Abstract: Overview of Advances in Risk Management of Government Debt

This article is based on a new OECD study, *Advances in Risk Management of Government Debt*, that provides an in-depth overview and analysis of risk management practices of OECD debt managers. Risk management has become an increasingly important tool for achieving strategic debt targets, and is now an integral part of a wider strategic debt management framework based on benchmarks in most jurisdictions.

Risk management should be seen as an integral part of a wider strategic debt management framework based on benchmarks. A strategic benchmark plays a key role in the control of risk. The benchmark in its function as management tool requires the government to specify its risk tolerance and other portfolio preferences concerning the trade-off between expected cost and risk.

The risk management policy framework constitutes the critical connection between the formulation and implementation of debt management decisions. This risk framework includes in most countries market, credit, and operational risk, while only in relatively few OECD countries attention is paid to the risks related to contingent liabilities (although there is a growing interest in exploring their role in this policy area).

Debt managers need to have a view on the optimal structure of the public debt portfolio. Ideally, they should be able to assess how a portfolio should be structured on the basis of cost-risk criteria so as to hedge the government's fiscal position from various shocks. The optimal debt composition is derived by looking at the relative impact of the risk and costs of the various debt instruments on the probability of missing a well-defined stabilisation target.

Emerging market debt managers are generally facing greater and more complex risks in managing their sovereign debt portfolio and executing their funding strategies, than their counter-parts managing sovereign debt in the more advanced markets. At the same time, many emerging markets are not in the position to benefit from efficient international or domestic risk-sharing arrangements. In view of these structural obstacles, debt and risk management (including the specification of a strategic benchmark) need to be integrated into a broader policy reform framework.

Overview of Advances in Risk Management of Government Debt*

I. The growing importance of risk management of public debt in the OECD area

Modern risk management has become an important tool for achieving strategic debt targets in the OECD area. In essence, risk management policies, based on the use of formal methods, are now an integral part of debt management in most OECD jurisdictions. In general, risk management tolerances and policies are approved (and often set) by the Ministry of Finance (or other appropriate Ministry). This strategy about risks entails an explicit political decision about the trade-off between costs and risks. The actual risk management operation is often run at a separate agency responsible for management of the sovereign debt or at the central bank if it manages the debt, and is typically segregated from other treasury operations.

The risk management function is therefore part of the *wider institutional framework* for debt management, which includes the integration of the management of domestic and foreign debt. In fact, the trend to more autonomous debt management agencies is accompanied by an increased emphasis on *risk assessment and risk management*. As a result, the risk management function is now a central feature of debt offices in many OECD countries. This risk control function is in many debt offices organised in the form of separate *risk management unit* and as part of the middle office.

This article is based on a forthcoming OECD publication (Blommestein, 2005a). Many of the key policy findings in that publication reflect the outcome of meetings by OECD debt managers[1] on the role of risk management in achieving strategic debt targets. Much of the components of the required analytical framework in this policy area are not available from academic or other[2] sources. Consequently,

* This article was prepared by Hans J. Blommestein, senior economist in the Financial Affairs Division of the OECD Directorate for Financial and Enterprise Affairs.

OECD debt managers had to carry out the bulk of the analytical development work themselves.

The OECD publication provides an in-depth overview and analysis of risk management practices in OECD countries. Special focus is on the technical problems and policy issues related to market-, credit-, and operational risk as well as the risks associated with contingent liabilities. The discussion of recent trends and developments in the publication is accompanied by the presentation of an analytical framework for debt and risk management. The publication also provides an analysis of the use of recently developed cost and risk measures, asset-liability models, simulation models, and benchmarks. The final part of the publication gives an overview of risk management policies and risk control procedures and techniques, in a selected number of individual OECD countries.

Risk management should be seen as an integral part of a wider strategic debt management framework based on benchmarks (see section II). The risk management policy framework constitutes the critical connection between the formulation and implementation of debt management decisions.[3] This risk framework includes in most countries the following risks: market risk (interest and currency risk), credit risk, and operational risk. In relatively few OECD countries debt managers are involved in the risks related to contingent liabilities, although there is a growing interest in exploring their role in this policy area.[4]

II. The role of strategic benchmarks as risk management tools[5]

A strategic benchmark plays a key role in the control of risk. The benchmark in its function as a management tool requires the government to specify its risk tolerance and other portfolio preferences concerning the trade-off between *expected* cost and risk.

To that end, debt managers need to have a view on the optimal structure of the public debt portfolio. Ideally, they should be able to assess how a portfolio should be structured on the basis of cost-risk criteria so as to hedge the government's fiscal position from various shocks. The *optimal debt composition* is derived by looking at the relative impact of the risk and costs of the various debt instruments on the probability of missing a well-defined stabilisation target (*e.g.* the stabilisation of the debt ratio at some target value, thereby reducing the probability of a fiscal crisis; see Annex). This framework would allow the pricing of risk against the expected cost of debt service. This price information makes it possible to calculate the optimal combination along the trade-off between cost and risk minimisation.[6]

This means that the choice of debt instruments that a government should issue depends in large part on the structure of the economy, the nature of economic

shocks, and the preference of investors. For example, fixed-rate nominal debt (expressed in local currency) would help hedge the budgetary impact of supply shocks, while inflation-indexed debt instruments are a better hedge than nominals in case of demand shocks. This example also makes clear that cost-effectiveness (although very important) should not be the sole decision criterion when governments and debt managers assess which (new) instruments to issue or not.

Against this backdrop, the government needs to specify *a strategic benchmark*, representing the desired structure or composition of a liability (and asset) portfolio in terms of financial characteristics such as currency and interest mix, maturity structure, liquidity, and indexation. It is a management tool that requires the government to specify its risk tolerance and other portfolio preferences concerning the trade-off between *expected* cost and risk.

For a debt manager a strategic benchmark represents the longer-term structure of the debt portfolio the government wishes to have, taking also into account the risks at the asset side. Strategic benchmarks have two key roles:

a) They provide guidance for the management of costs and risk.

b) Portfolio benchmarks also define a framework for assessing portfolio performance in relation to cost, return, and risk.

III. The use of risk management tools by OECD debt managers

The forthcoming publication on advances in risk management of government debt (Blommestein, 2005a) provides a comprehensive overview of risk management practices by OECD debt managers. Although the overview shows that the extent of risk management varies widely across countries, the majority of OECD countries are actively engaged in risk management. Risk is typically not managed on a consolidated basis across all government entities. Sources of risk exposure are tied to the domestic debt management activities of the central governments, which include management of the domestic treasury bill and bond programs, and associated asset and cash management operations. Sources of risk exposure can also arise from the management of national foreign currency reserves in those countries where the reserves are not managed separately by the central bank. Derivative operations related to either the domestic or foreign reserve activities of the central government such as interest-rate and currency swaps, are used as part of the management of market risk. However, their use provides new sources of credit risk exposure.

In general, risk management tolerances and policies are approved (and often set) by the Ministry of Finance (or other appropriate Ministry). The actual risk management operation is often run at a separate agency responsible for manage-

ment of the sovereign debt. Market risk, credit risk, liquidity risk and refunding risk are the risks most likely to be managed. Operational risk and legal risk are less likely to be formally managed. Thus far, most OECD debt managers have played only a small role in managing the risks associated with contingent liabilities. More recently, however, government debt managers in a greater number of OECD countries are becoming interested or involved in the monitoring of explicit contingent liabilities, designing contingent-based instruments, and making recommendations to the government on appropriate provisioning.[7]

The use of recently developed risk management tools typically allows for a separation between considerations about the funding strategy and risk management targets. Another desirable feature of these risk models is that all sovereign liabilities are managed as a single (integrated) portfolio. The next conceptual and practical step is to expand the pure liability risk management framework with public assets, resulting in an asset and liability management (ALM) framework. The central insight here is that resources (and the assets that generate them) are key for the assessment and management of risk (and not only the structure of liabilities). Several different measures are typically used in combination to monitor market risk and credit risk. In general, OECD countries with active risk operations update market risk and credit risk positions on a daily basis. Risk management systems that are in use tend to be a combination of internally developed models, specialised purchased applications and general software.

IV. Organisation of risk management and place of the auditing function

The risk management function has become a central feature of the operation of debt offices in many jurisdictions.[8] This function is usually organised in the form of a separate *risk management unit* which may be part of the middle office (MO). In some cases this MO unit has responsibility for a wide range of analytical tasks, including the development of alternative debt strategies, and the monitoring and operational management of the stock of outstanding sovereign debt. Even if the MO´s mandate is limited to the control of risk in a more narrow sense, it still has a very central role in the debt office. The principal reason is the need to include all departments and all aspects of the debt office's work in the risk control framework, thereby incorporating all relevant departments and all debt management activities in an *integrated* risk management framework. This portfolio framework should be based on clearly articulated responsibilities for all staff involved, a transparent framework for the monitoring and control of activities, as well as clear and transparent reporting arrangements. In order to execute effectively the risk management function, the head of the MO should have the proper level of seniority and authority, while reporting directly to the senior management of the debt office.

In parallel, the demand for transparency and accountability about the risk profile has increased. Therefore the *auditing function* also plays a crucial role. To that end, a debt office needs to have a professional audit unit. This unit would have as an important task the assessment of the quality of *risk control systems*. In addition, DMO operations (including risks management operations) need to be audited by an external agency with the required competence and capacity (this is usually the *general audit agency* of the government such as *de Rekenkamer* in the Netherlands or the GAO in the United States).

V. Major challenges and next steps in OECD jurisdictions

Recent meetings of the OECD Working Party on Debt Management revealed a number of areas which appear to be at the forefront of current risk management work or thinking in OECD member countries:

a) Risk management has become an increasingly important tool for achieving strategic debt targets, and is now an integral part of a wider strategic debt management framework based on benchmarks in most jurisdictions. Benchmarks and stress testing are important tools in setting risk limits. However, the development of appropriate benchmarks and stress tests is in practice not a straightforward exercise.

b) The use of benchmark portfolios to evaluate the management of the government's debt portfolio is common among several debt managers. The cost and risk characteristics of the actual debt portfolio are compared to those of the benchmark debt portfolio. But to make further progress in performance management in debt management, several issues need to be resolved.[9] F*irst*, who has the ultimate responsibility for debt management (who is the agent and who is the principal?), while it also necessary to determine the appropriate level for the debt office (for example, is it the execution layer?). S*econd*, since there are different layers for measuring performance (for example, political-, strategic-, and execution levels), determining the appropriate levels of delegation is also important. T*hird*, more work is also needed about reaching a common understanding about the key elements of the measurement of performance. The identification of specific strategic benchmarks for performance measurement is essential, but at this stage of development (where the concept of benchmark means different things to different debt managers) very hard to determine. In the interim (that is, in the absence of these specific benchmarks), qualitative measures and peer-reviews may have to be used instead.

c) OECD debt managers pay increasingly attention to the significant balance sheet risks associated with contingent liabilities. Several key questions need to be addressed.[10] F*irst*, to what extent should debt managers be

made responsible for, or involved in, the design and/or management of guarantees? In other words, which contingent liabilities should be managed by the debt manager? S*econd*, should debt managers include the risks of state guarantees when analysing and deciding on the risk profile of the conventional government debt portfolio? If so, to what extent? T*hird*, how to design and implement a framework for monitoring contingent liabilities, how to design contingent-based instruments, and how to calculate provisions for expected losses in the government budget?[11]

d) To what extent should debt managers manage overall government's balance sheet risk? In other words, to what extent should debt managers be assigned responsibility for overall risk management of the government's balance sheet? At this strategic level the key question is which (part of the) liabilities, but also assets, are under the responsibility of the debt manager. After determining the scope of the risk framework, the next step is to agree on the degree of centralisation and integration of the risk control framework.

e) To what extent should treasury and cash management functions be included in the risk management framework?

f) Which accounting principles should be used by the debt manager? Are public accounting systems in the various jurisdictions capable of providing a true and reliable valuation of the debt? Are they suitable for producing a complete balance sheet of the government, including off-balance sheet commitments (such as contingent liabilities) and assets? And are (public) accounting standards capable of true and reliable valuations of the various risks? Is it possible to use fair value accounting? Which valuation methodology should be used (mark-to-market *versus* mark-to-curve)?

g) The pros and cons of using dynamic, macro-economic asset-liability models (ALM) *versus* more modest versions of ALM (*e.g.* static or financial ALM) needs to be further studied.

h) Debt managers will also need to make an assessment of the usefulness and feasibility of using quantitative macro models. This includes an assessment of: structural models *versus* time-series; the complexity, simplicity and the need for robustness; the scope for stress testing; the use of deterministic scenario vs. stochastic simulation models; the employment of these models in benchmarking exercises; performance measurement; the impact of macro-economic volatility; and so on. A dynamic macro ALM framework is conceptually superior as it allows the incorporation of all future flows of tax revenues and expenditures by using a structural macro model that also determines the principal debt costs (such as price indices, interest rates and exchange rates). This risk framework is of course only as good as it weakest link. In particular the use of the underlying econometric model of the economy

may be too unreliable due to unstable parameters of interest (as a result of the Lucas critique). In that case the use of a dynamic, macro ALM framework is not very useful for assessing and preparing policy options.

Clearly, further progress in the *practical* use of risk management tools by sovereign debt managers is in large part dependent how successfully these policy issues and problems are being tackled.

VI. Complexities in the design and implementation of strategic benchmarks in emerging debt markets

As noted, the specification of strategic benchmarks requires governments of emerging markets to specify their risk tolerance and other portfolio preferences concerning the trade-off between *expected* cost and risk. To that end, debt managers need to articulate a view on the optimal structure of the public debt portfolio, derived from the overall debt management objective of minimising a country's fiscal vulnerability. But this means that the choice of debt instruments depends in large part on the structure of the economy, the nature of economic shocks, and the preference of investors.

However, in designing and implementing strategic benchmarks, debt managers operating in emerging markets are generally facing greater challenges than their counter-parts managing sovereign debt in the more advanced markets.[12] The structure or composition of the outstanding debt in emerging markets is in most cases much more complex, while volatility in the macro environment is usually much higher than in advanced markets. An increasing body of research shows that emerging market economies lack the natural stabilising structural characteristics that allow the use of effective counter-cyclical policies.[13] Moreover, emerging debt managers are facing "original sin" (the situation in which it is difficult or impossible to borrow in nominal terms in the domestic currency). Emerging debt managers are therefore facing greater and more complex risks in managing their sovereign debt portfolio and executing their funding strategies. At the same time, many emerging markets are not in the position to benefit from efficient international or domestic risk-sharing.

Somewhat paradoxically, it can be argued that these debt managers have a greater need for quantitative risk management tools but, at the same time, the greater complexity of the structure of the risk as well as higher macro volatility make it much harder to implement and use some of these more advanced risk tools. For example, structural macro models are less stable in a more volatile environment and therefore the reliability and robustness of their use in a dynamic ALM framework are questionable.

Because of these structural difficulties, it will also be much harder to define quantitative benchmarks with desirable properties in terms of the trade-offs between costs and risk. As a result, it will be more difficult for emerging market debt managers (in comparison with their counter-parts from more advanced debt markets) to construct an optimal debt portfolio that can serve as a reliable guide for performance measurement.

A key challenge in emerging markets such as Brazil, China, Argentina and India is to develop meaningful benchmarks tools and related risk control procedures, that are at the same time relatively simple and robust to employ in a relatively more volatile environment.

Another challenge is how to deal with the fact that serial default on debts is in fact the rule rather than the exception in many jurisdictions.[14] Because of this (in some lower-income country cases the odds of default are as high as 65 percent) some analysts[15] have argued that debt managers from emerging markets should aim for far lower levels of external debt-to-GDP rations than has traditionally been considered prudent. For example, for emerging markets with a bad credit history this may imply prudent ratios for external debt in the 15-20 percent of GDP range.[16]

Moreover, advanced markets are capable to share to a significant degree their risks with their creditors,[17] while this is not (or much less) the case for emerging market economies.[18] This is an additional (though related) reason why the benchmark should incorporate the prudential notion that governments in emerging markets should hold relatively less foreign debt than those from advanced market jurisdictions, while they also need to hold higher reserves (and smaller current account deficits). The strategic benchmark (derived in principle for the entire portfolio of assets and liabilities) is also likely to show the notion that larger shares of inflation-indexed local currency debt (in comparison with many existing portfolios) are beneficial.

In view of these structural obstacles, the risk management of government debt should be part of a broader policy reform framework. What is needed is the integration of debt and risk management (including the specification of a strategic benchmark) into this framework. The paramount, overall objective in many emerging markets is reducing the country's fiscal vulnerability and restoring the credibility of monetary policy, while tackling incomplete and weak financial and insurance markets. This objective requires such standard measures as cutting public expenditures, boosting the private saving rate, broadening the tax base, and strengthening a country's capacity to export.[19] It also requires institutional reform measures including stronger property rights and more efficient bankruptcy procedures, thereby improving the conditions for the development of more complete and stronger markets for risk-sharing and risk-pooling. This in turn would contribute to

eliminating the sources of deep-seated emerging market risks, including currency and maturity mismatches, weak and ineffective prudential oversight, opaque supervisory practices often mirrored by non-transparent transactions in banking and capital markets, a weak institutional infrastructure, and an inadequate exchange rate regime.[20]

It is against this backdrop of a broader policy reform agenda that a risk management framework for government debt as those used in advanced markets should be implemented, including the specification of a strategic benchmark (see the Annex for details). Nonetheless, this integrated framework should be sufficiently flexible and pragmatic to absorb various shocks so as to overcome crisis situations. This may involve a temporary deviation from a pre-announced debt issuing programme based on a strategic benchmark.[21] For example, during a serious crisis situation the DMO may have to resort to issuing shorter maturity instruments than previously announced, and the issuance of fixed nominal debt or inflation indexed bonds may have to be temporarily suspended. It may also be necessary to provide liquidity for fixed rate positions. These pragmatic responses[22] will not necessarily undermine the debt strategy as being an expression of opportunistic debt management as long as the debt managers and other financial authorities continue to communicate in a transparent fashion with markets, including by explaining the rationale of their actions. Moreover, as soon as market conditions return to a normal situation, the earlier announced debt strategy must be continued (for example, reducing the share of floating debt, increasing the share of inflation linkers, and lengthening the maturity of domestic debt).

However, short-term deviations from the strategic benchmark should not become short-term "solutions" to procrastinate, rather than prompt decisive actions to overcome a sudden stop in capital inflows. When a country is responding to a foreign credit crunch (in financing its external deficit) by issuing massive amounts of short-term foreign currency debt, then the resulting mismatch on the country's balance sheet is setting the stage for a very costly currency crash.[23]

In sum, structural weaknesses in emerging markets create more volatility in macro-economic outcomes. The more volatile the economy is, the more prudent the policy stance needs to be.[24] This fundamental notion of prudence should be reflected in the strategic benchmark.

Notes

1. These meetings were held under the aegis of the OECD Working Party on Debt Management (WPDM).
2. Such as investment banks.
3. See Blommestein (2002).
4. Past and ongoing work by the OECD Working Party on Public Debt Management (WPDM) on risk management includes: market risk (interest and currency risk), credit risk and operational risk. Currently, the WPDM is focusing on the problems and management issues related to the risks of contingent liabilities. See for details on the outcome of these projects Chapters 2 and 6 in Blommestein (2005a).
5. Another project of the OECD WPDM, led by the UK Debt Management Office, focuses on the use of benchmark portfolios, including the role of risk management objectives when designing performance measurement systems.
6. See, for example, Giavazzi and Missale (2004).
7. See for further details Chapters 2 and 6 in Blommestein (2005a).
8. See Kalderen and Blommestein (2002).
9. An *ad hoc* experts' group of the OECD Working Party on Debt Management studies issues related to performance management.
10. Some of these issues were identified as part of the OECD Working Party's project on contingent liabilities.
11. Policy recommendations can be found in a first report on the role of explicit contingent liabilities in debt management. This report on best practices in managing guarantees was prepared by an *ad hoc* experts' group of the OECD Working Party on Debt Management. See Chapter 6 in Blommestein (2005a).
12. Blommestein (2004).
13. Garcia and Rigobon (2004).
14. Reinhart and Rogoff (2004).
15. *Ibid.*
16. It has also been argued that emerging markets are more vulnerable for a slowdown in growth, leading to unsustainable debt levels. In this view, lower growth has a significant impact on debt ratios via a reduction in tax income and the primary surplus (Easterly 2002). However, beyond a certain threshold, there is also evidence of reverse causality of a negative impact of high debt on growth (Pattillo *et al.* 2004).

17. Usually the foreign debt position of advanced markets does *not* involve a net foreign currency exposure.
18. Hausmann (2004).
19. See also Rajan (2004).
20. The complexities involved in eliminating these sources (or at least reducing their impact) have been underestimated or misjudged by many analysts and policy makers. De la Torre and Schmukler (2004) make the important observation that many of these structural sources of risk are in fact the *endogenous outcome* of the interactions of rational agents (including debt managers) with the market environment. From this perspective these deep-seated structural weaknesses can even be interpreted as risk-coping devices. De la Torre and Schmukler (2004) argue that these risk-coping mechanisms are jointly determined and each of them involves trade-offs. The costs of their removal may even be prohibitive when undertaken without taking into account the overall macro-economic and structural situation. The introduction of new technical debt management procedures or instruments (called "clever solutions" by Rajan, 2004) such as letting multilateral organisations like the IMF and World Bank issue bonds in the emerging market currency or as debt indexed to the local inflation rate or bonds in a synthetic unit of account (based on a weighted basket of emerging-market currencies), will then be counter-productive or even backfire. The execution of the debt strategy needs to be attuned to the underlying macro policy stance and the situation (including assessments by investors) in the global financial market environment. This is another illustration why debt management in emerging markets is in general a much greater challenge than in more advanced markets.
21. As noted in section II, the specification of a benchmark portfolio represents the desired *longer-term* structure or composition of the government debt portfolio.
22. These pragmatic responses are another illustration of the insight that (some of) the structural weaknesses or features of a typical emerging market economy (a high degree of short-termism in the form of currency and maturity mismatches, financial dollarisation or euroisation, and illiquid domestic financial markets) are to an important degree the (endogenous) outcome of rational responses by debt managers and other market participants.
23. Frankel (2004) refers to this policy response as "gambling for resurrection". Buying time by running down reserves and shifting the composition of the debt toward foreign currencies is likely to wreak havoc with private balance sheets when a forced adjustment of the external balance finally takes place, "regardless of the combination of increases in interest rate and currency depreciation" (Frankel, *ibid*).
24. Hausmann (2004).

Annex

Optimal debt and strategic benchmark: The risk management approach to debt sustainability

As noted in section II, the optimal debt composition is calculated by assessing the relative impact of the costs and risk of the different debt instruments on the debt ratio, B (debt-to-GDP). In essence, the choice of debt instruments trades off the risk and expected costs of debt service.[1] Reducing the variability in the primary surplus (or deficit) and the debt ratio (for any given expected cost of debt service) is desirable, because it reduces the probability of a fiscal crisis due to adverse shocks to the budget (that in turn might trigger a financial crisis).

Let's assume that the *overall or wider* debt management objective[2] is to reduce the country's fiscal vulnerability by stabilising the debt ratio. We shall use the following debt management model[3] to illustrate the trade-offs between expected cost of debt service and the risk in choosing different debt instruments. In order to stabilise at time t the debt ratio, $B_{(t)}$, the *fiscal authority* decides to implement a fiscal reform programme, taking into account the realisation of debt returns, output, $Y_{(t)}$, inflation, $\Pi_{(t+1)}$, and the exchange rate, $e_{(t)}$. Success of a stabilisation programme is by definition uncertain. As a result, a debt-cum-financial crisis cannot be prevented with certainty. When a debt crisis arises, the debt ratio increases rapidly:[4]

$$\overline{B}_{(t+1)} - \tilde{A}_{(t+1)} + \varepsilon \succ B_{(t)} \qquad \text{(A-1)}$$

where $\overline{B}_{(t+1)}$ is the trend debt ratio,[5] $\tilde{A}_{(t+1)}$ is the expected fiscal adjustment; and ε is a shock to the budget (external shocks such as oil price hikes or internal shocks such as the discovery of "hidden" contingent liabilities[6]).

Debt accumulation $\Delta\overline{B}_{(t+1)} = \overline{B}_{(t+1)} - B_{(t)}$ is driven by:

$$\Delta\overline{B}_{(t+1)} = I_{(t+1)}B_{(t)} + \Delta e_{(t+1)}b_2B_{(t)} - \overline{S}_{(t+1)} - [\Delta \ln Y_{(t+1)} + \Pi_{(t+1)}]B_{(t)} \qquad \text{(A-2)}$$

where $I_{(t+1)}B_{(t)}$ is total nominal interest payments on outstanding amount of debt; $e_{(t+1)}$ is the log of the nominal exchange rate; b_2 is the share of foreign currency-denominated debt; $\overline{S}_{(t+1)}$ is the trend primary surplus; ln Y is log output; and $\Pi_{(t+1)}$ the rate of inflation.

Total interest payments are equal to:

$$I_{(t+1)}B_{(t)} = i_{(t+1)}b_1B_{(t)} + [\tilde{R}_{(t)} + RP_{(t)}][1 + \Delta e_{(t+1)}]b_2B_{(t)} + [r_{(t)} + \Pi_{(t+1)}]b_3B_{(t)} + R_{(t)}[1 - b_1 - b_2 - b_3]B_{(t)} \qquad \text{(A-3)}$$

where b_1 is the share of debt indexed to the (average) domestic interest rate $i_{(.)}$; $\tilde{R}_{(.)}$ is the world (dollar) interest rate; $RP_{(.)}$ the risk premium; $r_{(.)}$ is the real interest rate; b_3 is the share of price-indexed debt; and $R_{(.)}$ is the nominal rate of return on nominal fixed-rate bonds.

The ratio of the trend surplus-to-GDP, $\overline{S}_{(.)}$ depends on cyclical conditions and unanticipated inflation:

$$\bar{S}_{(t+1)} = E\bar{S}_{(t+1)} + \eta_1(y - Ey) + \eta_2(\Pi_{(t+1)} - E\Pi_{(t+1)}) \quad \text{(A-4)}$$

where $E_{(.)}$ denotes expectation conditional on the available information at time t; η_1 is the semi-elasticity of the government budget (relative to GDP or output); η_2 is the semi-elasticity with respect to the price level; and $y = \text{In } Y_{(t+1)}$. Hence, expression (A-4) captures the notion that $\overline{S}_{(.)}$ can be higher than expected because of output surprises and/or inflation surprises.

The optimal debt portfolio (that is, the choice of debt denomination and indexation) is based on the minimisation of the probability that the expected fiscal adjustment programme fails:

$$\text{Min}\{E_{(t)}\text{Prob}[\varepsilon \succ \widetilde{A}_{(t+1)} - \Delta\overline{B}_{(t+1)}\} \quad \text{(A-5)}$$

subject to (A-2), (A-3) and (A-4). Solving (A-5) with respect to b_1, b_2 and b_3 yields the optimal debt structure. These first-order conditions show also the trade-off between the risk and expected cost of debt service related to the choice of debt instruments.[7] As noted in section II, the optimal debt composition constitutes the basis for the specification of the strategic benchmark.

The risk management approach to debt sustainability goes therefore beyond the traditional debt sustainability literature that focuses simply on determining the primary deficit (surplus) and/or growth rate of GDP that would keep the debt level at a certain level. The traditional approach analyses in essence debt sustainability in the absence of risk. The risk management approach, in contrast, shows that risk is minimised if a debt instrument provides insurance against variations in the primary budget and the debt ratio due to uncertainty about output and inflation.

The next step would be to use a structural macro-economic model to investigate *how* the optimal debt portfolio depends on the type of shocks (demand, supply, spreads).[8] An alternative approach is to use a VAR methodology for modelling the links between macro variables.[9]

Notes to the Annex

1. See, for example, Giavazzi and Missale (2004).
2. This overall or wider debt management objective should be seen as encompassing the following conventional (more narrow) debt management objectives: *a*) undisturbed access to markets to finance the budget deficit at lowest possible borrowing cost, subject to *b*) an acceptable level of risk. This follows from the need, noted before, that debt and risk management (including the specification of a strategic benchmark) need to be integrated into a broader policy reform framework. The successful implementation of this policy reform framework is important for achieving debt management objectives *a*) and *b*).
3. This model is based on Giavazzi and Missale (2004).
4. This expression can also be interpreted as including the notion that the debt ratio must exceed a critical threshold for a crisis to arise, by interpreting Ã as the sum of expected adjustment and the difference between and its threshold (*cf.* Giavazzi and Missale, 2004).
5. This is the debt ratio that would materialise in the period t+1 in the absence of fiscal adjustments.
6. The debt increases when implicit or explicit contingent liabilities are transformed into actual liabilities. For example, a recent World Bank Study of public debt dynamics shows that the realisation of (implicit and explicit) contingent liabilities contributes nearly 50 per cent to the increase in public debt in a sample of 21 emerging markets. (See Anderson, 2004.)
7. See expressions (15)-(17) in Giavazzi and Missale (2004).
8. See Giavazzi and Missale (2004).
9. See Garcia and Rigobon (2004).

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Résumé : Aperçu des progrès de la gestion des risques inhérents à la dette publique

Cet article s'inspire d'une nouvelle étude de l'OCDE, *Advances in Risk Management of Government Debt* (*Les progrès de la gestion de la dette publique*, à paraître), qui procède à un tour d'horizon et à une analyse approfondie des pratiques de gestion des risques des gestionnaires de la dette publique des pays de l'OCDE. La gestion des risques est devenue un instrument important pour atteindre des objectifs stratégiques et, dans la plupart des pays, elle fait désormais partie intégrante du dispositif stratégique plus général d'une gestion de la dette s'appuyant sur des références.

L'existence d'une référence stratégique joue un rôle essentiel dans la maîtrise des risques. Par sa fonction d'instrument de gestion, la référence impose au gouvernement de spécifier sa tolérance aux risques ainsi que d'autres préférences relatives au compromis entre coût et risque attendus dans le cadre du portefeuille de la dette publique.

Le dispositif de la politique de gestion des risques constitue le lien critique entre la formulation et la mise en œuvre des décisions en matière de gestion de la dette. Ce dispositif en matière de risques inclut dans la plupart des pays le risque de marché, le risque de crédit et le risque opérationnel, tandis que dans un nombre relativement restreint de pays de l'OCDE ont accorde une attention particulière aux risques relatifs aux passifs éventuels (même si l'on s'intéresse de plus en plus à l'étude de leur rôle dans ce champ d'action des pouvoirs publics).

Les gestionnaires de la dette doivent avoir une vision de la structure optimale du portefeuille de la dette publique. Dans l'idéal, ils doivent pouvoir apprécier la façon dont il convient de structurer un portefeuille sur la base de critères de coûts et de risques de façon à protéger la position budgétaire de l'État contre divers chocs. On détermine la composition optimale de la dette en étudiant l'impact relatif des risques et des coûts des différents instruments de la dette sur la probabilité de ne pas atteindre un objectif de stabilisation précis.

Sur les marchés émergents, les gestionnaires de la dette sont généralement aux prises à des risques plus importants et plus complexes lorsqu'il s'agit de

gérer le portefeuille de la dette souveraine et de mettre en application leur stratégie de financement que ce n'est le cas sur les marchés plus avancés. Parallèlement, de nombreux marchés émergents ne sont pas en mesure de tirer parti d'une répartition efficiente des risques à l'échelle internationale ou nationale. Compte tenu de ces obstacles structurels, la gestion de la dette et des risques (notamment la spécification d'une référence stratégique) doivent être intégrés dans le cadre d'une réforme plus générale de l'action des pouvoirs publics.