without any exposure to foreign exchange rates. The links between debt management, and primary and secondary market development is the topic for chapter 8.

Box 3. The debt management strategy should take into account macro and market constraints



Detailed cost-risk analysis facilitates the identification of robust and resilient debt management strategy. But if such a strategy does not explicitly take into account constraints from the macro economic framework and the level on market development, it may be a strategy that cannot be implemented. Similarly, if the strategy is designed taken into account constraints but not based on cost-risk analysis, important risks that have potential macroeconomic and market implications may be overlook.

It should also be noted that the cost-risk analysis of alternative borrowing strategies can inform fiscal and monetary policy, and that the debt management strategy is a key component in market development.

1.6. Governance

A good strategy based on detailed cost-risk analysis and strong coordination with macroeconomic policies and with specific links to market development efforts will not yield the expected benefits unless it is supported by a legal framework and organizational arrangements that promote its implementation. Governance and its importance for debt management strategy development is discussed in chapter 9.

Sound governance requires clear delegation and accountability. The responsibility for debt management flows from parliament or congress, through the cabinet or the minister of finance, to the head of the debt office. The counterpart for such delegation is accountability that takes place primarily through reporting on the existing debt and risks, and on strategy implementation.

The strategy document is typically a relatively short document that includes the debt management objectives provided by the debt management law, the scope of the analysis, and information on the structure and main risks to the existing debt and future funding sources, as well as the macroeconomic context within which the strategy was developed. The strategy itself is typically expressed as guidelines for the debt composition or through target ranges for specific risk exposure indicators. It is common practice that the strategy has a medium-term focus and is updated annually.

Further reading

- Guidelines for public debt management, revised (2014), World Bank and IMF.
- Guidelines for public debt management, accompanying document and selected case studies (2003), World Bank and IMF.
- Managing public debt: From diagnostics to reform plan implementation (2007), World Bank.

Chapter 2: A theoretical framework for debt management

Learning objectives

- Understand why managing government debt is a critical public policy function, including its contribution to crisis prevention
- Recognize that asset liability management (ALM) and tax smoothing can provide a context within which the debt manager can define and manage cost and risk

2.1 Introduction

Sound debt management is important because the government borrowing decisions can have substantial impact on the government's budget and its financial standing. Situations where the cost of the debt increases when the primary deficit is high or rising, could force the government to cut expenditures and/or increase taxes, and in the worst cases default on its obligations[1]. The implication is that a good understanding of the government's revenues and expenditures as well as its assets and liabilities is essential for sound debt management.

Sound risk management

Sound risk management practices are essential given that a government's debt portfolio is usually the largest financial portfolio in the country and can contain complex and risky financial structures, which have the potential to generate substantial risk to the government's balance sheet and overall financial stability.

Revised Guidelines for Public Debt Management (2014)

[1] Examples are numerous, and include the bankruptcy of the state of Denmark in 1813, and more recently the debt defaults by Argentina in 2001 and Greece in 2012.

2.2 A framework for debt management

This section discusses possible theoretical frameworks than can support debt management decisions on the preferred cost risk trade-offs. The first part focuses on asset liability management (ALM), the second part on tax smoothing. A conclusion is that the debt managers should attempt to reduce the variability of the debt cost.

2.2.1. Asset Liability Management

A balance sheet is a summary of the financial balance of a company at a specific point in time, i.e. assets, liabilities and equity, typically measured at their (estimated) market value or valued at cost. In other words, the balance sheet can be considered a snapshot of the company's financial condition. Key insights from applying balance sheets in risk management is that financial assets and liabilities are sensitive to interest rates and exchange rates that can be quantified, and that risk can be reduced/removed by matching the financial characteristics of assets and liabilities. This can be done for the overall balance sheet or on a sub-portfolio basis. If for example a company hold US dollar denominated assets, having loans in the same currency can remove exposure to the US dollar.

Box 4. A stylized balance sheet of a bank:

Assets	Liabilities
Current Assets	Current Liabilities
Fixed Assets	Long Term Liabilities
	Equity

A balance sheet is a statement of assets, liabilities, and shareholder's equity at a specific point in time. The assets – what the bank own – are funded by the liabilities– what the bank owes – and equity – what the owners are financing.

Assuming an unchanged balance sheet at nominal value, the market value of the individual components on the balance sheet will change over time according to changes in market rates, i.e. interest rates and exchange rates. The implication is that risk to individual components on the asset side on the balance sheet can be managed by matching, hedging, the financial characteristics of the liability side.

While only very few governments prepare a balance sheet for the overall government, entities in the public sector such as the central bank and state owned enterprises prepare balance sheets along the same lines as private companies. Although most governments do not produce balance sheets that conform to generally accepted accounting principles, all governments own assets and incur liabilities and could do so. One practical challenge is that governments hold a wide variety of assets and liabilities, some of which are very difficult to value. Examples include the road network, schools, national parks etc.

The main difference between governments and private companies, is the government's ability to tax households and corporates and the range of public goods and services it is expected to provide in return.

A stylized fiscal or conceptual balance sheet would have the stream of future tax revenues as the main asset and the stream of future of government expenditures and the government debt as the main liabilities. Although this does not conform to generally accepted accounting principles, it is a useful twist on the traditional balance sheet, as the government's creditworthiness arises largely from its fiscal stance, rather than the strength of its conventional balance sheet.

Box 5. A stylized balance sheet of a government:

Assets	Liabilities
"Accounting" balance sheet	
Fixed assets	Public debt
Land	Contractual pension obligations
Infrastructure	Currency issued
Equity in SOEs	Payment owed to suppliers
Foreign currency reserves	Equity
Other financial assets	
Accounts receivable	
Proven commodity reserves	
"Fiscal" balance sheet	
Future taxes	Future expenditures

The "accounting" balance sheet of the government presented above is similar to that of a company. It covers the total public sector, including the central bank. While central banks are "independent" in the design and implementation of monetary policy, they are an integral part of the public sector as exemplified by the CB regular transfer of net profits/losses to the government and by eventual recapitalization operations conducted by the government to solve CB structural deficits. The inclusion of the central bank in the government balance sheet offers the possibility of reducing exchange rate risk when the currency composition of the foreign currency reserves is matched with that of the foreign currency debt.

When including future flows in the government balance sheet (the "fiscal" balance sheet) the largest asset is the discounted value of future tax revenues while the largest liability is the discounted value of future expenditures. Note that the difference between future taxes and future expenditures, net of interest payments, is equal to the future primary balances which is the source to service the government debt.

The stylized balance sheet is in line with the inter-temporal budget constraint: the present value of future primary surpluses (revenues minus expenditures) should at least equal the value of debt, otherwise the government's fiscal policy is unsustainable in the long run. Looking at the inter-temporal budget constraint through the stylized balance sheet provides important insights for the debt manager: since both revenues and expenditures are typically denominated in domestic currency, debt should also be denominated in local currency to immunize the government to changes in exchange rates. In this manner the debt manager reduces the risk of adjusting fiscal policy. Furthermore, since tax revenues and government expenditures tend to be relatively insensitive to real interest rates, long-maturity fixed-rate debt will reduce the volatility of the debt service relative to the primary surplus and thus the need to introduce fiscal policy changes.

The construction of a government balance sheet offers other insides for the management of the government exposure to financial risks. The “conventional” assets and liabilities on the balance sheet could be analyzed, and sub-portfolios identified. One example is the foreign currency reserves (held by the central bank) and the foreign currency debt, as these have similar exposure to movements in exchange rates. Another example could be matching the currency and interest rate exposure of on-lent loans (the asset) with that of the underlying debt (the liability).

Managing risks by matching the financial characteristics of the sub-portfolios (also referred to as “hedging”) can be a very effective way of minimizing risk. However, account needs to be taken of the accounting rules applied to those portfolios as well as the overall budget, and similarly the objectives and governance arrangements for managing the sub-portfolios may be very different – a prime example being the management of foreign currency reserves, that are held on the balance sheet of the central bank. When managing foreign currency reserves there is a strong focus on preserving market value whereas, for the foreign debt the focus is less on the market value of the debt, and more on the volatility of the annual cost, see chapter 3 for a further discussion of cost and risk. The message is not that governments should shy away from ALM, but rather that explicit account should be taken on the institutional and governance arrangements related to the sub-portfolios.

In practice, governments have applied ALM principles to achieve a range of objectives. Some have accumulated assets to manage future liabilities that arise from pension obligations. For example, Australia, New Zealand and Norway have established “funds for the future” for this purpose, using actuarial techniques to estimate the volume of assets that would be required, as well as an appropriate mix of these assets, to meet increased pension payments arising from aging populations. Denmark introduced formal coordination of the management of currency risk on the government’s foreign debt and the central bank reserves, where decisions on the net and gross currency compositions is decided on quarterly meetings between the ministry of finance and the central bank.

Some commodity exporting countries, such as Chile and Nigeria have established stabilization funds in order to smooth the impact of commodity prices changes on the government’s finances. Other countries, having determined that highly liquid foreign-currency reserves have reached an ample level under a range of measures, have decided to segregate a portion of the reserves in a separate wealth fund with a longer-term investment horizon (e.g. China, Russia, and Korea) with the expectation of higher returns.

2.2.2. Tax smoothing

Tax smoothing is an extension of the ALM approach, see the box on basic budget arithmetic below. The budget mechanics allows an understanding of how fiscal policy and debt management are interlinked, even if they have different objectives, see chapter 7. Fiscal policy targets are typically focused on the fiscal balance, e.g. a ceiling on the size of the annual budget deficit, and it is important to note that interest cost are included when calculating the fiscal balance. Two things are worth highlighting in this context. First, the size of the debt will directly impact the total debt cost, and secondly, and more importantly in the context of debt management strategy development, the structure of the debt, and therefore the volatility of the cost of debt, can substantially impact the size of the fiscal balance and the likelihood that a fiscal policy target can be met.

As discussed, the largest asset on the government's (conceptual) balance sheet is the present value of future flows of the primary surpluses, i.e. the difference between future streams of government revenues and expenditures. The objective for managing the future flows of primary surpluses may be framed in terms of the objective for smoothing taxes. Tax smoothing is preferable if taxes are distortionary, as it is generally assumed that individuals increase labor input when tax rates are reduced, and reduce labor input will when tax rates increases. Changes in tax rates or government spending results in economic inefficiency if labor input shifts away from the optimal allocation, whereby labor input increases when the marginal product of labor is decreasing, and labor input decreases when marginal product increasing.

Tax smoothing implies that the primary balance improves when GDP increases, and declines when GDP goes down, resulting in a counter-cyclical fiscal policy that helps stabilize the economy through its business cycles. While tax smoothing may not be an explicitly stated objective for fiscal policy, governments generally attempt to structure fiscal policy in such a way that the primary surplus increases when GDP is up and the primary surplus falls when GDP is down.

The ALM framework suggested that risk can be minimized when the financial characteristics of the asset matches the financial characteristics of the liabilities. The implication for debt management of a tax-smoothing objective for fiscal policy is that the debt portfolios should be structured in such a way that debt cost are low when there is a primary deficit, and are high when there is primary surplus. In other words, high debt cost in good times, and low debt cost in bad economic times. This would help minimize the need for fiscal policy adjustments (increase in taxes, cuts in expenditures etc.), i.e. supporting the fiscal policy objective of tax-smoothing, with the debt portfolios structured such that it provides a hedge (protection) to the budget under economic shocks.

Box 6. Basic budget arithmetic:

Key to sound debt management is an understanding of how debt management decisions impacts fiscal policy and vice versa.

Revenues
- Expenditures

_____

= Primary balance

- Interest cost on debt

_____

= Fiscal balance

- Principal payments on debt

_____

= Funding need

As is clear from the above, the funding need, i.e. how much the government need to borrow in a specific period, consist of three main components: 1) the primary balance that is a results of fiscal policy decisions; 2) interest cost; and 3) principal payments. The two latter components are results of debt management decisions, with due account taken to the constraints facing the debt manager.

Risky debt structures, i.e. debt compositions where interest costs may be very high in specific periods will impact the size of the debt in the future, since higher cost will generate higher funding needs, and therefore, higher debt. The main driver of the debt size, however, is the primary balance, i.e. fiscal policy decisions regarding taxes and spending.

Note that realized contingent liabilities, privatizations etc. will impact future debt levels, as they will directly impact the funding need.

In reality, there will be constraints on fiscal policies as well as debt management, e.g. limited financial choices available. What is critical to keep in mind is that debt management decisions can have substantial impact on the overall fiscal balance, and, therefore, is an important component of sound fiscal policy.

Balancing the budget on a period-by-period basis may not be an attractive fiscal policy, particularly in developing countries where government investment and current expenditures are important to reduce poverty and to create an environment conducive to accelerate economic growth. Alternatively, the government may want to increase expenditures in excess of the built-in automatic stabilizers to smooth the effects of a recession, and/or the debt servicing cost. In such cases, balancing the budget over the business cycle or over a medium time horizon rather than year by year may be a more reasonable objective. Under such a policy, temporary budget deficits are allowed in order to smooth taxes over time and soften the effect of public finances on economic activity. More generally, the objective of the debt manager then becomes one of minimizing the variability of the overall budget balance.

The debt structure that results in interest cost that co-moves with the primary balance, however, depends on the nature of the shocks that the economy is likely to experience. If the economy is hit by a supply shock, a good example being an increase in oil prices, the result will be a contraction of the economy, including a decline in the primary balance, and a rise in inflation. In this case, domestic nominal fixed interest rate debt results in a positive covariance with the primary balance, as real debt charges decline with the decline in primary balance. If the economy is hit by a demand shock, the economy contracts, the primary balance declines, and prices fall; in this case, inflation indexed or floating interest rate debt produces a positive covariance with the primary balance, and is therefore preferable to nominal debt, as debt charges fall with the fall in prices.

2.3 ALM and tax smoothing – implications for debt management

The implication of the above discussion is that the preferred debt structure is derived from a joint analysis of the financial characteristics of the government's future primary surpluses, the potential shocks to the economy, and possible debt management strategies. In practice, this turns out to be complicated, not least because it is hard to forecast future revenues and expenditures. In addition, the nature of the shocks to the economy in the future are uncertain. An alternative when analyzing possible debt management strategies is to make simplifying assumptions about the future primary balances, either using forecasts from medium term expenditure framework or debt sustainability analysis, see chapter 7, or assuming that future primary balances remain at the current level. Note that if the fiscal policy target is a stable fiscal balance, an assumption of stable future primary balances leads to an objective for debt management to keep interest cost stable. This would point in the direction of a preference for fixed interest rate long-term debt in domestic currency.

When defining cost and risk for government debt, these should be relevant for and linked to the fiscal policy objectives. While a natural the starting point for defining cost and risk for a debt portfolio is along the lines of the accounting principles applied in the government's budget, it is important that all dimensions of risks to the debt portfolio are duly taken into account. This is discussed further in the next chapter.

Further reading

- On the Determination of the Public Debt (1979), Barro, Robert J., The Journal of Political Economy, Volume 87, Issue 5, Part 1.
- Tax Smoothing with Financial Instruments (1990), Bohn, Henning, The American Economic Review, Volume 80, Number 5.
- Sound Practice in Government Debt Management (2004), Wheeler, Graeme , World Bank.

Chapter 3: Defining and measuring cost and risk

Learning objectives

- Understand the concepts of cost and risk and their importance for debt management strategy development
- To understand how changes in interest rates and exchange rates can affect the cost and size of the debt
- Understand and interpret cost and risk measures, and that these concepts should be carefully defined

3.1 Introduction

Chapter 2 discussed the theoretical framework for debt management. ALM and tax smoothing provide a context for identifying and managing cost and risk. The next step is to define cost and risk. Debt management objectives typically refer to ensuring low cost taking into account risk, i.e. a cost-risk trade-off, see chapter 2 and 9 for a discussion of debt management objectives. It is important that debt managers are clear about what exactly is captured by specific cost and risk measures so that the most appropriate measures are selected.

Market risk

Market risk is measured in terms of potential increases in debt servicing costs from changes in interest or exchange rates relative to the expected costs. An important role of the debt manager is to identify these risks, assess to the extent possible their magnitude, and develop a preferred strategy for managing the tradeoff between expected cost and risk.

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Often, cost and risk measures are focused on the budget, e.g. the effect on interest cost if there is an increase in interest rates. Measures that focus on the debt level are also useful. This is especially the case with debt portfolios with high shares of concessional debt denominated in foreign currencies. If only looking at interest cost, the impact of even a substantial depreciation of the local currency will be modest, since the (coupon) interest rates on concessional loans are low – when focusing on debt levels on the other hand, a currency depreciation will have an immediate impact.

As a general point, debt managers should not be relying on one single indicator for cost and risk respectively, but use a variety of measures to ensure that all relevant dimensions of cost and risk are captured. The choice of indicators will be country specific and may change over time.

3.2 Choice of time horizon

When developing a debt management strategy, the time horizon for the analysis of cost and risk depends on the characteristic of the primary balance, and the assets available to fund current and future interest and principal payments. If the time horizon is too short, e.g. the budget cycle, there is a risk that short-term expediency will dominate, turning the focus to short-term costs and away from (potentially very substantial) risks that could materialize later. If the time horizon is too long, the concepts of strategy, and cost and risk lose practical meaning and linkages with the current situation.

The evaluation of the cost and risks underlying the strategy should aim to capture the full economic cycle, allowing potentially higher short-term interest rates and substantive movements in the exchange rate to emerge, both of which may significantly increase the cost of debt. In practice, when debt managers analyze cost and risk they apply a medium-term horizon, typically defined as 3-5 years. Also, note that debt management objectives typically include a reference to ensuring low cost in the medium term, taking into account risk.

In line with medium term expenditure frameworks it is essential that the strategy is a medium term rolling plan, i.e. that it is updated annually, and more often if there are substantial changes to the environment for debt management.

3.3 Choice of currency in which to measure cost and risk

Cost and risk is typically measured in local currency with reference to the denomination of the government's main assets and the denomination of the government's budget. The main asset of the government is the future stream of primary balances that will be used to service the debt, see chapter 2 for a more detailed discussion of the theoretical framework for debt management, and in general, these are mainly denominated in local currency as taxes are mainly collected and expenditures made in local currency. Similarly, the currency denomination of the government's budget itself is, with very few exceptions[2], the local currency. The implication is that cost and risk on government debt is measured in local currency, and that foreign currency debt is evaluated on the basis of the value in local currency.

3.4 Measures of cost and risk

Below alternative measures of costs are discussed, and it is concluded that debt managers should be careful not to rely on one single measure, but instead identify a sufficient number to ensure a holistic view of the costs and risks to the government debt, and how these can affect the government's budget and the size of the debt.

[2] These exceptions are, for example, countries with local currency linked to a foreign currency such as the USD or Euro,

3.4.1. Nominal versus present value

Typically, the government's budget is measured in nominal (cash flow) terms, and a main concern of the Minister of Finance is the impact on the budget from changes in interest costs on the debt. From a budget perspective therefore, the focus will be on the potential volatility in the interest costs rather than volatility in the market value of the debt.

Risk on a government debt portfolio is related to the volatility in cost. This is in opposition to what is taught in finance theory. From the finance text books, it is clear that market value (or Present Value - PV) is the important concept when analyzing portfolios. This theory is founded on risk concepts as seen from the point of view of a private investor/portfolio manager. These types of economic agents are focused on maximizing the market value of their portfolio (in the case of central banks on protecting market value, i.e. keeping the value of the reserves stable).

The implication is a fundamental difference between the government debt manager and other portfolio managers. The former will focus on cost volatility while paying less attention to the market value of the portfolio, while the latter will focus on volatility in the value of the portfolio paying less attention to annual returns. In other words, short maturity securities will be considered high risk by the government debt manager as such securities can imply high volatility in interest costs, while the same type of security will be considered low risk by the 'traditional' portfolio manager, as short maturity securities protects him against losses in market value.

The implication is not that market value is without importance when managing government debt. When new debt is issued or maturing debt is rolled over, the cost of this new debt will be determined by the market value of the specific security at the time of issue, and when debt is bought back before original maturity, similarly, such transactions takes place at market value. Furthermore, when the sustainability of the debt is evaluated, the basis for this evaluation is the PV of the debt. Also, valuing the external debt is local currency is typically done at current exchange rates, i.e. a mark-to-market valuation of the nominal debt. It is therefore important that the debt manager is familiar with PV concepts and is able to calculate PV/mark-to-market for individual securities and for the portfolio as a whole. However, when it comes to cost-risk analysis as an input to debt management strategy, the PV concept is of little value. Instead, the debt manager focuses on the annual interest cost and their budget impact, as well as the nominal size of the debt.

3.4.2. Economic versus accounting cost

A measure reflecting prevailing accounting or budgetary practices is the natural starting point for defining cost, but may be inadequate. Under a cash accounting principle, capital gains and losses resulting from issuing securities at prices different from par, will only be realized as the debt matures. For long-term securities issued at deep discounts this can substantially skew the evaluation of cost, since they will appear to have very low cost until redemption. A similar problem exists for debt issued in foreign currencies, where, under cash accounting, capital gains and losses stemming from changes in the value of the foreign currency will only be realized at repayment. Under an accrual accounting principle, these issues are, at least partially, addressed, with capital gains and losses distributed over the life of the individual securities.

3.4.3. Cost measures

For budget purposes the focus is typically on absolute nominal measures, i.e., nominal interest payments at current exchange rates. While nominal measures are useful for budgeting purposes they may fail to inform the decision makers of the true cost of debt as they ignore the implications of inflation on the real cost and value of the debt, or gains and losses on debt issued at prices different from par, and gains and losses on indexed debt or debt denominated in foreign currency. Care should be taken when using average cost measures, since they can potentially hide bad outcomes in individual years, and they can be hard to meaningfully relate to the budget and GDP.

Nominal measures also do not reflect how the repayment capacity is influenced by growth in GDP or tax revenues. Consequently, it may be useful to consider the ratio of interest payments to nominal GDP or budget revenues—both effectively real measures that better capture the true burden of debt. Examples of cost measures include[3]:

- Nominal interest cost
- Interest cost adjusted for unrealized capital gains and losses
- Interest cost as a percentage of GDP
- Interest cost as a percentage of budget revenues
- Debt to GDP

[3] See Appendix III, in Developing a Medium-Term Debt Management Strategy (MTDS) – Guidance Note for Country Authorities (2009), World Bank and IMF, for more examples of cost measures.

3.4.4. Risk measures

The focus in this publication when discussing risk is market risk, i.e. what happens to cost when interest rates increase and/or the domestic currency depreciates. The definition of risk follows the definition of cost, as it can be defined as a change in one cost measure after a shock is applied, e.g. what happens to interest cost to GDP when domestic interest rates increases by X percentage points. As a supplement, risk can be evaluated using a range of risk exposure indicators for interest rate risk, foreign exchange rate risk, and refinancing risk, see chapter 4.

From a budget perspective, risk means unexpected increases in the government expenditures caused by higher debt cost. To assess market risk, the debt manager should regularly evaluate the potential impact of financial and/or economic shocks on debt payments, and should monitor these on a continuous basis. Risk is a function of the exposure of the debt (composition) and the changes in interest rates and exchange rates (market factors). The cost impact on portfolios with a low share of a specific currency will be limited, even if there is a substantial depreciation of the local currency versus that foreign currency. Similarly, the cost impact of a small depreciation of the local currency versus a foreign currency will be limited, even if the share of that foreign currency in the portfolio is substantial.
The risk exposure of the debt, e.g. the currency composition, the share of short term debt etc., is to a substantial degree controlled by the debt manager (are endogenous), while the changes in market rates are outside of the control of the debt manager (are exogenous).

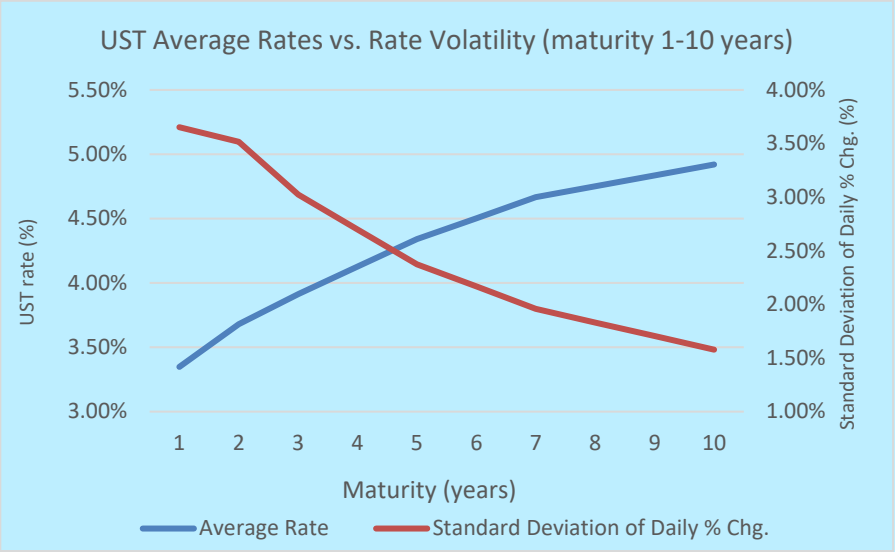
3.5 The cost-risk trade-off

Typically, low cost comes at high risk and vice versa. The two main factors that generate the cost-risk trade-off are the shape of the yield curve and the local currency risk premium. In a normal environment, the yield curve is positively sloped – short maturity interest rates are lower than long maturities. This will result in the fact that borrowing short term or floating rate debt (which is indexed to short-term rate), on average is cheaper than long-term fixed interest rate debt. The risk is generated by the higher volatility of short term rates relative to long-term rates, i.e. in some periods short-term debt can be (much) more expensive than long term debt.

Local currency borrowing typically entails a risk premium above the rate suggested by interest rate parity condition, see chapter 6, but no currency risk. This generates the trade-off between higher cost and low risk of borrowing in local currency, versus lower cost and higher risk of borrowing in foreign currency. In addition, funding in foreign currencies may be the only way to access to long maturities.

Box 7. Example: The cost-risk trade-off

The measurement of cost and risk is essential for developing a good strategy. If the average cost of the debt is used, there will be a strong bias towards short-term borrowing, since short-term interest rates on average tend to be lower than longer term rates.



The chart above shows the average yield curve for US Treasuries since 1990. If only looking at average cost, short-term rates indeed are lower than longer term rates. If the volatility of interest rates are calculated on the same dataset, and the objective of the debt manager is to reduce risk (volatility) as much as possible, there would be a preference for long-term borrowing, since that would provide the lowest risk (most stable cost).

The definition of specific cost measures will be discussed in more detail in chapter 3. While average cost is not a good cost measure (since the exposure of the government is to the actual periodic cost outcomes and not the average), the chart demonstrates that debt management is about identifying the preferred cost-risk trade-off.

3.6 Types of market risk

The two types of market risk are interest rates risk and exchange rate risk. Often, debt managers include refinancing risk under market risks, since it is closely related to interest rate risk.

3.6.1. Interest rate risk:

Refers to the vulnerability of the debt portfolio, and the cost of government debt, to higher market interest rates at the point at which the interest rate on variable rate debt and fixed rate debt that is maturing or is being re-fixed.

3.6.2. Foreign exchange rate risk:

Refers to the vulnerability of the debt portfolio, and the government's debt cost, to a depreciation of the external value of the domestic currency.

3.6.3. Refinancing risk:

Refers to the exposure of the debt portfolio to unusually high interest rates at the point of refinancing maturing debt; in the extreme event, debt managers are unable to roll over maturing obligations.

Refinancing risk is a bit more complicated since both the exposure of the debt and the risk factor are a function of the debt manager's activities. If there are very large amounts falling due on one specific day, this may lead to interest rate increases that are specific to this issuer, i.e. if the refinancing of maturing debt coincides with a general increase in interest rates, there would be an additional increase in cost for this specific country that is related to the debt maturing. The reason is that the investors may be nervous about whether the issuer is able to refinance the maturing debt at current market rates or able to refinance at all.

Box 8. Example: Other types of risk

A main focus in the context of developing a debt management strategy is on market risks, i.e. how the current and future debt portfolios are exposed to changes in interest rates and exchange rates, and how the cost and risk on the debt influences the government budget and the size of the debt.

A strong risk management framework should not be limited to market risks, but include policies for managing credit risk, liquidity risk, operational risk, etc.

Credit risk: Refers to the risk of non-performance on on-lent loans or other financial assets, or by counterparty on financial contracts.

Liquidity risk: In the context of debt management it refers to a situation where the volume of liquid assets diminishes quickly as a result of unanticipated cash flow obligations and/or a possible difficulty in raising cash through borrowing in a short period of time.

Operational risk: Refers to a range of different types of risks, including transaction errors in the various stages of executing and recording transactions; inadequacies or failures in internal controls, or in systems and services; reputation risk; legal risk; security breaches; or natural disasters that affect the debt manager's ability to pursue activities required to meet debt management objectives.

Risk exposure indicators for interest rate risk, foreign exchange rate risk, and refinancing risk are discussed in more detail in the Chapter 4.

Further reading

- Developing a Medium-Term Debt Management Strategy (MTDS) – Guidance Note for Country Authorities (2009), World Bank and IMF.

Chapter 4: Risk exposure indicators

Learning objectives

- Define and interpret risk exposure indicators for interest rate risk, foreign exchange risk, and refinancing risk
- Understand how targets for risk exposure indicators can be an effective way of expressing the debt management strategy

4.1 Introduction

Chapter 3 discussed definitions of cost and risk for strategy development, and stressed the need to have clear definitions of these concepts as well as the time horizon. From a budget perspective, market risk was defined as an unexpected increase in the government expenditures or the size of the debt caused by higher debt cost stemming from higher interest rates and/or a weaker local currency. Refinancing risk was defined as the exposure of the debt portfolio to unusually high interest rates at the point of refinancing maturing debt.

Risk on a debt portfolio is a function of the risk exposure of the debt, which is largely endogenous to the debt manager, and changes in interest rates and exchange rates, that are exogenous to the debt manager. This chapter will discuss the definition and practical application of a range of risk exposure indicators that focus on the composition of the debt, i.e. the part that is endogenous and therefore (at least partly) under the control of the debt manager.

Sound debt structures

Sound debt structures help governments reduce their exposure to interest rate, currency, refinancing, and other risks. Many governments seek to support these structures by establishing targets and ranges for key risk indicators or, where feasible, target portfolios related to the desired currency composition, duration, and maturity structure of the debt to guide borrowing activities and other debt transactions.

Revised Guidelines for Public Debt Management (2014)

4.2 Indicators for interest rate risk exposure

Interest rate risk refers to the vulnerability of the cost of the debt to higher market interest rates. The parts of the debt exposed to re-fixing are the variable interest rate debt and the fixed interest rate debt maturing.

The exposure to interest rate risk is given by the share of the total debt stock whose interest rate is reset during a particular period.

This portion includes two basic components:

(i) The fixed rate debt maturing in that particular period and that will be refinanced at unknown interest rates

(ii) All the outstanding debt contracted at variable interest rates, that will have its interest rates re-fixed during the coming period. Debt portfolios with large proportions of variable rate loans, or where most funding is raised through T-Bills or short-term securities, are more vulnerable to changes in interest rates than portfolios where most loans/securities are contracted at medium to long-term tenors and at fixed interest rates.

Box 9. Is the share of variable interest rate debt a good indicator of interest rate risk?

The share of variable interest rate debt as a percentage of total debt is an indicator that is straight-forward to calculate and interpret. But is it a good indicator? Since the indicator does not include fixed interest rate debt that matures within the relevant period, and therefore needs to be refinanced at market rates, the share of variable interest rate debt may be an incomplete indicator of interest rate risk. The reason is that not including short-term fixed interest rate debt in the calculation of interest rate risk measures can substantially underestimate the exposure to interest rate risk.

4.2.1. Share of debt with interest rate re-fixing within a specific period

This indicator measures interest rate exposure as the percentage of the total outstanding debt whose interest rate will be subject to re-fixing over the next period (typically a year). It is computed by dividing the share of debt exposed to interest rate changes within a specific period, by the total debt outstanding. As indicated above, the share of debt exposed to re-fixing is all the variable interest rate debt plus the fixed rate that matures within the period.

Ratios for exposure to re-fixing can be calculated for different time periods. For instance, if a significant portion of the government debt is contracted in T-Bills at tenors shorter than one year, debt managers may want to measure the share of debt whose interest rate re-fixes within the next 3 or 6 months, in addition to measuring the exposure on an annual basis.

Indicators for interest rate risk exposure [4]

Box 10. Indicators for interest rate risk exposure[1]

The amount of the debt stock re-fixing in a particular period t is:

$$D_t^{refix} = D_t^v + A_t^f = D_t^{v,FX} + D_t^{v,DX} + A_t^{f,DX} + A_t^{f,FX}$$

where D_t^v = $D_{t_t^v}^{v,FX} + D_{t_t^v}^{v,DX}$ = total variable rate debt; $D_{t_t^v}^{v,DX}$ = domestic currency variable rate debt; and $D_{t_t^v}^{v,FX}$ = $\sum_{j=1}^{m} e_{t,j} D_{t,j_t^v}^{v,FX}$ = foreign currency denominated variable rate debt (converted to domestic currency); $A_t^f = A_t^{f,DX} + A_t^{f,FX}$; A_t^f = principal or amortization repayments of fixed-rate debt falling due in period *t*, $A_t^{f,DX}$ = principal repayments on domestic fixed-rate debt falling due in period *t*, and $A_t^{f,FX}$ = $\sum_{j=1}^{m} \left(A_{t,j}^{f,FX} . e_{t,j} \right)$ = principal repayments on foreign currency denominated fixed-rate debt falling due in period *t*.

The share of debt with re-fixing in a particular period t:

$$d_t^{refix} = \frac{D_t^{refix}}{D_t}$$

Average time to re-fixing (ATR) is a measure of the weighted average time until all principal payments in the debt portfolio become subject to a new interest rate

$$ATR_t = \frac{\omega^f . \sum_{t=1}^{T} \left(A_t^f . t \right) + \omega^v . \sum_{s=1}^{S} \left(D_{t,s}^v . s \right)}{D_t}$$

where ATR_t = the average interest rate re-fixing period of the debt portfolio, D_t^v, D_t, A_t^f are as defined above, s = time to the next interest rate re-fixed for the variable rate debt, and ω^j, v and f, are the respective shares of variable rate debt outstanding and fixed rate principal falling due. ATR_t shows the time it takes for principal payments to be subject to a new interest rate. A low value of *ATR* suggests that the portfolio is, on average, facing a new interest rate frequently and therefore is exposed to re-fixing shocks, i.e. an increase in market rates.

4 See Appendix III in Developing a Medium-Term Debt Management Strategy (MTDS)-Guidance Note for Country Authorities (2009), World Bank and IMF.

4.2.2. Average Time to Re-fixing (ATR)

Average Time to Re-fixing (ATR) measures, how long, on average, it will take for changes in market interest rates to have effect on the whole debt, i.e. how often the interest rates on the portfolio are re-fixed. ATR is typically measured in years, and a high value of ATR indicates low risk.

Box 11. Example: Calculating the share of debt to be re-fixed and Average Time to Re-fixing

Assume that the debt portfolio as of end 2014 comprises two loans, each with 100 nominal outstanding, i.e. the total outstanding debt is 200. Loan number 1 is has fixed interest rate, and is amortizing over four years. Loan number 2 has variable interest rate, and is amortizing over four years. Assume that there is one payment per year. The table below shows the principal cash flows for the two loans.

		Principal		Timing of re-fix		
Year	Time to payment	Fixed	Var	Fixed	Var	ATR
2014	0.5	25	25	25	100	0.31
2015	1.5	25	25	25		0.19
2016	2.5	25	25	25		0.31
2017	3.5	25	25	25		0.44
		100	100	100	100	1.25

The principal cash flows in the table are outlined according to the actual timing of the payments falling due. In the columns "Timing of re-fix" the principal cash flows are organized according to the time at which the interest rate is re-fixed. For the fixed interest rate debt this is according to maturity, while for the variable rate debt it is all within the first year, since all of the variable rate debt will have its interest rate re-fixed during that first year.

The share of debt that will have its interest rates re-fixed within the first year, using the principal cash flows organized as described above is 62.5% ((25+100)/200*100).

To calculate Average Time to Re-fixing (ATR) an indicator for the timing of the re-fix is needed. The column "Time to payment" is an indicator of the timing of the principal payment within the year, measured from the starting day of the analysis. In the table it is assumed that payments take place in the middle of the year, i.e. t = 0.5 years for the first year (the length of time from the end of 2014 to the middle of 2014). For the second year t= 1.5 (the length of time from the end of 2014 to the middle of 2016), etc. For the first year that calculation is ((25+100)/200*0.5), for the second year ((25+25)/200*1.5) etc., to give 1.25 years, i.e. on average, the portfolio will have its interest rate re-fixed in 1.25 years.

4.3 Indicators for foreign exchange rate risk

Foreign exchange rate risk (FX risk) is related to the vulnerability of the debt portfolio, and to the interest cost, to a depreciation/devaluation in the external value of the domestic currency.

Commonly used FX risk exposure indictors are the share of external debt[5] , i.e. debt denominated or linked to foreign currencies, as a percentage of total debt, and the currency composition of the external debt. Sometimes the latter is supplemented with measures on the degree of mismatch between the currency composition of the debt and the currency composition of the main financial assets, e.g. the foreign currency reserves or the composition of government inflows in foreign currencies.

Box 12. What about duration as a measure of risk measure for government debt?

Duration is a risk measure developed for fixed-income securities, and was introduced as a risk exposure measure by government debt managers in OECD countries in the late 1980's. The calculation of duration is based on the complete cash flows, i.e. both principal and interest, and applies present values to these cash flows.

When calculating duration, the portfolio is split into variable rate and fixed rate loans (in line with the calculation of the share of debt with re-fixing within a specific period, and ATR):

Variable interest rate securities: Duration is defined as the time until the next interest rate re-fixing. It is typically assumed that the duration of variable interest rate loans is equal to half of the length of the interest period (for a loan with annual payments, duration for variable interest rate debt is equal to 0.5 years).

Fixed interest rate securities: The average time to maturity of the cash flows discounted to present value:

$$Dur_f = \sum_{t=1}^{n} \frac{(t * CF_t)/(1+i)^t}{\sum_{\tau=1}^{n} CF_t/(1+i)^t}$$

,

where *CF* is the cash flow, *t* is the time indicator, and *i* is the discount interest rate.
Duration for the total portfolio is then weighed average of the fixed and variable rate portfolios:

$Dur = \omega_f Dur_f + \omega_v Dur_v$, where ω is the portfolio share of fixed and variable rate debt.

While the calculation of duration for a debt portfolio is straight-forward, the interpretation is not. For an asset portfolio – for which duration was originally developed – duration indicates the loss

[5] The definition of external debt applied here is the currency denomination. Alternative definitions are according to the domicile of the investors (for balance of payments purposes) and according to the legal jurisdiction of the instruments of the portfolio.

in market value when interest rates increase. This interpretation is less useful for a government debt portfolio where risk is related to the variation on interest cost rather than variations in market value, see chapter 3. Debt managers have "solved" this problem by interpreting duration as a measure of the length of the period in which interest rates are fixed, i.e. in line with ATR.

A main challenge with using duration as a risk exposure indicator is the choice of discount interest rate for calculating present value. The textbook definition is that the discount interest rate is equal to the current market rate. An implication of this is that the duration of the portfolio will change when interest rates change, i.e. even if the debt manager has not taken any active decisions. If a duration target is applied and market interest rates increase, duration will fall. If the debt manager now wants to return to the value of duration before the interest rate increase, he will have to issue longer-term debt, at a time where interest rates have just increased. Some debt managers have addressed this challenge by using a fixed discount rate – note that when the discount interest rate is zero, duration becomes equal to ATR except that the former is calculated on the basis of the total cash flows and rather than principal payments.

There appears to be a trend in moving away from using duration as a risk exposure indicator and instead use a combination of targets form interest rate risk and refinancing risk, that have the advantage of being simpler to calculate and interpret.

While duration is less useful as a risk exposure measure for the government debt, it should be noted that duration and other market value based indicators are essential when issuing securities in the market, understanding market preferences for specific instruments, and in communications with market participants.

Indicators for interest rate risk and refinancing risk can are typically calculated on a sub-portfolio basis in addition to the whole portfolio. A reason for this is that he FX portfolio often is quite different in structure, being longer term and/or on concessional terms, compared to domestic debt. In addition, it can be argued that there are refinancing risks that are specifically related to debt in foreign currencies in the sense that there may be a premium, i.e. a sovereign risk premium, to refinancing FX debt that is specifically related to the fact that the debt is denominated in foreign currency. The reason is that investors may be worried that the country will have difficulties generating earnings in foreign currency to fund interest and principal payments.

Box 13. Calculating risk exposure indicators on the basis of principal or total cash flows?

The basis for calculating risk exposure indicators is cash flows, i.e. the future payments organized according to their timing. Most commonly, the risk exposure indicators are calculated on the basis of the principal cash flows only. Reasons for this include simplicity, but more importantly, that the absolute value of an indicator is less important than how the specific indicator develop over time.

Some countries, e.g. Brazil, base the calculation of risk exposure indicators on both principal and interest cash flows, to take into account the fact that the debt is relatively short term and interest payments are high. It can be argued that including interest cash flows gives a more accurate calculation of indicators.

In practice that debt manager has to make a choice. Whether the indicators are calculated on the basis of principal or total cash flows is not important, since the focus is how the indicator develop over time rather than its nominal value.

4.4 Indicators for refinancing risk

Refinancing or rollover risk is referred to as the risk that the debt will have to be rolled over at an unusually high cost, or, in extreme cases, cannot be rolled over at all. Refinancing risk is present when liabilities fall due and need to be refinanced.

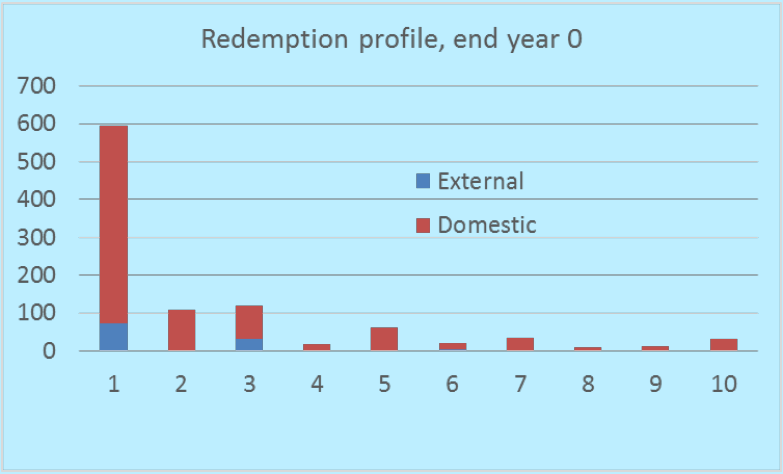
At that point, a refinancing shock can have two outcomes:

(i) An increase in interest rates that are higher than a general increase in market interest rates that the issuer has to accept to accommodate the refinancing
(ii) The government is unable to refinance debt maturing debt, and therefore has to default.

Refinancing risk is in many aspects similar to interest rate risk since it focuses on the effect of an interest rate increase. Nonetheless the two risks can be differentiated based on the causes triggering the movement in market rates. Refinancing risk is related to interest rate changes caused by the excessive volume of government securities maturing relative to demand, i.e. it can materialize without a general increase in interest rates, whereas interest rate risk refers to an increase in interest rates that is general in the market.

Box 14. Indicators for refinancing risk

The redemption profile of the outstanding debt, i.e. the periodic principal payments, is a very powerful indicator if refinancing risk. A concentration of repayments the first periods will indicate high refinancing risk.



The share of debt falling due within a specific period as a share of the outstanding debt will indicate the concentration of the redemptions in the first period. A high share will indicate high refinancing risk.

Average Time to Maturity (ATM) measures the weighted average time to maturity of all the principal payments in the debt portfolio. It is computed as:

$$ATM_t = \frac{\sum_{t=1}^{T}(A_t \cdot t)}{\sum_{t=1}^{T} A_t}$$

where ATM_t = the average time to maturity of debt portfolio, A_t = t^{th} period principal payment in the portfolio. ATM_t shows how long it takes on average to refinance the debt portfolio. A low value of this indicator suggests that the portfolio is being rolled over frequently and therefore is exposed to refinancing shocks.

While conceptually refinancing risk and interest rate risk can be separated, in practice the two can occur simultaneously. For instance, at maturity, all government debt that needs to be rolled over is exposed both to refinancing and interest rate risk: refinancing risk is always accompanied by interest rate risk. The opposite is not always the case. Variable interest rate securities are exposed to changes in interest rates every time the interest rate (coupon) is re-fixed, but they are not exposed to refinancing risk before they reach maturity. In fact, debt managers who are not able to issue long-term fixed interest rate debt, often use long-term variable rate bonds to reduce the exposure to refinancing shocks while accepting a level of interest rate risk that is similar to issuing short-term securities.

Box 15. Example: Calculation of the share of debt maturing and Average Time to Maturity (ATM)

Assume that the debt portfolio as of end 2014 comprise two loans, each with 100 nominal outstanding. Loan number 1 is has fixed interest rate, and is amortizing of four years. Loan number 2 has variable interest rate, and is amortizing over four years. Assume that there is one payment per year. Note that these assumptions are identical to the ones used in the example above of calculating ATR. Compared to the ATR example the cash flows are organized according to the time of maturity instead of time of the interest rate re-fix.

Year	Time to payment	Timing of maturity Fixed	Var	ATM
2014	0.5	25	25	0.13
2015	1.5	25	25	0.38
2016	2.5	25	25	0.63
2017	3.5	25	25	0.88
		100	100	2.00

The share of debt that will mature within the first year, using the principal cash flows organized according to maturity is 25% ((25+25)/200*100).

To calculate Average Time to Maturity (ATM) an indicator of the timing of the refinancing is needed. As for ATR it is assumed that payments take place in the middle of the year, i.e. t = 0.5 years for the first year, t = 1.5 for the second year etc. In the example ATM is 2.0 years, i.e. on average, the debt will mature in two years. The higher the value of ATM, the lower the risk.

4.5 Why are risk exposure indicators useful?

Risk exposure indicators are used to describe and communicate the risk characteristics of the existing debt. In addition, these same indicators can be used to describe future debt structures simulated in a deterministic or stochastic cost-risk model, see chapter 6. Since scenario analysis allows the identification of the preferred debt composition through its cash flows, risk exposure indicators can be calculated based on those cash flows and used as strategic targets, i.e. to describe the characteristics of a preferred debt composition. Targets or ranges for risk exposure indicators greatly facilitates reporting and accountability.

The chosen combination of risk and cost, articulated through a particular debt management strategy, depends on the risk appetite of the government, and strategic targets will therefore be unique to each country. They reflect the government's preference for risk, which is in turn determined by the overall objectives and the constraints facing the debt manager. Uniqueness means that there is no common threshold for risk indicators, i.e., there is no a priori level for a risk indicator, which, if it exceeded, is a sign that the debt is risky. The country specific target levels depend on a range of other issues, including the level and composition of the existing debt and the economy's vulnerability to shocks.

Using strategic targets requires that some degrees of freedom are available to the debt manager, i.e. instruments should be available that allows reaching the targets at a cost that are reasonable and in line with expectations. In case the debt manager is constrained, as is the case for most low income countries (LICs), softer targets, i.e. targets expressed as a preferred direction for risk exposure indicators may be more useful than specific targets. For example, in a LIC, access to long-term domestic funding may be limited and volumes uncertain. In such cases a guidelines expressing a preference for lengthening the average maturity of the domestic debt may be more useful than a specific target for ATM. To give some leeway to the debt manager, target indicators are typically expressed as ranges or directional targets rather than a specific number.

Strategic targets are forward-looking, helps express the preferred debt management strategy, and provide guidance for debt management activities. It is essential that they are updated on a regular basis, i.e. when the medium term debt management strategy is updated.

It is common to use a set of risk exposure indicators to describe the existing and preferred debt composition, to ensure that all types of market risks, i.e. interest rate risk, foreign exchange rate risk, and refinancing risk, are covered.

Box 16. Example: Risk exposure indicators as strategic targets

Romania (2015) – targets include:

Currency risk: Share of local currency debt should be 40-55 percent, and the share of EUR denominated debt 80-95 percent of total external debt.

Interest rate risk: The share of debt with interest rate re-fixing within 1 year should be 15-25 percent, and Average Time to Re-fixing 4.5-6.5 years.

Refinancing risk Debt maturing in 1 year in the range of 15-25 percent, and Average Time to Maturity 5-7 years.

Poland (2014)

Currency risk: The target for FX debt as a share of total debt is less than 30 percent. The effective share of euro debt should be at least 70 percent with possible temporary deviations in case of limited access to euro market.

Interest rate risk: Average Time to Re-fixing for domestic debt 2.8-3.8 years

Refinancing risk: Aiming at an even distribution of repayments, and an Average Time to Maturity of more than 4.5 years.

It is key that strategic targets take into account what is under the control of the debt manager. The risk exposure indicators discussed above all fulfil this requirement. An example of a strategic target that is not appropriate is a limit for the annual cost of the debt, either in nominal terms or as a percentage of revenues or GDP. The debt manager is not controlling the cost of the debt, that will vary according the changes in interest rates and exchange rates, nor does he control revenues or GDP. While such a cost-based target indicator may appear useful and easy to communicate and understand, the debt manager cannot reasonably be held responsible for meeting it.

Further reading

- Developing a Medium-Term Debt Management Strategy (MTDS) – Guidance Note for Country Authorities (2009), World Bank and IMF.
- Revised Guidelines for Public Debt Management (2014), World Bank and IMF

Chapter 5: Quantitative analysis of cost and risk – scenario analysis

Learning objectives

- Understand the use of models in analyzing cost and risk, and how models can provide an analytical foundation for the medium term debt management strategy; and understand the limitations of scenario analysis
- Understand how scenario analysis can support the identification of the preferred cost-risk trade-offs- but does not identify an optimal debt composition
- Understand how quantitative analysis is needed to identify targets for risk exposure indicators

5.1 Introduction

As discussed in chapter 4, risk on government debt is related to the future development in market rates, i.e. as debt matures and as the interest rates on variable rate debt is re-fixed, the government is exposed to changes in interest rates and exchange rates, since both new borrowing and refinancing of maturing debt takes place at market rates. These rates will only be known at the time of borrowing. Furthermore, changes in foreign exchange rates will affect the funding need and the nominal value of the outstanding debt in local currency. The result is that the government's budget – via payments on the government debt – and the balance sheet of the government is exposed to changes in market rates. In addition, the debt is exposed to refinancing risk, i.e. debt that matures and have to be refinanced by issuing new debt.

Stress tests

To assess risk, debt managers should regularly conduct stress tests of the debt portfolio on the basis of the economic and financial shocks to which the government—and the country more generally—are potentially exposed. This assessment is often conducted using financial models ranging from simple scenario-based models, to more complex models involving highly sophisticated statistical and simulation techniques.

Revised Guidelines for Public Debt Management (2014)

A model is a simplified description of a complex reality, and models should only contain elements that are needed to answer specific questions. The implication is that the first and essential step in building and using models is to carefully think about the problem that you are trying to solve. In the case of a debt management strategy development the primary objectives are to ensure timely funding and to

minimize cost in the medium to long term, taking into account risk, i.e. a precise definition of the concepts of cost and risk is needed, to enable the debt manager to identify the preferred cost-risk trade-off.

Even though very simple in nature and easy to construct and run, a scenario model is a very powerful tool, as it allows the debt manager to quantify risks, and it facilitates a deeper understanding of the potential cost-risk trade-offs, and the identification of target levels for specific risk exposure indicators, see chapter 4. Having said that, a market risk model is not a precondition for developing a debt management strategy – there are examples of good debt management strategies that was developed without the support of models.[6]

5.2 Models in government debt management

Debt managers use a variety of analytical tools. These include tools focused on developing next quarter's borrowing plan, tools that can support the preparation of input to next year's budget, tools that calculate risk exposure indicators on a monthly basis etc. The focus in this chapter is on models that can support the debt manager develop a medium term debt management strategy.

Models used for strategy development are typically scenario models, where future market rates and new borrowing is simulated. A distinction is made between deterministic models, which are the focus in this chapter, and stochastic models[7] . The latter type can be further classified into models where macro variables are assumed to be exogenous to the model, or where the macro- and market variables are modeled jointly.

A scenario analysis model allows the debt manager to analyze the existing debt management strategy under different scenarios for future market rates, including shock scenarios, and to compare alternative strategies under different scenarios for interest rates and exchange rates. A scenario analysis model also makes it possible to test whether a specific strategy is consistent with the overall objectives for debt management in the longer term, i.e. to analyze how robust the strategy is, and to provide information on how long it could take to reach the desired debt structure, taking into account constraints. Finally, models allow the debt manager to quantify the costs and risks of pursuing domestic market development strategies that typically include longer term – and higher cost – securities.

[6] How Strategically is Public Debt Being Managed Around the Globe? A Survey on Public Debt Management Strategies (2015), Rodrigo Cabral, World Bank Group.

[7] In a deterministic model a limited number of scenarios for future market rates, e.g. 3-5, are defined by the user. In a stochastic model, a model is used to generate a high number of scenarios for future market rates, e.g. 10,000 or more, allowing the generation of probability distributions.

When using scenario models, the aim is to get the direction and approximate size of costs and risks right, rather than estimating or forecasting precise cost and risk figures. This is important to keep in mind when constructing a model – simplifying assumptions have to be made.

One word of caution when using models is related to the fact that the output will never be any better than the input. If unrealistic and overly optimistic market scenarios are used in the analysis of the cost and risk of alternative borrowing strategies, the output will be misleading and could lead to costly borrowing-decisions.

Box 17. How does a scenario model work?

The starting point for scenario analysis is basic budget arithmetic, see chapter 2. For a given year, the funding need of the government can be calculated as:

Revenues

- Expenditures

= Primary balance

- Interest charges on outstanding debt)

= Budget balance (or fiscal balance)

- Principal payments on outstanding debt

= Funding need

The primary balance, i.e. the net of revenues and expenditures before interest payments, is determined by fiscal policy, while the interest exposure – therefore the cost on outstanding debt – is to a large extent a result of debt management decisions. Some debt managers in low income countries are so constrained in their financial choices that they have limited influence on the structure of the debt. However, even in these cases, costs will still directly affect the budget balance, and should therefore be measured and monitored. From the equation above it is clear that high levels of debt and/or risky debt structures can have substantial impact on the overall budget balance, and therefore on funds available for social spending, education etc. Since budget targets are typically formulated for the overall budget balance, the implication is that the risk exposure of the debt is important for fiscal policy planning.

Adding the debt maturing in a specific year to the budget balance gives the annual funding need, i.e. how much does the government need to borrow in domestic and foreign currencies during the year. In a scenario model the primary balance is typically taken as exogenously given, while the funding need is calculated in the model. This is necessary, as the future borrowing activities will affect interest cost and the amount of debt maturing in a given year, and therefore how much the government needs to borrow in future years.

5.3 Undertaking scenario analysis

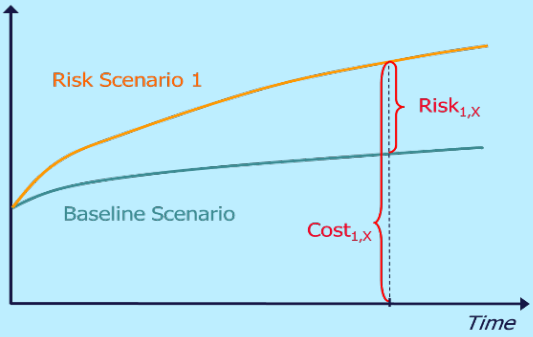
5.3.1. Definition of cost and risk

While the structure of the model is very simple, important pieces of groundwork need to be done before commencing with risk analysis. First of all, cost and risk need to be defined clearly.[8] It is recommended to use several cost (and risk) indicators to ensure that risks to both the budget and the size of the debt are captured.

5.3.2. Scope for the analysis and debt data

Box 18. Measuring risk

Risk is associated with the potential for the cost to deviate from its expected outcome. In the modeling context, risk is the difference between cost under a shock scenario and the cost under the baseline scenario. The definition of risk will therefore follow from the definition of cost.



In the chart above, the baseline scenario provides the expected annual cost. The annual cost under risk scenario 1 is calculated for the same borrowing strategy, but with higher expected interest rates and/or a depreciation of the local currency. The difference of cost under the risk scenario and the base scenario for a specific year, is defined as risk.

The next step is to define the scope for the analysis, i.e. what types of debt are included. Typically, the starting point is direct domestic and external central government debt, but may be broader and include local government debt, and types of explicit contingent debt.

[8] See chapter 3 for a more detailed discussion of cost and risk.

The existing debt is transformed into cash flows, i.e., regular payments/costs of interest and principal[9] . Often the portfolio consists of hundreds or thousands of loans, some of which can be quite complicated structures, and simplifying assumptions need to be made. For example, if there are 200 outstanding loans in US Dollars with variable interest rate with different base rates, and with different spreads to the base rate, a simplifying assumption would be to assume that all the 200 loans have US Dollar 6 month Libor as the base interest rate, and calculate a weighted average spread. This would collapse the 200 loans into two cash flows – one for interest and principal payments respectively. Similarly, if there is outstanding debt in 10 different currencies, some of these could either be ignored in the analysis (if the outstanding amount is very small, and/or if no future borrowing is planned in that currency), or if there is strong correlation to one of the major currencies it can be assumed that new borrowing will take place in that major currency. Such assumptions will simplify the problem of analyzing the cost and risk of the debt but at the same time ensure that the size and direction of the risks will be appropriate.

5.3.3. Time horizon and granularity

Often a time horizon between 3 and 10 years is used in cash flow simulations. The reason for the specific choice of horizon is somewhat arbitrary, and modeling-wise there are no limits regarding the choice of time horizon. The choice of a specific time horizon is not straightforward. For instance, without having access to financial derivatives, changing the risk structure of a government debt portfolio often is a process spanning several years. Therefore, the time horizon chosen should not be too short. On the other hand, and especially for developing countries, the existing debt structure can be far from "optimal" and the country may face strong constraints, implying that the main focus of the analysis is relatively short, for example 3 years rather than 10 years. It is important that the time horizon exceeds the budget year, and is aligned to the time horizon for the medium-term debt management strategy.

When constructing a model, the choice of the length of time periods, or granularity, is important. To avoid circularity, it is generally assumed that no securities have payments of interest and principal in the period where the security is issued. Working with monthly or quarterly data allows a high degree of precision. From a practical perspective, a starting point for the choice of granularity can be the length of the shortest instruments being used, i.e. quarterly if the shortest instrument is a 3-month T-bill. The downside is that the amount of data needed to be handled increases with the shortening of the length of the time periods.

Since the focus is medium to long-term, and since the budget is on an annual basis, the choice is often to work with annual data. This means that all short-term instruments are modeled as having 1-year remaining maturity at issuance. While this implies loss of detail, in practice, and unless the share of short-term debt is very high, operating with 1-year time-periods works well.

[9] Note that the cash flows are the basis for calculating risk exposure indicators, see chapter 4.

5.4. The structure of a simple scenario analysis model

5.4.1. Model inputs

There are four sets of inputs to the scenario model: i) future annual primary budget balances of the government; ii) future payments of interest and principal on existing debt (cash flows); iii) future borrowing strategies; and iv) assumptions about future market rates (interest rates and exchange rates) – both a baseline and risk scenarios.

5.4.2. Cash flow simulation

Taking the payments of interest and principal payments on outstanding debt, and the primary balance for each period, the gross funding need, i.e., the amount the government has to borrow in the coming period (a quarter, a year or other time-periods), can be calculated. The funding need is then covered according to the borrowing strategy specified. For the coming periods the same procedure is used.

5.4.3. Output: Cash flows on the basis of which cost and risk indicators are calculated

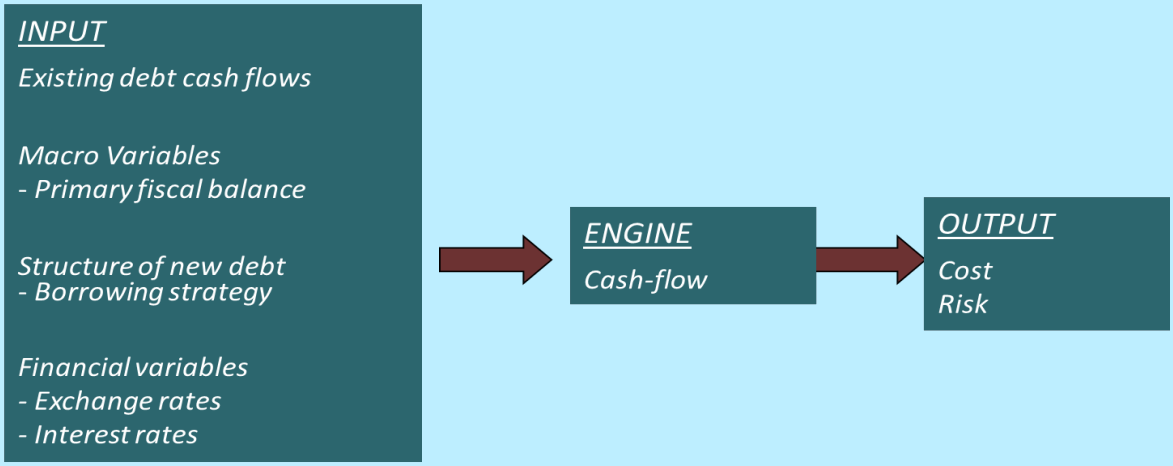
Using the baseline assumptions for future interest rates and exchange rate, see chapter 6 for further discussion of baseline and risk scenarios, the expected cost can be calculated. For any specific period in time, the cost under a risk scenario can be compared with the baseline scenario. A risk scenario will typically be a scenario with either higher interest rates for a specific period of time, changes in the shape of the yield curve, and/or scenarios where the domestic currency depreciates vis-a-vis one or more foreign currencies. The difference in cost between the risk scenario and the baseline at a specific point in time will provide a measure of risk. Note that this procedure can be applied no matter what definition of cost is used. If a 10-year time horizon and annual time steps are used, the debt manager will have cost and risk information for each borrowing strategy for the end of each year for all 10 years (complete cash flows of interest and principal payments). In practice, debt managers overcome the potential problem of overload of information by focusing on 2-3 specific years, e.g. year 2, 5 and 10, to capture the short-, medium- and long-term effects. Total or average cost measures (including PV of future costs) should be avoided since they potentially hide volatility in cost and risk between years.

Furthermore, for each period risk exposure indicators for interest rate risk, refinancing risk and exchange rate risk can be calculated on the basis of the simulated cash flows. Such risk exposure indicators can facilitate the analysis of the risk to the existing strategy as well as alternative debt management strategies, and can be used to define target levels for specific indicators, see chapter 4.

5.4.4. How many strategies and risk scenarios should be examined?

A practical problem is choosing the number of strategies and risk scenarios to analyze. Initially, the debt manager will typically focus the analysis on the existing borrowing strategy to analyze how costs and risks are affected under different scenarios for future interest rates and exchange rates. Internally, the group responsible for risk analysis will run the model under perhaps 10 or 15 different market scenarios, including stress scenarios, i.e., scenarios where market rates move very strongly against the government (worst case scenarios), to get an idea of the effects on cost and risk under severe market movements.

Box 19. The structure of a scenario analysis model



***Existing debt cash flows*:** Future payments on existing debt are generated by mapping interest and principal cash flows according to the time of their payment. The main source is the information in debt recording system.

***Macro variables*:** The future primary balances are very important for the results of the model. For the first period the funding need will be given by the primary balance and the interest and principal payments on the existing debt, but gradually the assumptions applied for future borrowing will determine the periodic funding need. A simplifying assumption is to assume that there is no linkage between the size of the primary balance and the interest-rate level, i.e., the primary balance is an exogenous variable. It is preferable to use publicized and official data provided by the budget or planning department of the Ministry of Finance, e.g. the Medium Term Expenditure Framework or the Debt Sustainability Analysis. This is because it is outside the expertise of the debt manager to forecast government revenues and expenditures.

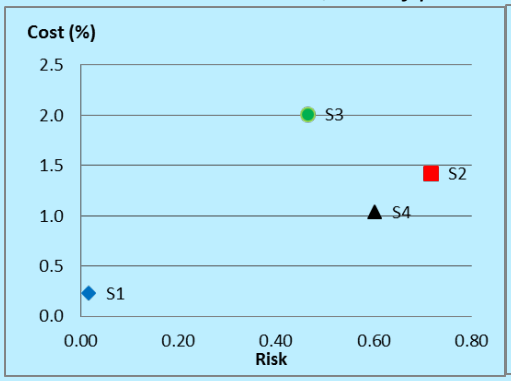
***Structure of new debt*:** The borrowing strategy will determine the structure of the new debt. A borrowing strategy can be described by a percentage distribution between domestic and foreign borrowing, and, as the next step, a percentage distribution on the individual instruments specified for domestic and foreign borrowing respectively.

***Financial variables*:** Assumptions about future market rates – interest rates and exchange rates – are essential for the simulations. Often, current yield curves and exchange rates are applied for the baseline, see Chapter 6 for a more detailed discussion of the assumptions regarding future interest rates and exchange rates. The purpose of defining a baseline is to have a reference point when evaluating the costs and risks to the debt portfolio under alternative market scenarios, i.e., risk scenarios.

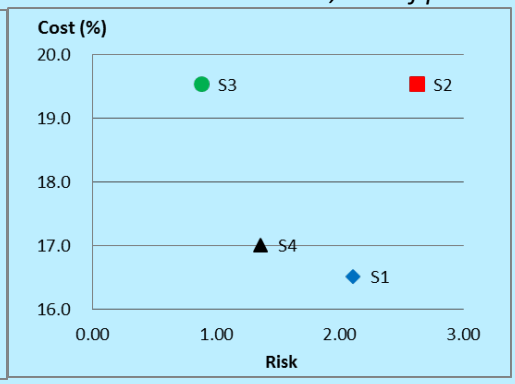
Box 20. Example of model output

The main output from scenario analysis are future cash flow at the end of each period. For the first period (the first year of the analysis), the cash flows are given by the existing debt. For following years, they will be a combination of the debt that existed at the beginning of the analysis and the new debt generated. The cash flows of the new debt will depend on that assumptions about borrowing strategies and market rates.

Interest to GDP, end of period



Debt to GDP, end of period



The charts above show stylized output from analyzing four borrowing strategies over a 5-year time-horizon under four alternative risk scenarios for market interest rates and exchange rates. The risk shown in the charts is the maximum deviation from the expected cost for each strategy. The illustrative strategies are extreme strategies where only one instrument is issued under each strategy. For strategy S1 the instrument is long-term external on concessional terms, S2 short - term external, S3 long-term domestic, and S4 short-term domestic.

The debt management objectives of minimizing cost taking into account risk means that the debt manager wants to be as close to the South-West corner in the charts. For interest to GDP, S1 is dominating, i.e. it has both the lowest cost and the lowest risk. When looking at debt to GDP identifying the best performing strategy is less straight-forward. S3 has the lowest risk, but substantially higher cost than S1 and S4, and while S4 has slightly higher cost than S1, the risk is lower. When using debt to GDP as the indicator S4 appears to be the most favorable. When taking into account both cost measures, S1 would seem to be the preferred one. However, in practice this strategy may not be implementable if the access to external concessional funding is limited, and even if such funding was available, an objective of supporting government securities market development might lead the debt manager to choose a strategy that neither dominates from a cost nor a risk perspective.

As mentioned, the main output from scenario analysis are cash flows, and in addition to the information in the charts above additional cost and risk measures can be calculated as can a whole range of risk exposure indicators.

The next step, analyzing alternative borrowing strategies under different market scenarios follows a similar pattern, i.e. borrowing strategies are analyzed under the same scenarios for market rates as described above.

A limited number of strategies and scenarios will then be presented to management as input for discussions on the preferred cost-risk trade off. Management would typically be presented with 3-4 different borrowing strategies under 3-4 different market scenarios plus a stress scenario.

Box 21. The MTDS Analytical Tool

The Analytical Tool (AT) is part of the MTDS Toolkit developed by the World Bank and the IMF, and allows quantitative analysis of alternative borrowing strategies. The AT is a spreadsheet-based application that allows projecting cash flows as a function of: (i) existing debt; (ii) macroeconomic assumptions, i.e. the primary balance; (iii) new borrowing strategies; and (iv) financial variables, including interest rates and exchange rates. The tool simulates different cash flows under various scenarios. The output is a quantification of the costs and risks associated with a particular debt management strategy.

The AT facilitates the quantification of costs and risks for each strategy under consideration. By illustrating the consequences of following a particular strategy under various scenarios for macroeconomic and market variables, it gives insight into the key vulnerabilities embedded in the specific strategy under consideration. The output, generated by the AT is a number of cost and risk indicators, for example annual interest payment-to-GDP and the nominal stock of debt-to-GDP. Risk is measured in terms of the increase in cost, given a particular macro and market scenario, relative to the baseline. The AT includes different cost and risk indicators, and allows countries to focus on those measures most relevant for their needs.

The AT has been designed to show the details of all cash flow calculations at every step of the process. Intermediate cash flows as well as Excel functions are explicitly shown at every stage, allowing the user to track the assumptions underlying the analysis. Thus, the AT is not only useful for the quantitative analysis underlying a debt management strategy, but also a device for building capacity in the debt office. Finally, once the desired debt management strategy is implemented, the AT can be used to measure adherence to the strategy, and reevaluate the cost-risk alternatives should there be a change in market conditions or the authority's risk preference.

The MTDS AT can be downloaded at *www.worldbank.org/en/topic/debt/brief/mtds*

5.5. Off-the-shelf, or in-house developed model?

An essential input to model building is people, i.e. staff that is given time and resources to develop models. Based on country experiences, working with risk models is time consuming, a trial and error process that often is frustrating, and implies substantial key-person risk. This explains why many debt managers are tempted to find off-the-shelf models.

However, the supply of such models[10] is very limited, and tends to be quite inflexible and complicated to operate. More importantly, off-the-shelf models often contain elements of "black boxes", where the debt manager is not sure how exactly calculations are performed. When speaking about very simple scenario models this may seem to be a minor problem, but experience clearly show that an important, perhaps the most important, outputs from in-house developed models, are the insights into the sensitivities of the costs and risks to the government debt under different developments of market rates, and understanding of the mechanics of bonds and cash flows that the debt management staff is acquiring during the process of building a model. Furthermore, in-house development implies that the model can be tailor-made to specific country-circumstances and can be further developed, along with the development of capacity in the debt management unit.

[10] For example, the Medium Term Debt Management Strategy (MTDS) Analytical Tool.

Box 22. Deterministic scenario analysis vs. stochastic modeling

In the Revised Guidelines for Public Debt Management it says that: "Complex simulations models should be used with caution. Data constraints may significantly impair the usefulness of the models, and the results obtained may be strongly model-dependent and sensitive to the parameters used. For example, some parameters may behave differently in extreme situations or be influenced by policy responses."

A simple scenario model can be further expanded into a stochastic model, where a given borrowing strategy is analyzed under hundreds or thousands of different market scenarios. This allows for the generation of probability distributions, i.e., answering the question "What is the Cost-at-Risk, or what is the maximum cost on the debt in year x with a probability of 95%?" The methodology and basic ideas behind Cost-at-Risk are very similar to the Value-at-Risk methodology widely applied by asset managers. A main difference is that Cost-at-Risk focuses on volatility in costs, whereas Value-at-Risk focuses on volatility in the market value of a portfolio. Furthermore, Value-at-Risk typically applies a very short time horizon (less than one month), where Cost-at-Risk applies a long time horizon (e.g. 5 years).

For CaR-calculations, the availability of high-quality historical data for market rates is a requirement, as these will provide the input to the models generating future market scenarios. In many developing countries, this type of historical data is not available.

On the use of deterministic and stochastic models, Balibek (2012) notes that "Given their pros and cons, deterministic and stochastic techniques are not necessarily substitutes for each other, nor should simulation be interpreted as a required further step in debt strategy modeling. These approaches are similar in essence, with differences in structural forms, and both can provide useful input for decision makers. The choice between methods should be based on available resources, the degree of detail needed for analysis, and other country-specific circumstances. It is also possible to employ deterministic and stochastic models as complementary tools."

In practice, deterministic scenario models are typically constructed in spreadsheets. On the one hand spreadsheets are perfect for risk modeling, as these are very flexible, and facilitates a trial-and-error process that is often characteristic of model building. Also, building a model in a spreadsheet ensures that debt offices with basic IT-capacity can perform this work. On the other hand, the flexibility can also be a downside, as the model structure easily gets messy and difficult for newcomers to understand and work with, and operational risks can be substantial. One way of addressing this problem is for management to require precise descriptions of how the model works, and clear and written procedures for the application of the model.

Box 23. An optimal debt portfolio composition?

Often, at the initial stages of model development, the ambition is to construct a model that can identify the optimal debt composition. In finance theory, portfolios on the efficient frontier can be defined as optimal, and in theory, the same could be applied to the debt portfolio, taking into account the different definition of risk applied, see chapter 3. Identification of the optimal debt composition would require that we are able to identify an optimal model for generating interest rates and exchanges rates over the 3-10 horizon. Country examples demonstrate that different models for market rates can provide substantially different results, even of the model-parameters are estimated in the same historical data. Furthermore, the model may not fully account for the benefits of some strategies where these have a strong focus on market development.

As a theoretical concept, the efficient frontier can be useful when analyzing potential debt management strategies. In practice, a more modest approach, where the aim is to identify good and robust strategies is recommended.

5.6. How are scenario models used in practice?

Models are increasingly applied by public debt managers to facilitate decisions on the preferred cost-risk trade-off that is at the center of debt management. However, experiences applying models in debt management are still limited, and while there seem to be general agreement that models can provide important input for decision-making, there is also some reluctance to relying too strongly on model-outputs. This is partly due to the fact that it is very difficult to predict what will happen to interest and exchange rates in the future, especially when forecasts are needed for 3 years or more, and partly due to unfamiliarity with risk models among decision makers.

International experience suggests that simple scenario models can be extremely useful in presenting the cost-risk trade off to decision makers, and facilitate more informed choices. This is mainly due to the ability to compare different borrowing strategies under different scenarios for future market rates, and directly relate the cost and risk to the government's budget. At the same time, it should be clear that models will not identify the optimal strategy, but rather support sound judgment by the debt manager in providing a more solid basis for identifying the preferred strategy.

Further reading

- Advances in Risk Management of Government Debt (2005), OECD.
- Balibek, Emre, and Hamdi Alper Memis: Turkish Treasury Simulation Model for Debt Strategy Analysis (2012), World Bank Policy Research Working Paper 6091.
- Bolder, David J.: Towards a More Complete Debt Strategy Simulation Framework (2002), Bank of Canada Working paper 2002-13.
- Holmlund, Anders and Lars Risbjerg: Analytical Framework for Debt and Risk Management (2005), in OECD: Advances in Risk Management of Government Debts.
- Developing a Medium Term Debt Management Strategy (MTDS) – Guidance Note for Country Authorities (2009), World Bank and IMF.

Chapter 6: Baseline and risk scenarios for market variables

Learning objectives

- Understand the importance of well-defined baseline and risk scenarios for interest rates and exchange rates
- Recognize the importance of building a storyline around baseline and risk scenarios, to ensure that there is theoretical and/or historical backing for the scenarios chosen
- Understand alternative approaches to defining baseline and risk scenarios for future interest rates and exchange rates

6.1 Introduction

The government debt portfolio is exposed to future changes in interest rates and exchange rates. At the time a borrowing decision is taken (and at the time of undertaking scenario analysis), these market rates are unknown.

Chapter 5 focused on quantitative analysis of cost and risk using a deterministic scenario model. The modeling of future costs and risks is based on cash flows from the existing debt, assumptions about the primary balance of the government, borrowing strategies, and future interest rates and exchange rates. The latter are key inputs to scenario analysis. This chapter will discuss approaches and examples on how to define scenarios for future market rates, both baseline and risk scenarios.

Trade-offs between strategies

The trade-offs between different debt management strategies can be evaluated using the expected financial cost and volatility under a wide range of possible economic and financial scenarios.

Revised Guidelines for Public Debt Management (2014)

6.2 Why do we need to make assumptions about future market rates?

Since future debt servicing costs to a large extend depend on the interest and exchange rates projected, the design of these future market scenarios is critical for the evaluation of a given borrowing strategy, and for a comparison of the performance of alternative borrowing strategies. The challenge is to construct well-defined baseline and risk scenarios that are as objective as possible. If the scenarios are not objective, analytically derived, and well-explained, the debt manager may be seen as manipulating the results of the scenario analysis.

In addition to risk scenarios it is recommended to apply stress scenarios, i.e. scenarios for interest rates and exchange rates that have little probability of materializing but that have very high impact on cost and risk should they materialize.

If scenario analysis is undertaken with the assumption of 1 payment per year, i.e. on an annual basis, assumptions about interest rates and exchange rates are needed on an annual basis for each instrument and for each currency within the time horizon specified for the analysis. If the time horizon is 5 years, and 3 domestic instruments and 1 instrument in foreign currency are used, assumptions for 4 interest rates and 1 exchange rate needs to be made for every year, 5 years ahead. Note that countries typically use many more instruments, and that domestic and foreign interest rates (yield curves) may be correlated.

Box 24. Building a storyline for baseline and risk scenarios

It is a challenge to design baseline and risk scenarios for market rates that are objective. Objective in this context can be understood as covering scenarios that are either developed by entities outside of the DMO, or are grounded on well-known financial or economic models. In other words, when debt managers design market scenarios s/he should be careful to avoid putting their personal opinions about the future into the baseline and risk scenarios.

One way of ensuring objectivity is for the debt manager to build a story around each scenario. This is especially important since the analysis and the strategy that is recommended on the background of the cost-risk analysis will be presented to decision-makers that often have limited knowledge of finance and the technical issues around debt management.

6.3 Baseline assumptions

For each funding strategy the baseline scenario represents the most likely path for future interest rates and exchange rates and therefore the basis to calculate its expected debt servicing costs. The risk scenarios on the other hand, depict the potential of interest and exchange rate to deviate from their expected path and give a sense of how much debt servicing costs can increase beyond their expected value.

In scenario analysis the main function of the baseline is to provide the basis on which alternative borrowing strategies can be compared. Since in the communication of the results of the analysis, there tends to be a lot of weight put to the expected cost, the debt manager should spend time developing a well-specified baseline that is understood and accepted by the decision-makers. Often it is easier to estimate future foreign yield curves than domestic, since more market information is available.

6.3.1. Baseline for interest rates

The government typically borrows in a variety of instruments, and in different currencies and maturities. This means that multiple future interest rates need to be projected. Below, alternative methods to determining the baseline are described. A main challenge in developing countries is often the absence of actively traded government securities markets, see chapter 8 for a further discussion of market development issues. The implication is that the debt manager has to base his expectation on interest rates from the primary issuance, and they may only partially reflect “true” market prices.

6.3.2. Interest rates will remain at their current levels

The simplest assumption is that interest rates will remain constant at their current level. If choosing constant interest rates, the debt manager should make sure that macro and market fundamentals are supportive of constant rates. For instance, a current yield curve with a steep positive slope, may introduce a bias in favor of short-term funding based on an expected cost advantage that could be temporary. A variation of this approach is assuming that interest rates will remain constant at the average level recorded of the last few years. Given that interest rates need to be projected for 3-5 years, this assumption tends to offer better support against the uncertainty and volatility characteristic of interest rates in many developing countries.

6.3.3. Market analysts’ estimates

In countries with relatively active domestic and foreign debt markets, market analysis is often available. Investment banks, brokers, etc. usually publish their forecasts for key interest rates on a regular basis. For some markets information services such as Bloomberg and Reuters publish rates expected by market participants, and in some countries central banks conduct periodic polls among market agents and publish averages, ranges, etc. for interest rates.

The advantage of this alternative is the "objectivity" of a projection taken from an external source – it is often easier to explain for the debt manager that he is not using his own expected interest rates for the analysis. A serious shortcoming is the lack of information on the process used to produce the estimates and the corresponding difficulty in justifying its rationale. Furthermore, the forecasts will typically be relatively short-term, and not match the need of the debt manager to get 3-5 year projections.

Box 25. Covered and uncovered interest rate parity

When calculating implied forward yield curves and estimating domestic yield curves based on foreign yields curves, a central assumption is that of interest parity (or a no-arbitrage condition). The assumption implies that the total return from investing in similar securities in two different countries should be the same. If not, investors will actively buy and sell the securities until this is the case. This means that it is assumed that similar financial products exist in the two countries, and that there is free mobility of capital.

Covered interest rates parity implies that forward markets exist where investors can lock in gains from buying and selling securities between the two countries. Under uncovered interest rate parity, the investor will be attempting to exploit the difference in interest rates between the two countries without hedging the exchange rate risk.

Factors preventing interest parity include taxation, transaction costs, market liquidity etc.

6.3.4. Macroeconomic projections

Ministries of finance, central banks, International Financial Institutions etc. regularly conduct exercises of macroeconomic programming that provide a picture of the expected performance of the economy over the medium-term. Such forecasts typically include key interest rates and exchange rates, inflation, etc. The main advantage of these models is that projected real interest rates and inflation are consistent with the plans of public and private investment, projections of economic growth, evolution of the fiscal and external accounts, etc.

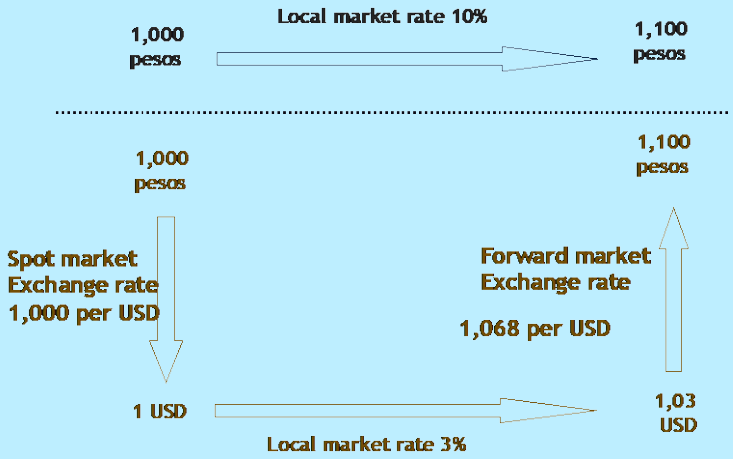
Macroeconomic models are by their nature highly simplified and typically use few interest rates, usually one domestic and one foreign. Since the entire yield curve may be needed at input for the analysis, this does not help the debt manager much. However, the macroeconomic models can help the debt manager in ensuring consistency between his expected rates and the expected macroeconomic development.

Box 26. The no-arbitrage assumption

Arbitrage will tend to move prices for the same product in different markets towards the same price, i.e. traders will continue buying and selling until this is the case, otherwise, there will be a riskless profit to be made. In other words, active trading will ensure that the total return to the investor for a financial product with the same cash flow will be the same no matter which market they are invested in.

A no-arbitrage assumption is often used when pricing financial instruments. A consequence of a no-arbitrage assumption is that a unique price for a financial contract can be calculated.

In the example below, the no-arbitrage assumption is used in an example of covered interest rate parity (see box on covered and uncovered interest rate parity).



Assume that an investor wants to invest 1,000 pesos for one year. The local market interest rate is 10%, meaning that he will be able to collect 1,100 pesos after 1 year. Alternatively, this investor could have exchanged his 1,000 pesos to US dollars at the current exchange rate of 1,000 pesos per US dollar. The 1 US dollar can then be invested for 1 year at the current interest rate in the US market, which in the example is 3%. After 1 year, the investor can therefore collect 1.03 US dollar. The investor now wants to exchange the US dollar back to pesos. At the time of the investment – today – we do not know what the exchange rate will be 1 year into the future. But if we assume that there will be no arbitrage, we know that the total return from investing in pesos, or from exchanging to US dollar, investing for 1 year in the US market and then exchanging back to pesos, should be the same.

In the example, this means that the exchange rate between pesos and US dollar, that is 1,000 pesos per US dollar today, should be equal to 1,068 pesos per US dollar, to ensure that the total return from the two investment alternatives is the same.

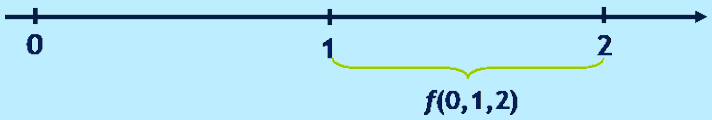
In practice, the no-arbitrage assumption typically doesn't hold, since there are frictions between markets, liquidity premia, imperfect price information etc. Even so, for calculating theoretical and unbiased prices, the assumption can be very useful.

6.3.5. Extract information from the market - implied forward interest rates

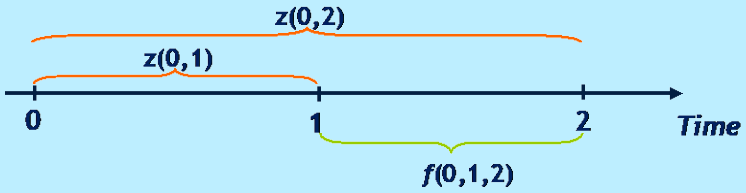
If a yield curve that is based on secondary market trading exists, implied forward interest rates can be calculated. The main benefit of using implied forward rates is that the debt manager is not including his expectations or views, but only uses the information that is available in the level and shape of the current yield curve.

Box 27. Calculating implied forward interest rates

A forward interest rates can be defined as the interest rate fixed today for a future financial obligation. The forward rate can be denoted $f(t,\tau,T)$, where t is the current time, τ is the starting point of the forward contract, and T is the maturity of the contract.



In the example above, $f(0,1,2)$ is the forward rate at time 0 for a contract starting at time 1 and maturing at time 2, e.g. a contract to borrow money in 1 year for a period of 1 year.



The formula for calculating the forward rate is:

$$f(t,\tau,T) = \left(\frac{\left(1+z(t,T)\right)^{T-t}}{\left(1+z(t,\tau)\right)^{\tau-t}} \right)^{\frac{1}{T-\tau}} - 1$$

with *z* being the interest rate.

With a no-arbitrage condition, if we invest $100 today for 2 years, the return should be the same as investing $100 today for 1 year and buy a forward contract today for 1 year that starts 1 year into the future.

$$f(0,1,2) = [\ [(1+z(0,2)]^2 / [(1+z(0,1)]^1\ ]-1$$

If the 1-year interest rate today is 6%, and the 2-year interest rate is 8%, we use the formula above to calculate the 1-year interest rate in 1-years' time (the 1-year forward rate) as:

$$f(0,1,2) = [\ (1+0.08)^2 / (1+0.06)^1\ ]-1 = 10.04\%$$

Meaning that if the 1-year rate today is 6%, and the 2-year rate today is 8%, the 1-year forward rate 1 year into the future will be 10%.

It should be stressed that an assumption behind calculating forward interest rates is that rates are market determined. This should be kept in mind if there is no or only limited secondary market activity, if administrative ceilings on interest rates are imposed, or if the government relies on captive investors for certain government securities, keeping rates at artificially low levels.

Box 28. Example: Estimating domestic interest rates based on a foreign yield curve

A challenge for developing countries when analyzing cost and risk of alternative borrowing strategies is often that the domestic market is only short term and/or is illiquid. The methodology described below estimates domestic interest rates on the basis of the yield curve of a mature market, calculating implied yield curves assuming covered interest rate parity.

The estimated interest rate for the domestic market can be split into three steps: A risk free interest rate, a credit risk premium, and the expected inflation differential between the two countries.

***Projecting the risk free rates*:** For US dollar and other major currencies current yield curves are easily available. Strictly speaking, the calculations of implied forward rates should be based on zero-coupon rates, i.e. cash flows with only one payment (similar to a T-bill). Zero-coupon yield curves can be estimated on the basis of the spot yield curve that can be observed in the market. However, since the differences between the zero and the spot yield curves are usually small, the assumption below is that the spot and zero-coupon yield curves are identical.

If the current secondary market yield curve can be observed, implied forward yield curves can be calculated for each of the years within the time horizon of the analysis, e.g. 3 years.

In the case where the base yield curve is the US Treasury yield curve, implied future yield curves can be calculated that indicates what the market expects the US Treasury yields to be. But for the developing country to get an idea of the cost of issuing in US dollar, a credit spread need to be added to the US Treasury yields.

The credit risk premium: The premium the country has to pay to issue in a foreign currency is equal to the country credit risk. From the observed points of the country's borrowing rates in foreign currency, estimates can be made for the credit risk premium for specific maturities. If the country has not previously issued in the markets in foreign currencies, estimates of the credit spread can be based on credit spreads for countries with similar sovereign credit ratings.

Expected rate of depreciation: Above the interest for issuing in foreign currency was estimated. For estimating the interest rates for domestic borrowing, the expected depreciation rate needs to be added. This rate can be estimated as the inflation differential between the local and foreign country.

The addition of the three components gives an estimation of the interest rate the developing country without a domestic market, would have to pay for domestic borrowing. To get a prober estimate of the domestic yield curve, liquidity premia should be added. These will have to be estimated.

6.3.6. Baseline for exchange rates

Exchange rates can be projected through approaches similar to the once outlined above for interest rates. The simplest assumption is to assume exchange rates as constant at the current level, or, at some historical average. A variant is to extrapolate the trend of the nominal exchange rate. However, care should be taken when using constant exchange rates in the analysis, since they will tend to skew the preferred borrowing to markets with the lowest interest rates. This advantage is larger the wider interest rate differentials. Using purchasing power parity provides a way of calculating the implicit foreign exchange rate based on the theory that exchange rates should eventually adjust to make the price of identical baskets of tradable goods the same in each currency.

An alternative approach is to rely on estimates provided by market analysts that will typically be easily available for the main international currencies.

6.3.7. Macroeconomic projections

Nominal exchange rates can be decomposed into real exchange rates and the difference in price levels in the domestic and foreign country, and each component can be estimated separately. Real exchange rates can be estimated by tracking the evolution of the external accounts while estimates of inflation may be available from the central bank, International Financial Institutions and others. This process is similar to projecting domestic interest rates based on a risk free yield curve, credit spreads and the expected inflation differential.

Real exchange rates are usually forecasted as part of Balance of Payments projections by the government. In addition, forecasts that include real exchange rates are prepared by the IMF and the World Bank as part of the debt sustainability analysis and regular economic monitoring. A key advantage of using these sources is that baseline real exchange rates are consistent with the expected evolution of trade and capital flows during the period of analysis.

6.3.8. Implied forward exchange rates

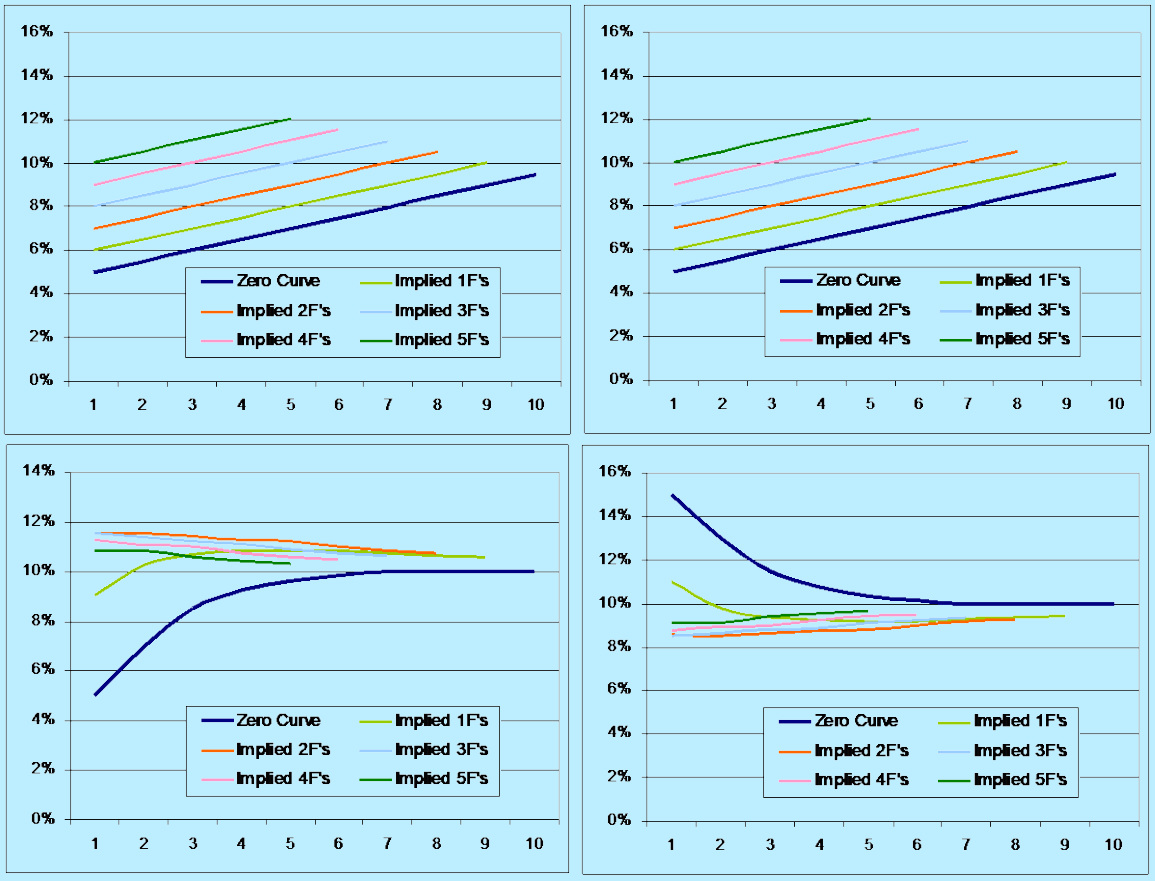
For the main currencies and for some emerging market economies, forward exchange rates can be observed in the market. But even in absence of forward markets, theoretical forward exchange rates can be calculated. As long as there is a spot market for the foreign currency and yield curves for the domestic and foreign markets, implied forward exchange rates can be estimated. Forward exchange rates estimates are based on uncovered interest parity that ensures that currencies with high interest rates trade at discount in the forward market with the discount offsetting the interest rate differential. This ensures that the total expected return from investing in different currencies is the same.

6.4 Risk scenarios

Risk scenarios are needed to analyze the performance under stress – higher interest rates and a depreciation of the domestic currency - of one or more borrowing strategies against the cost under the baseline scenario. As with defining the baseline, designing risk scenarios is far from an exact science, and it is essential that the debt manager use relevant current and historic information, and builds a case for each scenario. Since the focus is analyzing the risk of specific portfolios, risks scenarios are chosen as adverse outcomes compared to the baseline, meaning higher interest rates and/or a weaker domestic currency

Box 29. Example: Forward yield curves

Implied forward yield curves are calculated using only the information that is available in the current yield curve. This means that the level and shape of the current yield curve will determine the level and shape of the implied forward yield curves.



Risk scenarios are often designed on the basis of historical data. This historical information can be for the country itself, or, if data is not available, information from countries at a similar level of development or countries in the same region. Risk scenarios for interest and exchange rates should include both shocks reflecting the historical volatility of market rates as well as stress tests designed to capture events with a low probability of occurrence but that can cause major damage to the stability of government finances.

When using historical developments of interest rates and exchange rates to design risk scenarios, a rule of thumb is to look at a historical period of at least the same length at the time-horizon for the cost-risk analysis.

6.4.1. Risk scenarios for foreign currency interest rates

Risk scenarios for foreign interest rates could be designed by constructing separate shocks on the risk free rates risk premia (including credit and liquidity risk premia). These risk scenarios should comprise both parallel upward shifts in the foreign yield curve and changes in the slope of the curve, typically relatively higher increases in interest rates for short maturities, given that short-term interest rates tend to be more volatile than long-term rates.

6.4.1.1. Foreign currency yield curve

Usually, long time series for all the main points on the yield curve are available for the main international government securities markets. This allows calculating statistics such as average, standard deviation, and maximum and minimum.

Risk scenarios can also be constructed by choosing specific events where there was a substantial increase in interest rates. The absolute increase in the interest rate of a particular tenor could be used to design a parallel risk scenario by applying the same change to all tenors of the foreign risk free curve used in the baseline case. An advantage with designing shocks by looking at the historical development of interest rate rates is that it is possible to learn something both about the magnitude and duration of shocks. However, using historical date to construct shocks implicitly assumes that history will repeat, which may not be the case.

6.4.1.2. Credit risk and liquidity spreads

For countries that have issued government securities in the international capital markets for some time, the history of credit spreads can provide information of their volatility and how they change related to specific events. Credit spreads tend to display wide variations and trends that often reflect changes in investors' preferences, international liquidity, macroeconomic fundamentals, etc.

6.4.2. Risk scenarios for domestic interest rates

Domestic debt markets in developing countries often lack fully developed yield curves and the history of interest rates available is often too short to allow for meaningfully calculating volatilities.

One way around the limitations of the time series of nominal interest rates is estimating the volatility of the short-term nominal rates based on the evolution of the real interest rates and inflation. This decomposition may help discover trends or volatilities of real interest rates that would otherwise remain masked in the series of nominal rates. The debt manager may construct risk scenarios using the volatility of real interest rates; say 3 standard deviations, and adding plausible inflationary shocks. These shocks can be applied to the whole yield curve to obtain a risk scenario of a parallel movement. Flattening or steepening of the local yield curve based on historical states of the curve could be used to generate alternative risk scenarios.

An easier and often more practical approach is to look at past domestic interest rate developments, or developments in similar country settings, and design the shocks based on eyeballing historical developments. Such deterministic shocks may include both parallel increase in the baseline yield curve, and, increases in rates that change the slope of the curve.

6.4.5. Risk scenarios for exchange rates

In line with designing baseline scenarios for exchange rates, decomposing the nominal exchange rate into its real element and the differential in price levels in the economies of the currencies involved may help with the construction of risk scenarios. The risk scenario for the nominal exchange rate will be equal to the projected fall in the real exchange rate, adjusted by the plausible shock to the differential of price levels.

For debt sustainability analysis, the IMF and the World Bank use standard 30 percent nominal devaluation shock that takes place in a specific year. This shock could be too little or too much depending on the particular country and rather than using a standard shock, the debt manager should tailor the shock.

This chapter outlined some possible ways of defining baseline and risk scenarios for interest rates and exchange rates. It should be kept in mind that when undertaking scenario analysis debt managers are not trying to predict the future, but rather are looking for a reasonable way to understand the cost-risk tradeoffs of alternative borrowing strategies and their sensitivity to changes in market rates. The alternative methods for designing baseline and risk scenarios outlined demonstrate the variety of methodologies with which the debt manager can address a problem that is far from straightforward. In the end, the choice of a method to generate market scenarios will depend on preferences, data availability, and country particularities. Whatever method is chosen, the debt manager should attempt to be as objective as possible in designing the scenarios, and a storyline should be built for the baseline and risk scenarios.

Further reading

- Developing a Medium Term Debt Management Strategy (MTDS) – Guidance Note for Country Authorities (2009), World Bank and IMF.

Chapter 7: Links between debt management and macroeconomic policy

Learning objectives

- Understand that a separation of debt management from fiscal and monetary policy facilitates the setting of clear objectives for each area
- Understand that the medium term debt management strategy should be consistent with fiscal and monetary policies
- Understand the importance of clear objectives and high-level policy coordination

7.1 Introduction

Chapter 2 discussed the government's budget and the inter-linkages between fiscal policy and debt management. This chapter continues this discussion, and defines government debt management as a separate policy with different objectives from those of fiscal and monetary policies. Such a separation assists in positioning debt management as a separate policy area that requires explicit policy coordination. It argues that the debt management strategy should be developed in such a way that the overall macroeconomic policy mix is consistent and sustainable. When the policy mix is inconsistent (i.e., policy is uncoordinated), the policies will lack credibility and can result in undesirable policy shifts in the future. In addition, understanding of the risks arising from external imbalances is important in countries where the savings gap cannot be financed by private capital flows, i.e. where the government has to borrow externally, even if there is a preference for domestic borrowing.

Anchored in other policies

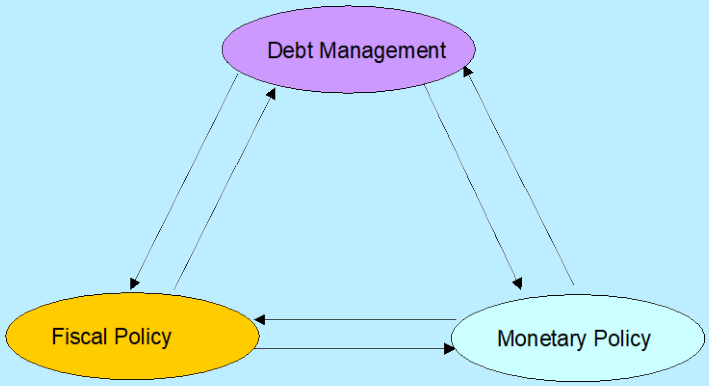
Debt management should be anchored in sound macroeconomic and financial sector policies to ensure that the level and rate of growth in public debt are sustainable. Debt managers, fiscal and monetary authorities, and financial sector regulators, should share an understanding of the objectives of debt management, fiscal, monetary, and financial sector policies given the interconnections and interdependencies between their respective policy instruments. In principle, there should be a separation of debt management policy and monetary policy objectives and accountabilities.

Revised Guidelines for Public Debt Management (2014)

7.2 Debt management and fiscal and monetary policies

Debt management interacts with, and has implications for fiscal and monetary policies. Interest cost on the debt directly affects the government's budget, and volatility in debt servicing cost affects the fiscal space and potentially the long-term sustainability of the debt. Debt management also has potential inter-linkages with monetary policy, specifically when government securities are used for monetary policy implementation, and where the exchange rate is a monetary policy target, requiring a certain share of external borrowing to support the exchange rate.

Box 30. Policy interdependencies



Debt management and fiscal policy

- The debt structure affects debt-servicing costs and can jeopardize fiscal sustainability.
- High expenditure levels may increase debt levels and lead to poor debt structures if sustainability is in doubt.

Debt management and monetary policy

- Exchange rate and interest rate policies affect the risks of foreign currency debt and floating rate debt.
- Poor debt structures can jeopardize the central bank's ability to tighten interest rates or to depreciate / devalue.

Fiscal policy and monetary policy

- High and volatile inflation and interest rates may reduce government revenue by slowing down the economy. Sterilization and quasi-fiscal deficits can directly increase the level of debt.
- Poor fiscal management and high levels of debt can increase inflationary expectations and cause interest rates to rise, and/or the currency to depreciate.

Debt management is increasingly being treated as a separate macroeconomic policy with its own policy objectives and assignment of separate instruments. This was first observed in the 1980s, when the government of New Zealand during a period when action to rectify deteriorating public finances required parallel policy assignment and accountability framework for public debt management, so as not to jeopardize overall macroeconomic stability. In Europe, in the run-up to the monetary union countries realized policies aimed at managing the size and volatility of the debt cost were key elements in meeting the budget deficit criteria. In the U.K., debt management responsibilities were moved out of the Bank of England in order to eliminate the perception of conflict of interest in undertaking debt management and monetary policy operations.

One of the main reasons establishing debt management as separate from fiscal and monetary policies is that the pursuit of the three policy objectives involves trade-offs. The assignment of separate policy objectives enhances credibility and policy implementation. If the fiscal authorities are responsible for both fiscal policy and debt management, it may take on excessive risk to keep the cost of debt low, with the aim of creating fiscal space. This may be the case even though it may imply an increase in the volatility of debt cost potentially forcing future governments to cut spending or raise taxes. Similarly, in a situation where the core objective of the monetary authority is to control inflation, the central bank, if it is also responsible for debt management, may either compromise inflation objectives for lower interest costs, or use government debt instruments to signal monetary policy commitment. This could happen through issuance of inflation-indexed debt, which might not be desirable from a debt management perspective. Separating debt management from the management of fiscal and monetary policies can help avoid conflicts, real or perceived, and can improve the credibility of the overall macroeconomic framework.

What are the separate policy objectives and the instruments used in the conduct of debt management, fiscal policy, and monetary policy? For debt management, the main objective is to ensure that the government's financing needs and its payment obligations are met at the lowest possible cost over the medium to long term, consistent with a prudent degree of risk. The instruments used by the debt manager are borrowing and portfolio management operations. The objective of fiscal policy is to achieve the least distorting budgetary policy that would stabilize output, improve the resource allocation, and to manage distributive objectives. An example of a fiscal policy target is balancing the budget over the business cycle. The policy instruments used to achieve this objective are the composition and level of taxes and spending. Finally, the objective of monetary policy is to achieve price stability, with targets such as inflation or the exchange rate, and the instruments are the interest rate, the exchange rate, or money aggregates.

Shortage of policy instruments is common in developing countries and can create policy conflict. For example, both the central bank and the debt manager may be issuing short-term securities in pursuit of their respective policy objectives. In a situation where the central bank issues debt in its own name, it may have less incentive to raise interest rates to curb inflation, as it may want to keep rates low in order to keep the cost of borrowing low. A shortage of instruments may force authorities to have two policy objectives even though there is formal policy separation. This could weaken the credibility of monetary policy.

Policy separation and instrument independence helps to reduce the perception of conflict of interest and thereby improve the credibility of the respective authorities. Obviously, policy credibility hinges on the consistency of the overall policy mix. Indeed, because policy separation is rarely complete and independent policies can rarely be achieved, policy separation can be facilitated by high-level coordination to ensure policy consistency.

Box 31. Example: Unsustainable policy mix

Lax fiscal policy under a targeted exchange rate regime can strain the credibility of the central bank's commitment to defend the currency. If the market observes that the policies cannot be sustained, it will assume that the existing policy mix will have to be abandoned at some point in time, and act accordingly.

7.3 Macroeconomic constraints and debt management strategy development

While there are separate policy objectives and instruments for debt management, there are important inter-linkages with fiscal and monetary policy. This requires coordination.

7.3.1. Coordination with fiscal policy

From a theoretical perspective, when taxes are distortionary, optimal fiscal policy suggest smoothing taxes to minimize distortions, see chapter 2. However, tax smoothing is not a commonly stated objective for fiscal policy. Nevertheless, tax smoothing is consistent with, and can be extended more generally to the government's objective for economic stabilization. This implies that tax and expenditure policies are managed in such a way that the primary surplus goes up in periods with strong growth and the primary surplus declines when growth is weak. Such a counter-cyclical fiscal policy is a more commonly observed fiscal policy objective.

The ability of the government to implement counter-cyclical fiscal policy depends on the overall macroeconomic framework, including monetary policy and debt management. Debt management is relevant because it determines the timing and volatility of interest payments on the debt. If debt costs are high when economic activity is declining, the government may have little fiscal space to conduct counter-cyclical policy, and may have to increase taxes or cut expenditures. Governments generally seek to minimize the risk that taxes must be raised or expenditures cut during a recession, or that there be a default on the debt.

Another factor that influences the ability of the government to conduct counter-cyclical fiscal policy is the timing of new borrowing and the government's ability to raise additional debt during economic downturn. If additional financing cannot be raised, the government may be forced to raise taxes and cut expenditures during a recession. In the same vein, realization of contingent liabilities will affect the level and timing of additional funding that needs to be raised. If a call on contingent liabilities materialize during a recession, fiscal space is reduced precisely at the moment when additional fiscal space is needed the most.

Emerging economies are often characterized by an inability to cover the total funding need domestically. The implication is that the cyclicality of capital flows is an important factor to consider, including funding from foreign investors in the domestic market. It is also a factor when a current account deficit requires financing, sufficient private capital flows are not forthcoming and additional external borrowing by the government is necessary. For emerging economies, recessions tend to be associated with increasing risk premia, meaning that the cost of funding increases when the need for external borrowing is the highest.

The implication for debt management is that increased gross borrowing requirement during economic downturn or a crisis should be avoided. Since the timing of a recession or a crisis is difficult to forecast, this points to preference for long-term debt, which minimizes the bunching up of maturing debt in a single year, and means that the cost of debt is more stable and predictable.

Debt sustainability is influenced both by fiscal policy (primary deficits), and the size and structure of the debt. Debt Sustainability Analysis (DSA) is essentially an analysis of the long-term soundness of fiscal policy, and the main driver on whether the debt is sustainable or not is the assumptions and forecasts of future government revenues and expenditures. While a DSA is best undertaken by the fiscal policy authorities (in practice typically the macro-fiscal or planning department in the Ministry of Finance), the debt manager plays an important role in providing input on the existing debt structure and future borrowing strategies. In addition, the debt manager plays a key role in sharing with the fiscal and monetary authorizes any concerns regarding the riskiness and sustainability of the debt, and should ensure that the fiscal authorities are aware of the impact that large funding requirements and high debt levels could have on the funding costs.

Box 32. Debt sustainability analysis and debt management

When analyzing alternative debt management strategies, see chapter 5, it is important that the macro-assumptions are in line with the medium term expenditure framework and the debt sustainability analysis (DSA).

The primary objective of the DSA is to gauge the level of current and expected future revenues and spending, that may lead to future debt servicing difficulties over the long-term (over-indebtedness). However, the term structure or composition of debt is not explicitly modeled.

Determining an effective debt management strategy requires various financing alternatives to be evaluated under a given path for key macroeconomic variables, which should be consistent with that used in the DSA. At that point, the preferred strategy, and its associated cost and risk implications, could be fed into an updated DSA.

7.3.2. Coordination with monetary policy

In countries where the financial markets are well developed, see chapter 8 for a discussion of market development issues, monetary policy can be carried out largely independently from debt management. This helps ensure that debt management decisions are not perceived to be influenced by inside information on interest rate decisions, and avoids conflicts of interest in market operations. A goal of cost minimization for the government's debt is not justification for an extension of low-cost central bank credit to the government. Similarly, monetary policy decisions should not be driven by debt management considerations.

Coordination between debt management and monetary policy is important since the instruments used in implementing policies can be similar or in some cases the same. Since monetary policy implementation is often undertaken using government debt instruments and markets, the choice of monetary instruments and operating procedures can have an impact on the functioning of government securities markets, and on debt management in a broader sense. For example, if T-bills are used for mopping up liquidity as well as for government funding purposes, separating the timing of the issuance and making clear to market participants the purpose of the issuance can help avoid confusion and reduce uncertainty among market participants. In some cases, the central bank uses its own instruments for monetary policy operations. In such cases a division of the maturities used by the central bank (shorter-term) and the government (longer-term) supports transparency and clarity vis-a-vis the market. When longer-term government instruments are used for monetary policy operations, best practice is that these instruments should be acquired by the central bank in the secondary market. Allowing the central bank to participate in the primary auctions can substantially disturb an effective and market-based pricing of the instruments.

In countries where the monetary policy anchor is the exchange rate, coordination and clarity of policies is especially important. With managed exchange rates – fixed or pegged to one or more foreign currencies – nominal exchange rates tend to be stable. This has important implications for debt management, since external borrowing becomes relatively more attractive. However, with managed nominal exchange rates imbalances can gradually build, i.e. implicit liabilities. If/when the monetary authorities are not able to hold on to the peg, the movement of the exchange rate is typically substantial, and in the form of a weakening of the domestic currency. If the share of external debt is high, this can lead to substantial increases in both the cost and the size of the debt. Even if the peg is upheld, there can be substantial implications for monetary policy, and indirectly to debt management. Under a pegged exchange rate regime, capital inflows tend to follow periods of economic growth. Inflows will be inflationary, and central banks will sterilize these flows by mopping up liquidity through the sale of securities. Interest rates may be raised to curtail inflation expectations, but higher domestic interest rates under fixed exchange rate will tend to attract more capital inflows, leading to higher inflationary pressures. Real exchange rates tend to appreciate during these periods, leading to higher

current account deficit. In the short run, the capital inflows will finance the current account deficits and international reserves will accumulate.

The reversal of the flows, which tend to occur when economic growth prospects decline, or when external conditions deteriorate, can be accompanied by speculative attacks on the exchange rate, requiring the central bank to sharply raise interest rates, despite falling domestic inflation and economic activity. This is compounded by the implicit contingent liabilities that the fixed exchange rate implies. Under such exchange rate arrangements, the monetary policy authority has no control of the monetary conditions to steer the economy from recessions and booms. The burden of economic stabilization falls mainly on fiscal policy. The implication for debt management is higher risk aversion, and focus on stable interest cost, i.e. long term domestic borrowing.

Because of the volatility of international capital flows, some countries restrict these by imposing capital controls. One of the major implications of such a restriction is that the financing of a current account deficits must be undertaken largely by the government. Therefore, in addition to deficit financing, an increase in borrowing requirement may arise from a need to finance a balance of payments gap[11]. This can have the same effect as discussed under increased borrowing needs from primary deficits and realization of contingent liabilities, but has the added effect that additional borrowing must be from foreign sources, since the foreign currency is needed. Since capital controls are generally accompanied by restrictions on currency convertibility, it is unlikely that foreign investors will be willing to lend in domestic currency, so by default, the borrowing will have to be in foreign currency, imposing an additional constraint in the determination of the currency composition of the government debt.

[11] Or the opposite can apply: a desire by the central bank for the government not to borrow in foreign currencies, as it would further aggravate capital inflows.

7.4 Coordination in practice

Fiscal policy, monetary policy, and debt management are separate policies, and the instruments used for meeting the objectives are separate. It is important to keep in mind though, that there are strong inter-linkages between the policies, requiring coordination. Such coordination is strong facilitated by having clear objectives and policies, i.e. clear objectives for monetary policy, specific fiscal policy targets, a medium term debt management strategy, etc. The more specific the targets are, e.g. a ceiling for the size of the budget deficit, the easier in general it will be to ensure coordination and avoiding that policy implementation implies results that are sub-optimal.

In the practical day–to-day implementation of policies benefits from exchange of information – sharing cash flow forecasts, efforts to support market development etc. - and coordination, both informally and formally through cross-institutional committees. Policy coordination, i.e. defining the objectives, roles, and tools of debt management, and fiscal and monetary policies, should take place at the highest possible level. This typically means establishing coordination committees including all the central economics ministers and the governor of the central bank.

Further reading

- Blinder, Alan S.: Issues in the Coordination of Monetary and Fiscal Policy (1983), NBER Working Papers No. 0982.
- Dornbusch, Rudi: Debt and Monetary Policy: The Policy Issues (1996), NBER Working Papers No. 5573.
- Guidelines for Public Debt Management (2001, revised 2014), World Bank and IMF.
- Togo, Eriko: Coordinating Public Debt Management with Fiscal and Monetary Policies: An Analytical Framework (2007), Policy Research Working Paper 4369, World Bank.

Chapter 8: Links between debt management and market development

Learning objectives

- Understand the importance of diversification of government funding, and the role of an active market for government securities in facilitating broader capital market development
- Understand that the debt manager can play a critical role in market development, specifically related to designing the primary issuance process
- Understand that the level of market development puts constraints on the borrowing strategies available

8.1 Introduction

Adequate measures

In order to minimize cost and risk over the medium to long run, debt managers should take adequate measures to develop an efficient government securities market.

Revised Guidelines for Public Debt Management (2014)

The focus of this chapter is the link between domestic government securities market development and debt management strategy design. The issues are covered at a relatively high level, as it is covered in more detail in the Implementing Government Debt Management Strategies training course.

Development of the domestic government securities market is often an explicit objective of debt management. Government debt managers seek to diversify and deepen the sources of financing and reduce the cost and risk of financing over the medium to long term.

A more developed domestic market helps to achieve those goals. Beyond being a source of government financing, government securities perform roles in the domestic financial system such as providing pricing references and risk-hedging instruments, which facilitate the development of corporate bond markets, housing finance, asset securitization, and markets for financial derivatives.

In addition, the positive externalities from the development of market infrastructure (clearing, settlement, and trading systems) and intermediaries (primary dealers/market makers) for government securities can serve other markets as well.

It should be noted that a debt management strategy supporting market development through extending maturities, typically comes at higher cost in the short term.

When developing a debt management strategy, the absorption capacity and the level of development of the domestic financial markets should be taken explicitly into account. This is both to ensure that constraints are identified, e.g. there may be limited demand for long-term securities, and to design borrowing strategies than can potentially support market development, thus ensuring increased access to domestic funding in the future.

When discussing supporting market development in broader terms, the role of the government is to a large extent related to the implementation of the debt management strategy. The government (the issuer of debt) can provide important support for market development through the primary issuance, i.e. ensuring transparency and predictability in the issuance, a solid infrastructure for security issuance, and a borrowing strategy that is in line with market demand, including through building benchmark bonds to support liquidity.

The development of an active secondary market, which is the objective of market development plans, requires a diversified investor base, a well-working market infrastructure etc. While this goes beyond what can be controlled by the government, the debt manager can play an important role of facilitating and actively lead market development efforts.

8.2 Importance of domestic government securities markets

An active domestic financial market provides a range of advantages to the government in its role as a borrower, and to the economy in a broader sense.

First, if the government is borrowing domestically, and not relying on captive investors and/or state owned financial institutions and the central bank to buy its debt, the prices (interest rates) in the market will be a reflection of the "true" market price, and will be providing a pricing reference for the rest of the financial market. It allows the government to reduce vulnerabilities to external shocks, and to lower refinancing risk by allowing for issuance of longer maturities.

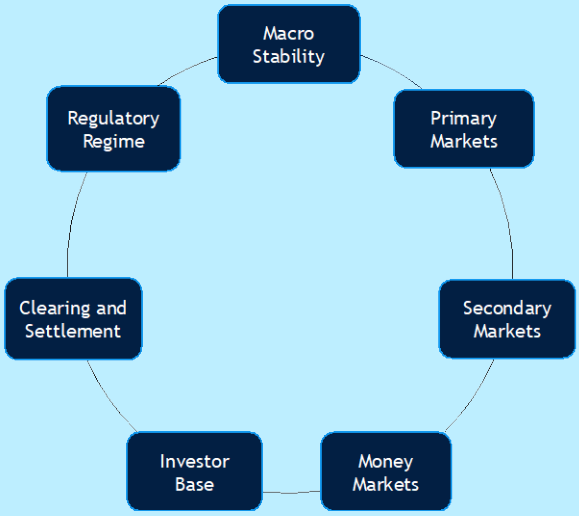
Secondly, a government securities market supports monetary policy implementation: directly by providing risk free instruments that can be used as the basis monetary policy implementation transactions, and in facilitating liquidity management for market participants and the government. In addition, a well-working government securities market can help effective mobilization of savings.

8.3 Developing domestic markets

The money market is the cornerstone of a competitive and efficient financial market. It normally needs to be in good working order before a government bond market, including both an efficient primary market and a liquid secondary market, is fully developed. Below, aspects related to the primary and secondary market are discussed on more detail.

Box 33. Key building blocks for government securities markets

Macro stability
Economic instability, often fed by high fiscal deficits, rapid growth of the money supply, high and variable inflation and a deteriorating exchange rate, can weaken investor confidence and increase the risks associated with development of a market for government securities.



Primary market
An efficient primary market is a foundation not just for the government bond market, but all fixed income. Relative to the other building blocks the debt manager has greater control in this.

Secondary market
Well-functioning secondary markets promote efficient price discovery, and facilitate liquidity and risk management. Also provide a continuous pricing reference (the yield curve) as primary market is periodic.

Money markets
An active interbank money market provides the pricing reference for the short end of the yield curve in many countries. It also encourages the development of bank treasuries that manage interest-rate risk and trade fixed-income instruments. This trading operation and culture can be extended to government securities

Investor base
A diversified investor base, where different segments have different risk preference and investment horizons supports an active market in government securities

Clearing, settlement and depository
Facilitates the efficient flow of transactions in the primary and secondary markets, strengthens investor confidence, stimulates the pace of market expansion, and limits exposure to systemic risk.

Regulatory regime
A country's legal and regulatory framework determines if markets are safe, fair, efficient and transparent. When it's inadequate, the consequences can be severe – one of the contributing factors to the global financial crisis

8.3.1. The primary market

Historically, primary market activity in developing countries relied on captive placement of government securities. Captive placements ensure the financing of the government at low direct cost and limited risk, but it implies exposure to high economic-efficiency losses and to misallocation of resources. Reliance on captive placement has generally declined and has been replaced by the development of more market-oriented funding strategies. A market-oriented funding strategy requires the use of issuance techniques and debt instruments that are suitable to the level of development of the domestic market. In practice, this often means using standard fixed-rate bullet maturity instruments that are simple to price and trade. Other types of instruments may be considered from an investor diversification point of view - inflation linked for institutional investors such as pension and insurance funds, or retail oriented instruments - but care should be taken to the potential cost of fragmenting the government securities market, as they do not contribute much to liquidity, and may add distribution costs in the case of retail investors.

The organization of auctions often depends on the structure and level of development of the domestic financial system. The choice between multiple-price and uniform-price auction formats is not clear-cut. When choosing how to arrange auctions, the debt manager needs to take into account potential costs and benefits of the different formats. In multiple-price auctions bidders will pay according to their bids, while in uniform-price auctions all successful bidders will pay the cut-off price. Many countries use multiple-price auctions to encourage competitive bidding and lowering the risk of auction manipulation. In countries with competitive financial systems, however, uniform-price auctions may encourage higher bids and generate better results for the government. Uniform-price auctions are often used for securities that are more difficult to price and thus pose a greater “winner’s curse” risk, such as long tenors or inflation-linked instruments.

Direct auction participation may be limited to appointed primary dealers, especially when the number of investors is large, or it may be open to all authorized banks, as well as other institutional investors. To ensure adequate participation and efficient outcomes, the auction organization may also cover non-competitive bids to allow participation in auctions by retail and small institutional investors. Limits on auction allocations to individual bidders may prevent attempts at market-cornering and price-manipulation.

Some countries appoint a network of primary dealers to facilitate the issuance of government securities. A main role of primary dealers is to ensure absorption of newly issued securities and distribute them to final investors. They may play a beneficial role in countries with a large number of institutional investors, including commercial and savings banks, pension funds, insurance companies and mutual funds. A primary dealer system, however, can prove detrimental in a country with a small financial sector because of the greater risk of collusion.

Finally, the issuer can target specific investors with the objective of ensuring cost effective funding, but also of expanding the investor base. Examples of targeted instruments include diaspora-targeted bonds, sukuk instruments, and dedicated retail programs. When deciding to target specific investors through tailored instruments, the debt manager needs to consider the adverse impact that fragmentation of debt instruments may have on the overall liquidity and process of bond market development.

8.3.2. The secondary market

A strong and diversified investor base is important for ensuring strong and stable demand for government debt securities. A diversified investor base is characterized by investors with different time horizons, different risk preferences, and different trading motives. Without a diversified investor base it is unlikely that an active secondary market will materialize.

The development of secondary markets is influenced by the type and design of government securities. Successful issuance of fixed-rate medium- and long-term securities is important for containing government exposure to interest-rate and refinancing risks, but should be balanced against market development objectives. In practice, a strategy with a focus on market development could aim to issue a range of maturities beginning with the short end and gradually increasing the tenors and amounts in a well-defined benchmark building strategy to support a continuous and liquid yield curve. Trading activity is often inhibited, however, by fragmentation of securities into a large number of small and non-standardized issues. Similarly, a high frequency of auctions allows investors to adjust their portfolios in the primary market, but dis-incentivize them from looking for those securities in the secondary market.

Trading activity and liquidity are heightened when a competitive market structure is established among dealers, when activity is consolidated into a small number of liquid instruments (benchmark securities), when transaction costs are minimized, when the market infrastructure is sound and robust, and when market participants have varying transaction needs and investment horizons. Primary dealers, provided that they comply with their market-making obligations, and interdealer brokers, who facilitate trading among dealers, contribute to greater market liquidity.

An active and liquid secondary market is difficult to develop and requires the presence of a sufficient number of market intermediaries and institutional investors with incentives to trade, appropriate instruments and transaction types, and well-established trading mechanisms, including prudential and business-conduct rules, effective market surveillance, and investor protection.

Trading is facilitated by adopting standardized transaction conventions with regard to pricing, trading units, trade-agreement formats, settlement cycles, instruction formats, and time periods. Ensuring that market conventions comply with international practice not only broadens domestic participation but also attracts participation by non-resident investors and intermediaries.

8.4 The impact of domestic markets on strategy design

The absence of an actively traded market for government securities can put substantial limits on the strategies and instruments available to the debt manager. As mentioned above, access to domestic funding in long maturities is attractive, since it can substantially reduce the risk exposure of the debt, but a market development strategy may call for a more gradual extension of maturities.

The implication is that the debt manager needs a good understanding of the current market environment and knowledge of the constraints the level of development of the market provides for the debt management strategy. For example, if no market for maturities longer than 1 year exists, the debt manager should design the debt management strategy taking the current situation into account. This is often the situation in less developed markets dominated by banks – that tend to prefer short-term or variable interest rate instruments since the risk exposure from such instruments matches their main liabilities (short-term deposits). However, since the debt management strategy is a medium term plan, the debt manager should analyze strategies that could support market development. A main advantage of basing the strategy on quantitative analysis, see chapter 5, is that it allows an estimate of the cost involved in supporting market development through a gradual extension of maturities.

8.5 The importance of debt management for market development

The debt manager to a substantial degree controls a range of areas that are important for market development. These are related to the borrowing strategy, i.e. what is being issued, when and how the securities are issued, and to the organization of the primary market.

Examples of policies and practices where the debt manager can support market development includes:

8.5.1. A formal and publicly available medium term debt management strategy

A key to market development is the existence of a medium term debt management strategy, since that will guide the development of regular issuance plans and activities to support market development going forward. Market development initiatives, such as targeting specific maturities and their volume can be integrated into the analysis of alternative borrowing strategies, see chapter 5.

8.5.2. Transparency and predictability

When accessing the market, the debt manager should keep in mind that he will have to come back to the market again at later stages, i.e. issuing bonds is a repeat game, and suspicion among market participants that the issuer is trying to manipulate or put pressure on the market may increase borrowing costs. By publishing regular borrowing plans that include (indicative) information on instruments, timing of issuance and volume, market participants are allowed to better plan their activities. Sticking to the borrowing plan to the largest extent possible allows the issuer to build trust.

Cancellation of auctions should be avoided unless circumstances are very unusual. This can be enhanced by regular dialogue with investors, and by providing detailed information on the outstanding debt and future borrowing plans.

8.5.3. Design of the issuance process

Whether issuing on auction, on tap, or other mechanisms, the government should be a price taker, i.e. issue securities at market prices. Auctions are the most widely used issuance technique, but syndications, that allow a negotiated price in cases where there are not reference prices, can be an alternative when opening new instruments and maturities, as can tap issuance, where the government is in the market on a continuous basis. Part of a well-designed issuance process is that the issuer monitors the activities of the market participants in the primary and secondary markets, to avoid collusion and price manipulation.

8.5.4. Design of the issuance strategy

Increasingly, countries promote large benchmark issues of standardized fixed-rate long-term securities. The use of re-opening issues and liability management techniques such as buy-back and exchange programs can accelerate the reduction of market fragmentation. In bank-dominated financial systems, developing medium-term benchmark issues is a major challenge, since banks will often have a preference for short-term exposure.

8.5.5. Use of primary dealers

Primary dealers are used by debt managers to ensure a certain minimum demand, and to promote active trading. They often have an obligation to participate in auctions, and to maintain a presence in the secondary market, sometimes including a requirement to post two-way prices. The counterparts to these obligations are privileges that can include exclusive rights to participate in auctions and participation in consultations with the debt manager. In small markets with few participants, primary dealers may provide very limited benefits.

8.5.6. Coordination with the central bank

When the central bank is issuing its own securities for monetary policy purposes, close coordination of the issuance plan with monetary policy operations is essential.

Further reading

- Developing government bonds markets – a handbook (2002), World Bank and IMF.
- Developing the domestic government debt market: From diagnostics to reform implementation (2007), World Bank.

Chapter 9: Governance arrangements for effective strategy development

Learning objectives

- Understand the importance of clear and strong governance arrangements
- Understand that debt management objectives and debt management strategies are different concepts
- Understand the entities involved in strategy development and implementation, and their roles and responsibilities; and the importance of the internal organization of debt management

9.1 Introduction

In the previous chapters the importance of a strong analytical basis for the debt management strategy was discussed, as was the importance of the fact that a strategy cannot be developed in isolation, but explicitly needs to take into account the macroeconomic framework and the level of the development of the domestic government securities market.

The focus of this chapter is governance in the context of debt management strategy development and implementation. Roles and responsibilities of the involved entities will be discussed, but it should be noted that the detailed governance arrangements may differ widely across countries, reflecting varying political processes, the framework for public administration, etc.

Governance "(r)efers to the legal and managerial structure that shapes and directs the operations of public debt management. It includes the broad legal apparatus which defines goals, authorities and accountabilities. …It embodies strategy formulations, operational procedure, quality assurance practices and reporting responsibilities" (G. Wheeler).

Surrounding frameworks

The legal framework should clarify the authority to borrow and to issue new debt, to hold assets for cash management purposes, and, if applicable, to undertake other transactions on the government's behalf.

The organizational framework for debt management should be clearly specified and the mandates and roles well-articulated.

Transparency and accountability are key factors in debt management operations.

Revised Guidelines for Public Debt Management (2014)

Effective governance is important in ensuring that a prudent debt management strategy is developed and adhered to. The reason is that debt management involves decisions that can significantly affect the government's budget and overall balance sheet. The tax payers will require assurance that these risks are managed appropriately, and that checks and balances and operations safeguards are in place. Furthermore, creditors and investors need to know that government debt managers have the authority to undertake transactions.

9.2 The legal framework for debt management

A key element in strong governance arrangements is the debt management law. The legal framework for government debt management comprises both primary legislation (laws enacted with approval of the parliament or congress) and secondary legislation (executive orders, decrees, ordinances, and so forth) determined by the executive branch of government.

The primary legislation, i.e. the debt management law (or a public financial management act in cases where no specific debt management law is in place, should clarify the authorization by parliament or congress to the executive branch of government (cabinet or the Minister of Finance) to approve borrowings on behalf of the central government.

Strong governance can be supported if the law includes specific directions regarding the roles of the entities involved in debt management, and clear language on the power to delegate.

Furthermore, the debt management law should include debt management objectives, see below for a further discussion of objectives, borrowing purposes, and a requirement to develop and regularly update a medium term debt management strategy. In addition, the primary legislation should include a requirement to report to parliament, including an annual report with a detailed evaluation related to strategy implementation and outcomes against stated goals.

9.3 Debt management objectives and debt management strategy

The main objective for debt management is to ensure that the government's financing needs and payment obligations are met at the lowest possible cost in the medium to long run, while taking into account risk. Often, these are supplemented with an objective to support domestic government securities market development.

The objectives provide an anchor for debt management strategy development and for facilitating sound accountability arrangements. No matter how the objectives are formulated in practice, they should be achievable, directly related to debt management activities, and be as specific as possible. Examples of objectives that are not in line with these criteria are statements that debt management activities should promote economic growth, or that debt sustainability should be assured. On the former, it is impossible to evaluate if and how debt management activities have promoted economic growth, and on the latter, the government debt level is mainly driven by fiscal policy rather than debt management.

While the debt management objectives determine the long-term aims of debt management, the debt management strategy is a specific medium-term plan on how to achieve these objectives.

The objectives are typically found in the debt management law, and they tend to be unchanged over very long periods of time. The debt management strategy is a rolling medium-term plan that is updated annually, or more often if circumstances change substantially. In the context of governance this difference between objectives and strategy is important, since they have different purposes and time horizons, as well as separate decision-making and evaluation processes.

9.4 Strategy decision-making process

A useful way of thinking about the governance framework for debt management is to look at the process of strategy development and implementation. The legislature (parliament) sets the objectives, while the executive (cabinet or minister of finance) take the decision on the strategy that is drafted by the Debt Management Office (DMO)[12] and has been through a consultative process with fiscal and monetary policy authorities. The role of these entities is discussed in more detail below.

[12] Debt Management Office (DMO) is used as a generic term in this chapter, and covers a wide variety of types of debt management organizations from unified DMO's to set-ups where debt management responsibilities are fragmented across different entities and institutions, and where coordination takes places through committees.

9.4.1. Debt management objectives – the role of the legislature

The structure of the debt and the debt management policies can have substantial impact in future tax and spending levels, see chapter 2. Since these impacts can extend beyond the life of the sitting government, the legislature should provide the overall framework for borrowing and debt management. The natural starting point is for the legislature to provide the objectives for debt management.

In cases where no debt management law is in place or where objectives are not formulated in a debt management vision statement or similar, and therefore, where there are no formal debt management objectives, second best is to still follow a clear process for strategy development and implementation as outlined in this chapter, and to formulate the debt management objectives as part of the medium term debt management strategy.

9.4.2. Debt management strategy development – the role of the DMO

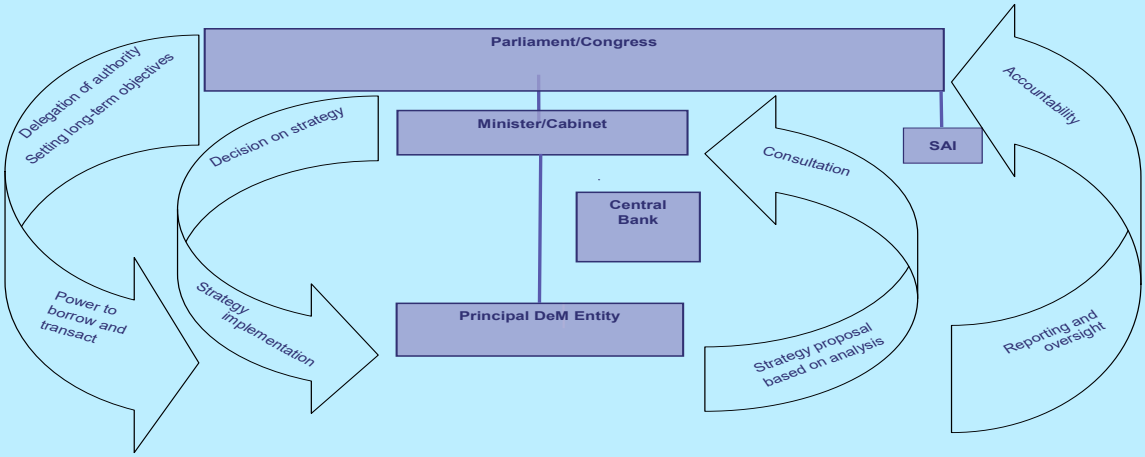
In the context of strategy development, the DMO is responsible for undertaking the technical and analytical work, specifically the responsibility for analyzing cost and risk implications of alternative debt management strategies taking into macro-economic and market constraints, and for drafting a debt management strategy. The draft debt management strategy, typically with one or two feasible alternatives, is presented by the DMO to the executive (or the advisory board). The DMO is responsible for ensuring that the draft debt management strategy has been shared and discussed with the fiscal and monetary policy authorities, and that comments from these are taken properly into account.

9.4.3. Debt management strategy approval – the role of the executive

While the legislature is responsible for providing the overall guidance for debt management through the overall objectives, the role of the executive is developing and implementing a plan for how to best meet the objectives. This plan is the medium term debt management strategy.

From a practical point of view, the executive delegates the responsibility for analyzing alternative debt management strategies, for recommending a specific strategy, and for drafting the strategy document, to the DMO. However, the executive is responsible for the debt management strategy approval and for ensuring its implementation.

Box 34. Overview of the main entities involved in government debt management



The legislature

Since debt management decisions may impact future tax and spending levels, the legislature, i.e. parliament or congress, should set the framework for debt management. A central part of this is defining the government debt management objectives.

The executive

The cabinet or the minister of finance is responsible for meeting the debt management objectives. This takes place through a debt management strategy that is a translation of the long-term objectives into a rolling medium-term plan.

The DMO

The DMO is the entity responsible for providing the analytical framework for the debt management strategy, and for drafting a recommended strategy. Following the formal approval and publication of the strategy, the entity is responsible for implementation, and for reporting to the executive and the legislature on strategy implementation.

The central bank and fiscal authorities

Since debt management policies can have significant impact on monetary and fiscal policies, it is essential that the debt managers consult with the central bank and the fiscal authorities before finalizing the debt management strategy.

Advisory committee

Some countries have established an advisory committee to provide guidance to the executive on debt management issues, to vet the draft debt management strategy, and to ensure coordination. Members of the advisory committee can be senior civil servants, central bank representatives, as well as representatives from academia and/or the market.

External audit (Supreme Audit Institution)
The external auditor should audit the DMO and the debt management operations on a regular basis, ideally, this should include performance audits, i.e. audits that goes beyond financial audits. INTOSAI, the International Organization for Supreme Audit Institutions, has developed guidelines for auditing government debt management. Regular external audits should be supplemented by a strong internal audit function.

Box 35. Should the legislature approve the debt management strategy?

Debt management objectives determine the long-term aims of debt management, e.g. to minimize borrowing costs subject to keeping risks at an acceptable level, and to support the development and functioning of the domestic financial markets.

The debt management strategy is a rolling medium-term plan on how to achieve the long-term objectives.

It is common practice for the legislature to approve the annual budget. Since debt policies and the debt structure can have substantial impact on the government's budget, it could be argued that the legislature should be approving the debt management strategy. However, practice is that the strategy is approved by the executive, i.e. cabinet or the minister of finance. The reasons for this include a wish to avoid political interference in an area that to a large extent is considered technical, and to avoid that detailed financial choices, e.g. choosing between borrowing in USD or JPY, become a topic for political discussion.

Box 36. The organization of the DMO

Central to debt management is the cost-risk trade off that is expressed in the objectives. Identifying and managing cost and risk is a specialized function that requires skills in both public policy and finance. Increasingly, debt management functions are unified either within the MoF, or as agencies outside, reporting to the MoF, to create the adequate enabling environment for strategy design and implementation. A consolidated debt management function reduces the risk that there are separate and/or contradictory policies for sub-portfolios, reduces the need for coordination, and facilitates having one debt recording function and one debt database.

As for the internal organization, best practice is to have an organization according to the debt management functions, i.e. transaction verification and servicing (back office), cost-risk analysis and strategy development (middle office), and borrowing transactions (front office). In practice there are many variations around this basic structure. Key from an operational risk management point of view is separating the responsibility for confirming and verifying transactions from the responsibility of undertaking transaction.

Often functions related to IT, legal etc. are placed outside the basic front, middle, and back office structure.

9.5 Strategy implementation and accountability

The roles of the legislature, the executive, and the DMO outlined above, requires clear delegation and accountabilities. When the legislature, through the legal framework, delegates the role of approving the debt management strategy to the executive, the counterpart to that is a requirement that the debt management strategy is a publicly available document and that the executive reports to the legislature on a regular basis on the implementation of the debt management strategy and the risks to the debt.

The DMO is tasked with implementing the medium term debt management strategy through domestic and external borrowing, as well as liability management operations, including buy-backs, the use of financial derivatives, etc. While the DMO is undertaking all borrowing and related transactions, the minister of finance/the executive is ultimately responsible to parliament for strategy implementation. Regular reporting on transaction and performance against the guidelines and targets defined in the strategy greatly facilitates this process and strengthens governance and clarity regarding accountability.

9.6 The debt management strategy document

The medium term debt management strategy is a plan that the government intends to implement over the medium term (3-5 years) in order to achieve a desired composition of the government debt portfolio, which captures the government's preferences with regard to the cost-risk tradeoff. It is good practice for the debt management strategy to a publicly available stand-alone document. This helps promote accountability and transparency, and enhances the effectiveness of debt management if the goals are clear and well understood and the debt manager is seen as making a credible commitment to meet them. Also, the strategy should be reviewed and updated on an annual basis. This helps evaluate the results of the strategy implementation, facilitates updating the analysis with the latest revisions of the macroeconomic framework, and to fine-tune the financing targets based on cost/risk preferences and the overall debt management objectives.

Box 37. The format of the debt management strategy document

The debt management strategy is a short and concise document that explains the strategy in as clear and precise a language as possible. When drafting the document, the audience should be kept in mind, i.e. the legislature, the public, the market participants, etc.

The main components of the strategy document are:

- Objectives and scope
- Cost and risk of the existing portfolio
- The environment for debt management going forward
- Brief summary of the analytical foundation for the strategy
- The targets/guidelines for the strategy

For more detail see appendix VII of the MTDS Guidance Note.

From an issuance and market development point of view, a publicly available strategy makes the government debt manager more transparent and predictable, and it increases the certainty for investors, with the likely side-effect of lowering the borrowing cost to the Government in the long-run. Finally, the self-interest of debt managers would strongly suggest that the strategy should be a public document: As discussed in chapter 3, the debt manager is making financial recommendations under uncertainty, i.e. borrowing decisions have to be made today, but market rates on debt that matures and will have its interest rates re-fixed will only be known in the coming years. A public strategy, therefore, reduces risk of criticism in the future “with wisdom of hindsight”.

Box 38. Summary of the evaluation and accountability process

1) The legislature sets the overall objectives of government debt management, and delegates the borrowing power to the executive branch of government (cabinet/council of ministers).

2) Cabinet or the executive determines the medium-term debt management strategy, based on the longer-term debt management objectives, and delegates the power to raise loans to the DMO, which must act within the framework of the strategy.

3) The DMO executes the strategy.

4) At the end of the year, the DMO sends a written report to the cabinet/minister of finance, including an internal evaluation on how its activities have moved the cost/risk of the debt portfolio in line with the plan laid out in the strategy, and what actions it has taken to promote development of the domestic debt markets (provided that is one of the debt management objectives).

5) The cabinet/minister of finance evaluates whether the debt management activities have moved the debt portfolio closer to the goals specified in the strategy.

6) The cabinet/minister of finance sends a report to the legislature, informing about the chosen strategy, the rationale behind it, and the activities that have been taken by the DMO, and explaining in what way the strategy decision and the debt management activities have assisted in achieving the debt management objectives.

7) The legislature evaluates the debt management strategy implementation against stated objectives.

Further reading

- Debt Management Performance Assessment (DeMPA) Tool (2009), World Bank.
- Developing a Medium-Term Debt Management Strategy (MTDS) – Guidance Note for Country Authorities (2009), World Bank and IMF.
- Wheeler, Graeme, Sound Practice in Government Debt Management (2004), World Bank.

Chapter 10: Bringing it all together

The development and implementation of the debt management strategy is at the core of government debt management. The previous chapters describe an overall framework for debt management, define measures for cost and risk, and an analytical framework within which cost and risk for alternative borrowing strategies may be compared. Following the cost risk analysis links between debt management, and macroeconomic policy and market development, respectively are discussed, as is a governance framework for debt management. It is key to understand that debt management strategy development cannot take place in isolation.

Based on the considerations in the earlier chapters, a process to design a medium term debt management strategy is outlined in this chapter. It is also in line with the step-wise process described in the MTDS Guidance Note.

10.1. Objectives and scope (chapters 2 and 9)

Debt management objectives typically refer to ensuring low cost in the medium term taking into account risk, i.e. a cost-risk trade-off. Often, debt management objectives also include ensuring timely funding, and supporting the development of domestic government securities markets.

A clear definition of the scope, I.e. a clear description of the types of debt are included in the debt management strategy, is key to defining the responsibilities and accountability of the debt manager.

10.2. Defining cost and risk (chapter 3)

An important step in strategy development is to define cost and risk, so that these concepts have concrete interpretations. Debt managers should be clear about what exactly is captured by specific cost and risk measures so that the most appropriate measures are selected.

Cost and risk measures are often focused on the budget, e.g. the effect on interest cost if there is an increase in interest rates. For countries with high debt levels and/or worries about debt sustainability, measures that focus on the debt level are also useful. This is especially the case with debt portfolios with high shares of concessional debt denominated in foreign currencies. If only looking at interest cost, the impact of even a substantial depreciation of the local currency will be modest, since the (coupon) interest rates on concessional loans are low – when focusing on debt levels on the other hand, a currency depreciation will have immediate impact.

10.3. Cost and risk of existing debt (chapter 4)

Government debt is exposed to changes in interest rates and exchange rates in the future. The risk on the debt is a function of the composition of the debt (the risk exposure), and the changes in market rates (the risk factors). The risk exposure is endogenous, i.e. (largely) determined by the debt manager, while the risk factors are exogenous, i.e. outside the control of the debt manager. Risk exposure indicators can provide information on interest rate risk, foreign exchange risk, and refinancing risk, and indicators can be used to express the target composition of the debt or the new issuance.

10.4. Analyzing future debt portfolios – scenario analysis (chapters 5 and 6)

The challenge when developing a medium term debt management strategy is to identify debt compositions that provide low expected cost and are resilient to a range of shocks to interest rates and exchange rates, i.e. ensures low cost in the medium term taking into account risk. Quantitative analysis greatly facilitates the identification of such strategies. Scenario models can support a quantification of cost and risk, and can provide input for identifying the preferred composition and risk exposure of the debt.

Key inputs to scenario analysis are future market rates, i.e. interest rates and exchange rates. A range of approaches for defining future market rates, including a baseline that will provide the expected cost, and risk scenarios that will provide information on the riskiness of the debt portfolios generated by different borrowing strategies, are important inputs for scenario analysis. Baseline and risk scenarios was stressed. These could be based on historical events, or events in neighboring countries or countries that are similar from an economic and market development point of view.

Since the main output of scenario analysis are future cash flows, risk exposure indicators for future debt compositions can be calculated, and applied as strategic targets.

10.5. Links between debt management and macroeconomic policy (chapter 7)

The quantitative and qualitative analysis of borrowing strategies that meets the objectives for debt management are essential in designing a medium term debt management strategy. But it is critical that analysis that forms the basis for the strategy explicitly takes into account constraints and options from the macroeconomic framework. A key insight is that government debt management is a separate policy with different objectives from those of fiscal and monetary policies. Such a separation assists in positioning debt management as a policy area that requires explicit policy coordination. It argues that the debt management strategy should be derived in such a way that the overall macroeconomic policy mix is consistent and sustainable. When the policy mix is inconsistent (i.e., policy is uncoordinated), the policies will lack credibility and can result in undesirable policy shifts in the future. In addition, understanding of the risks arising from external imbalances is important in countries where the savings gap cannot be financed by private capital flows, i.e. where the government have to borrow externally, even if there is a preference for domestic borrowing.

10.6. Links between debt management and market development (chapter 8)

Development of the domestic government securities market is often an explicit objective of debt management. Government debt managers seek to diversify and deepen the sources of financing and reduce the cost and risk of financing over the medium to long term. A more developed domestic market helps to achieve those goals. In addition, there are positive externalities as well. Beyond being simply a source of government financing, government securities perform roles in the domestic financial system such as a pricing benchmark and a risk-hedging instrument, which facilitate the development of corporate bond markets, housing finance, asset securitization, and markets for financial derivatives.

The role of the debt manager in market development is to a large extent focused on the primary market, i.e. what instruments are issued, when and how. However, the debt manager can play an important role in leading efforts to secondary market development.

10.7. Governance and the debt management strategy (chapter 9)

Effective governance is important in ensuring that a prudent debt management strategy is developed and adhered to. The reason is that debt management involves decisions that can significantly affect the government's budget and overall balance sheet. The tax payers will require assurance that these risks are managed appropriately, and that checks and balances and operations safeguards are in place. Furthermore, creditors and investors need to know that government debt managers have the authority to undertake transactions.

10.8. The strategy document

The debt management strategy is a short and concise document that explains the strategy in as clear and precise a language as possible. When drafting the document, the audience should be kept in mind, i.e. the legislature, the public, market participants, etc.

The main components of the strategy document:

- Objectives and scope
- Cost and risk of the existing portfolio
- The environment for debt management going forward
- The targets/guidelines for the strategy

Box 39. The 8 steps of the MTDS process

1. Identify the objectives for public debt management and scope of the MTDS.

2. Identify the current debt management strategy and analyze the cost and risk of the existing debt.

3. Identify and analyze potential funding sources, including their 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. Assess and rank alternative strategies on the basis of the cost-risk trade-off.

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.

In addition to these steps, the MTDS Guidance note highlights that once the medium term debt management strategy has been agreed, it should be disseminated through a published strategy document. The debt manager should then develop an annual borrowing plan that is consistent with the strategy.

Note that the process is closely aligned with the process of developing a strategy outlined in this publication.

For more detail see the MTDS Guidance Note.

As an important part in the governance structure, it is recommended that the strategy is a public document. Arguments for transparency includes enhancement of the effectiveness of debt management if the goals are clear and well understood and authorities are seen to make a credible commitment to meet them. In other words, a publicly available strategy strengthens accountability. From an issuance and market development point of view, a publicly available strategy makes the government debt manager more transparent and predictable, and it increases the certainty for investors, with the likely side-effect of lowering the borrowing cost to the Government in the long-run. Finally, the self-interest of debt managers would strongly suggest that the strategy should be a public document: the debt manager has to make financial recommendations under uncertainty, i.e. borrowing decisions have to be made today, but market rates will only be known in the coming years. A publicly available strategy reduces risk of criticism in the future “with wisdom of hindsight”.

Glossary

Amortizing structure: A security/loan where the principal is paid in installments. For a linearly amortizing structure the payments of principal are of equal size.

Average Time to Maturity (ATM): A measure of the sensitivity of the portfolio to refinancing risk. A lower number indicates that a higher relative share of debt will mature over the coming years, and therefore indicates higher risk.

Average Time to Re-fixing (ATR): The average time it takes for principal payments to be subject to a new interest rate. A low value of ATR suggests that the portfolio is, on average, facing a new interest rate frequently and therefore as a higher exposure to re-fixing shocks, i.e. higher exposure to increases in market rates.

Basis points: 10 basis points is 0.1 percentage point. By convention, interest spreads are expressed as basis points above a reference rate.

Benchmark bond: A bond that is used as reference when pricing other financial instruments. Benchmark bonds are characterized with having large outstanding volume and are actively trade in the secondary market.

Bullet structure: A security where the total principal is paid on the last day of the life of the security

Capital loss: When government securities are issued at prices different from par value, there are capital losses or gains that are part of the cost of the security. T-bills are zero-coupon instruments where the interest cost is in the form of a capital loss. From a budget/accounting point of view it is essential that capital losses are treated as interest costs.

Fixed interest rate bond: A repayment structure where the interest is fixed at the time of issuance, and remains fixed through the life of the security.

Foreign exchange rate risk: The risk that the cost of a security/loan increase due to a weakening of the domestic currency compared to the currency in which the instrument is denominated. Note that debt issued domestically with payments linked to a foreign exchange rate is treated as foreign debt from a risk management perspective.

Grace period: The grace period begins once the loan (or tranches of a loan) is disbursed. It is the period in the early life of a loan before principal repayments begin when the borrower pays only interest.

Interest rate risk: The vulnerability of the debt portfolio, and the cost of government debt, to higher market interest rates at the point at which the interest rate on variable interest rate debt and fixed interest rate debt that is maturing is being re-fixed.

Present value (PV): The value today of cash flows occurring in the future. Cash flows are discounted to today using a discount rate that appropriately captures the opportunity cost of those cash flows, i.e. takes into account the time value of money. The PV will always be lower than the sum of the nominal cash flows if a positive discount interest rate is applied.

Primary dealer: Primary dealers are financial institutions that have exclusive rights to participate in the primary auctions of government securities. The counterpart to such rights are obligations to by minimum amounts of government securities and to quote buy and sell prices in the secondary market.

Primary market: Market for newly issued government securities.

Refinancing risk: Measures the exposure of the debt portfolio to debt maturing and having to be refinanced, within a specific period of time. Refinancing risk focuses on the risk that the government have to refinance maturing debt at unusually high interest rate, or is not able to refinance maturing debt at all.

Re-fixing risk: Measure the exposure of the debt portfolio to changes in market interest rates within a specific period of time. The debt exposed to re-fixing risk is all debt with variable interest rate and the fixed rate debt that matures within the specified period.

Secondary market: Market for government securities after they have been issued.

Strategic targets: Targets used to specify the preferred direction of the composition of the government debt. Strategic targets are typically specified for a range of risk exposure indicators, and are often expressed as a band, or floor/ceiling.

Swap: A financial agreement under which two sets of cash flows are exchanged (swapped). The cash flows can be denominated in two different currencies, have fixed and variable interest rate etc. Swaps are executed to alter the risk characteristics of the portfolio.

Variable interest rate security: A security where the interest rate is re-fixed every period according to a market reference interest rate. Often a fixed spread is added to the reference interest rate.

Yield curve: The relationship between the level of interest rates and their maturities. A normally shaped yield curve is one where interest rates for short-term maturities are lower than for longer-term maturities. A declining yield curve is referred to as inverted