

Risk Management of Government Debt

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I. Introduction

An important lesson of the recent financial crises in emerging market countries is that inadequate risk management practices of corporate firms and financial institutions can lead to structural vulnerability of the entire economy and thus to financial crises. Imprudent resource allocations and resulting non-performing debts in the balance sheet of financial institutions ultimately increase government debt through explicit and implicit government guarantees in emerging market countries. Indeed, in the aftermath of the 1997-98 crises, central government debts in many crisis-ridden countries have rapidly increased. While upgrading debt management capacity of the government became an urgent task in response to the growing volume of sovereign debts, an effective debt management scheme has yet to be established in many emerging market countries.

With a view to upgrading its debt management capacity, the Korean government has attempted various reform efforts. In 2000, a debt management task force unit was established at the Ministry of Finance and Economy in order to support policy and middle office functions in the management of sovereign debt. The Korean government also launched the National Finance Information System (NFIS) for effective consolidation and real-time monitoring of fiscal information. However, regardless of the reform efforts, more endeavors are required for the government to upgrade its rudimentary debt management scheme to the level of global best practices and to put it into an appropriate organizational framework. The Korean government needs to fully understand various risks associated with its sovereign liabilities in reflection of sovereign assets. It also needs to better meet its financing requirements by effectively

containing vulnerability potentially arising from the changes in sovereign asset and debt conditions.

The objective of the present paper is to review and describe a sovereign debt management framework for Korea with a special attention to risk management and strategic benchmarking of the government debt portfolio. Section 2 overviews objectives and functions of sovereign debt management. Section 3 describes recent developments in Korea's government debt. Section 4 provides a conceptual framework for strategic sovereign debt risk management. Finally, section 5 addresses some institutional issues for effective debt management and provides concluding remarks.

II. Objectives and Functions of Government Debt Management

Sovereign or government debt management refers to the systematic management of the entire process involved in government funding operations. The key objective of a sovereign debt management is to fund the national debt at a reasonable financial cost and in such a manner that any volatility in financial markets has a limited impact on the budgeted cost.¹ According to Lee et al (1999), more detailed and specific objectives for government's debt management can be summarized as in Table 1.

For an effective sovereign debt management, a set of key functions must be performed in a coordinated manner. The key debt management functions include forecasting, planning, designing and implementing policies, issuing and marketing securities, accounting, and information functions to name a few. These functions are all

¹ For an excellent survey and discussion of the objectives of sovereign debt management in various countries see Carracedo, M. and P. Dattels (1997), Cassard, M. and D. Folkerts-Landau (1997), among others.

important to achieve the objectives of the government debt management outlined above. According to Carracedo and Dattels (1997), debt management policies can be classified into strategic and tactical policies. Strategic policies concern the overall design and implementation of the debt management program, including the types of debt instruments to be issued; the specific selling arrangements used for the primary issuance; design of the institutional framework to support the secondary market activities. On the other hand, tactical policies set the guidelines regarding the management and portfolio composition of the existing stock of government debt, including the composition of different instruments, maturity profile, and often the target duration. The risk management framework, the main focus of the present paper, can also be seen as a key element of tactical debt management policies.

In countries with relatively large volume of government debt outstanding, in general greater emphasis is given to cost minimization within adequate range of risk exposure in the management of government debt and formulation of tactical policies. Among those countries focusing on the cost-risk minimization as the main objective of debt management, a growing number of countries are relying on quantitative risk-return analysis for the formulation of the tactical policies to minimize cost within acceptable risk tolerance range.² However, as noted by Lee et al. (1999) quantitative risk-return framework widely employed in the private sector may not be as readily and practically applicable to sovereign debt management for several reasons. First, unlike portfolio management in the private sector, the government debt management may have several objectives other than cost / risk minimization. Second, given the significance of the

² According to Carracedo and Dattels (1997), countries employing quantitative tactical approaches based on risk-return analysis include the following: tactical policies based on identified cost-risk trade-off (Canada); cost minimization based on a performance benchmark (Ireland, Sweden); tactical policies

government's presence in the domestic market, active debt management could disrupt the financial market and increase uncertainty. Third, the characteristics of the government's typical assets make the application of modern asset-liability techniques difficult.

<Table 1> Objectives of the Government Debt Management

Basic Objective	- Covering the government's borrowing needs
Complementary Objectives - relating to the conduct of government borrowing and debt management policies	<ul style="list-style-type: none"> - Ensuring the government's continued access to the financial markets - Minimizing borrowing costs - Ensuring an effective and efficient liability management with regard to costs and risks - Structuring liabilities to match government assets; - Minimizing the market impact of government debt operations - Broadening the range and the distribution of government debt instruments - Ensuring an effective management of new issue operations - Ensuring an efficient functioning of the secondary markets for government securities - Achieving a balanced maturity structure
Complementary Objectives - in support of other policies	<ul style="list-style-type: none"> - Contributing to an improved functioning of financial markets - Contributing to the development of the bond market - Promoting household saving in general or longer-term forms of household savings - Contributing to a better distribution of income and private wealth
Special Objective	- Coordinating between debt management policy and monetary policy

Source: Lee et al. (1999)

Implementing the policies and debt programs through day-to-day operations also requires a set of operational functions. These include primary issuance function, secondary market function, cash management function, information function, and

based on asset-liability framework (New Zealand), among others.

accounting function, among others. Primary issuance function is responsible for the decision and activities directly related to placing government debt. For instance, the existence of a deep and liquid secondary market is of critical importance for smooth and successful funding operations in the primary market. The debt management authority also plays a key role for the development of an efficient secondary market by providing adequate infrastructure and regulatory framework to support the market, and through issuance policies conducive to the market development. The cash management function is to meet the daily cash requirements of the government at a minimum cost, including the opportunity cost associated with the idle, non-invested funds. Detailed discussions of the operational functions are beyond the scope of the present paper.

III. Government Debts in Korea

III.1. Scope of Government Debt

The word ‘government debt’ or ‘sovereign debt’ refers to the debt incurred by the consolidated government budget. It includes direct debts of the central government and local governments, and excludes contingent liabilities and debts of the central bank and public enterprises. In Korea, the consolidated central government budget covers the general and special accounts and public funds. The public funds are not part of the budget that requires authorization from the National Assembly, but their operational plans are reported to the National Assembly.

Among other debts that are not directly included as sovereign debt, of particular concern are the bonds issued by the Korea Deposit Insurance Corporation (KDIC) and

the Korea Asset Management Corporation (KAMCO). These bonds were issued to finance government-led financial restructuring programs for bank recapitalization and resolution of non-performing loans. These bonds explain most of the increase in government debt-guarantees since 1997. Since these KDIC and KAMCO funds are classified as ‘other’ funds, they are excluded from the consolidated budget and the bonds issued by them are not counted as part of sovereign debts. Nevertheless, these bonds are government bonds all but in name since the government pays for the interest accruing on them and guarantees their principal.

Another concern is the Monetary Stabilization Bond (MSB) issued by the Bank of Korea. The MSBs affect the government finance through the profit-and-loss account of the Bank of Korea. A small portion of the Bank's operating profits are set aside for the Bank's capital accumulation and the rest is transferred to the government general account as non-tax revenues. Interest payments on MSBs reduce the Bank of Korea's operating profits and thus the non-tax revenues of the government. Hence, the interest payments on MSBs appear in the government budget not as direct expenditures but as reductions in revenue, and as a result, their impact on the budget balance is the same as interest payments on any other government bonds.

III.2. Trends and Composition of Government Debt

As summarized in Table 2, as of the end 2003, the sovereign debt of Korea amounted to 165.7 trillion won, or approximately 23 percent of nominal GDP. When the government debt guarantees are included, the amount increases to 246.3 trillion won, or 34.2 percent of GDP. As a proportion to GDP, Korea's sovereign debt is not very large relative to

other countries (Figure 1). As of the end 2003, sovereign debt to GDP ratios of other countries were; U.S. 63.4%, Japan 154.6%, Germany 65.3%, U.K. 53.5%, and OECD average 78.2%. However, as can be seen in Figure 2, when government debt guarantees are included, current total liabilities of approximately 35 percent is historically highest.

<Table 2> Trends of Government Debt in Korea

	(Trillion won, %)			
	2000	2001	2002	2003
Sovereign Debt ¹	111.4	122.1	133.6	165.7
(% of GDP)	(19.2%)	(19.6%)	(19.5%)	(23.0%)
(Central Government Debt)	(100.9)	(113.1)	(126.6)	(158.8)
Debt Guarantees	74.6	106.8	102.5	80.6
(% of GDP)	(12.9%)	(17.2%)	(15.0%)	(11.2%)
(KDIC and KAMCO Bonds)	(68.2)	(97.3)	(95.3)	(77.4)
Total	185.9	228.8	236.1	246.3
(% of GDP)	(32.1%)	(36.8%)	(34.5%)	(34.2%)

Notes: 1) Sovereign debt includes direct liabilities of central government and local governments.

2) KDIC and KAMCO denote Korea Deposit Insurance Corporation and Korea Asset Management Corporation, respectively.

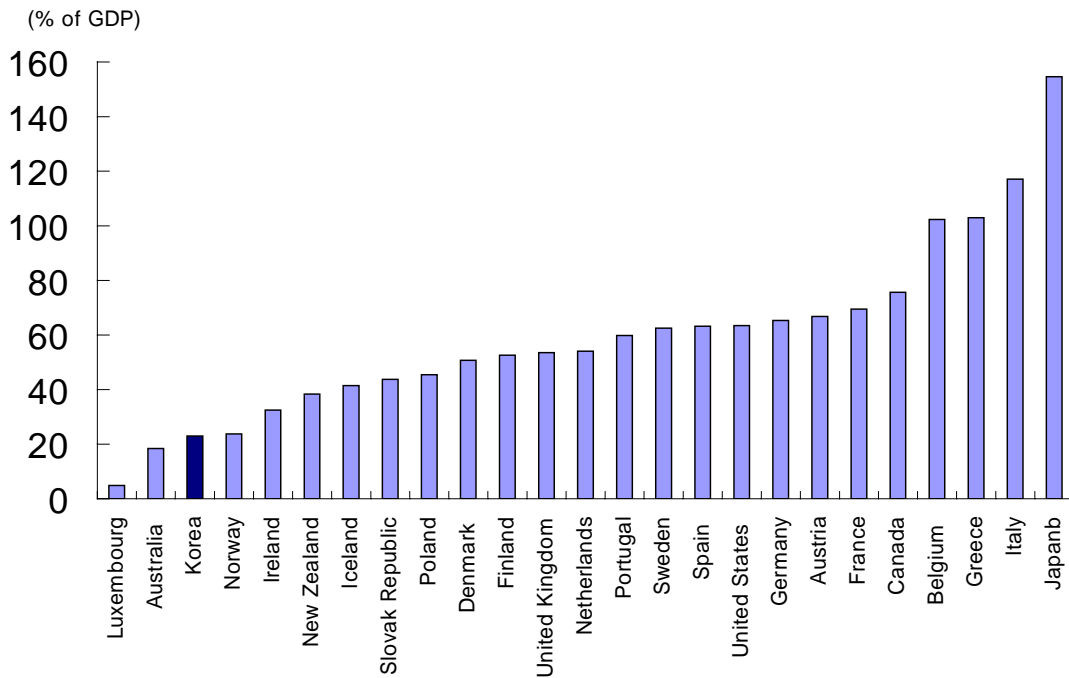
Source: Ministry of Finance and Economy

The composition of the government debt has changed significantly over the decades in Korean history. In the 1970s, the largest part of the sovereign debt took the form of foreign borrowing. In the late 80s and 1990s, however, both domestic and foreign borrowings declined significantly. In the aftermath of the financial crisis in 1997-98, both direct government debt and government guarantees increased rapidly, and currently, the largest item in the debt table is the government bond. As of the end 2003, the outstanding volume of government bonds is 140.6 trillion won accounting approximately 85% of government debt. Currently, Korean government is issuing six

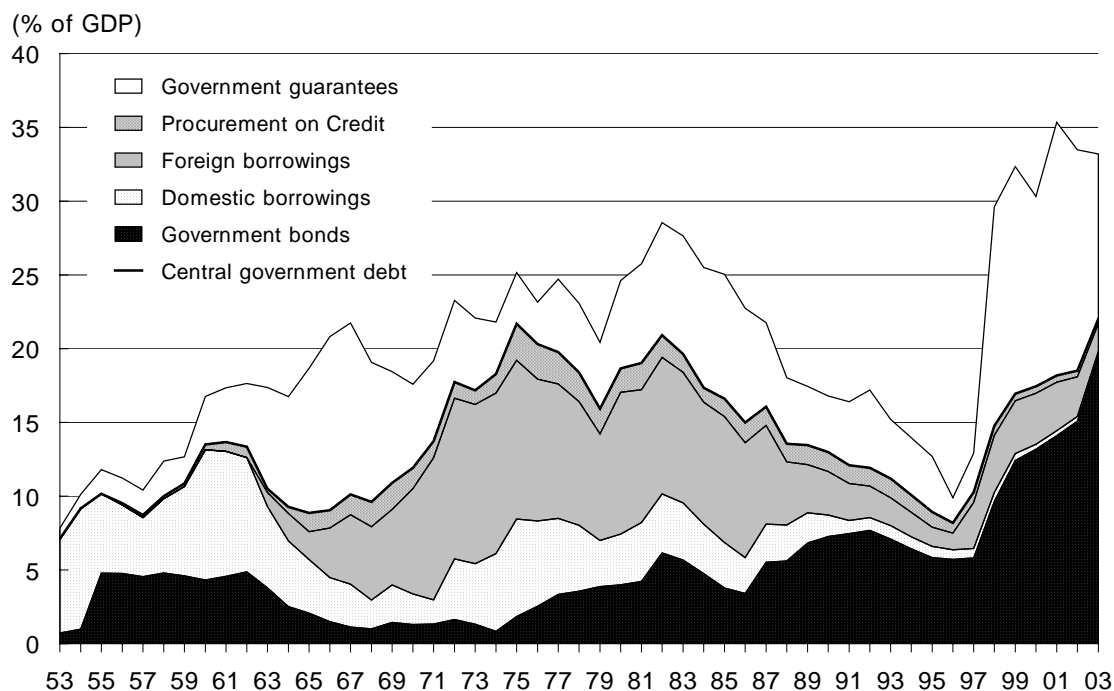
kinds of bonds: Grain Securities, Foreign Exchange Stabilization Fund (FESF) Bonds, Treasury Bonds, National Housing (NH) Bonds, and Land Compensation Bonds.

The government debt can also be classified as financial versus non-financial debts. Financial debts accompany increases of an equivalent amount of financial assets for the government such as loans to the private sector and foreign assets. Hence, financial debts can be repaid in principle through redemption of financial assets. Non-financial debts are the government liabilities that have to be financed ultimately through tax. As of the end 2003, out of the 158.8 trillion won central government debt, financial debts are 106 trillion won (66.8%) and non-financial debts are 52.8 trillion won (33.2%).

<Figure 1> Government Debts of Major Countries as a Percent of GDP



<Figure 2> Composition of Korea's Government Debt as a Percent of GDP



IV. A Strategic Framework for Government Debt Risk Management

As emphasized above, an important objective of government debt management is to minimize medium to long-term costs of debt, while taking into account implied cost/risk trade-offs associated with various funding strategies. As a supplementary objective, the sovereign debt management must ensure development of well functioning domestic capital markets. An important tool in carrying out debt management policies under such objectives is a strategic benchmarking framework, within which optimal debt portfolio structure is identified and maintained. The benchmarking framework is an essential tool for effective risk management and formulation of optimal debt policies. It provides guidelines in actual debt management practices, and debt managers' performance can be

evaluated against the guidelines. This section focuses on this strategic framework for sovereign debt risk management that can be applied to upgrade Korea's government debt management capacity.³

IV.1. Scope and Functions of the Benchmarking Framework

As described by Claessens et al (1995 and 1998), setting up a benchmark in the management of sovereign debt is equivalent to identifying an optimal solution to the dynamic stochastic problem given stochastic processes of exogenous variables such as exchange rates, interest rates, output growth rates, and so forth. This approach is analogous to finding optimal investment portfolios in finance literature.⁴ The benchmarking framework developed and outlined in the present section is also based upon, and broadly consistent with, this theoretical literature.

1) Scope and Main Functions

Considering the government demands and practical applicability, a sovereign debt benchmarking framework needs to include three main debt management functions:

- ***Risk Quantification of Existing Sovereign Debt Portfolios***

This function enables debt managers to quantify various risk characteristics of existing sovereign debt portfolios such as credit risk, debt-service cost risk, liquidity risk, market

³ Many countries are now adopting benchmarks in actual debt management practices. For example, the key operational objective of the Irish National Treasury Management Agency is to outperform a benchmark set in net present value terms while not exceeding the annual cash budget for interest payments on the debt (See F. Coleman (1999)). A growing number of countries such as Canada, Sweden, Denmark, Portugal and New Zealand, among others, are relying on a set of benchmarks in formulating and implementing debt policies.

⁴ Claessens (1992), Kroner and Claessens (1991), for instance, applied the dynamic optimization framework to actual debt management problems of obtaining optimal currency structure in an open economy.

risk, and operational risk. The benchmark framework must be able to quantify those risks in terms of traditional measures such as redemption profile, (modified) duration, currency composition, share of floating rate debt, market value of debt, and so on.

- ***Identification of Efficient Cost/Risk Tradeoffs and Optimal Benchmark Portfolio***

Given a debt management time horizon and the government's borrowing requirements over the horizon, a set of efficient portfolios (efficient frontier) can be derived as a summary of the tradeoff between expected debt-service cost and risk. In addition, the benchmarking framework must be able to identify the optimal debt portfolio from the set of efficient portfolios based upon the government objectives, risk tolerance and external constraints.

- ***Evaluation of Alternative Borrowing Strategies (Issuing Programs)***

Given a set of specific dynamic borrowing (issuing) programs under consideration, the benchmarking framework must be able to trace dynamic evolutions of sovereign debt portfolios and their risk characteristics associated with those borrowing programs. Alternative borrowing strategies can be evaluated against the optimal benchmark portfolio identified above in order for the government to choose the most ideal borrowing strategy from perspective of expected cost and risk.

2) Issues in Benchmarking

In carrying out strategic benchmarking, a set of issues must be addressed in order to lay out basic premises of the benchmarking framework:

- ***Debt Management Time Horizon***

First, a debt management time horizon of the government must be determined. A practically relevant time horizon for government debt management in Korea would be five years. Current practices of the Korean government in conducting fiscal

management are in general based upon the horizon of five years. Note also that while official budget forecasts for next five years are available, macroeconomic forecasts beyond five-year horizon are extremely unreliable.

- ***Definition of Cost Measures***

Cost measures to be used in benchmarking must be predetermined. Considering the current practice of budget accounting in Korea, and the observation that the Korean government does not frequently engage in market transactions to adjust sovereign debt portfolios, cash-flow cost measures are more relevant than marked to market cost measures. As a specific measure of the yearly borrowing costs, the relative cost measure (interest expense/debt outstanding) is preferred although costs in absolute terms need to be considered as complementary measures. In addition, some cost measures need to reflect accrual accounting. For instance, interest expenses on discount bonds must be amortized over the life of the bond. In the case of coupon bonds issued at prices different from the par value, initial capital gains or losses also need to be amortized.

- ***Domestic Debt versus External Debt Portfolios***

It must be decided whether to establish a common or separate benchmarking framework for domestic and external debts. The Korean government has not considered foreign currency debts for the purpose of financing budget deficits, and this practice is expected to continue in the future. Sovereign external debt denominated in foreign currencies has been mainly a vehicle to procure foreign exchange liquidities during the crisis episode.

Given the differential objectives of domestic and external debt financing in Korea, the benchmarking framework must assume a separate treatment of domestic (the Korean won denominated) and external (foreign currency denominated) portfolios although basically common technical methodologies are applied to the analysis of each portfolio.

Note also that, while it is natural to use the Korean won as the base currency in domestic debt management, the U.S. dollar would be a better base currency for external debt management. The base currency choice is based upon the fact that most of external government debt is not being repaid from the fiscal budget, and that the government is not taking foreign exchange risks associated with foreign borrowing as it maintains the proceeds in the form of foreign assets.

● *Asset-Liability Management (ALM) Considerations*

In the external front, the size of foreign exchange reserve is currently much bigger than the size of external government debt. This implies that a strict asset-liability management framework is not directly applicable due to the huge size mismatch between external assets and liabilities. Furthermore, the foreign exchange reserve of the central bank is to meet the emergency liquidity demands arising from the entire economy including corporate and financial institutions, not just the demands from the government. Consequently, rather than applying the benchmarking framework to net foreign asset portfolio, it must focus on total external debt portfolio. However, the benchmark needs to take into account the structure of the central bank's foreign reserve portfolio when target duration and currency structure is to be established.

For domestic front, asset-liability management is more difficult to apply since government assets such as tax base and real estates are often in the form of non-financial assets. Hence, as in most other countries, the main target of domestic debt management needs to be gross liabilities rather than net liabilities. Note however that some countries such as New Zealand are experimenting a sort of ALM framework and the benchmarking framework must be flexible enough to reflect characteristics of government assets.

- ***Treatment of Government Guaranteed Debt***

Although the benchmarking framework initially focuses on the direct central government debt, it is necessary to broaden its scope to include government guarantees in the long-run. In principle, the government debt guarantees could be added to direct debts by applying certain weights reflecting probabilities of guarantee realization. However, it is inherently difficult to come up with the time-varying probabilities. In practices, debt managers may need to conduct various scenario analyses.

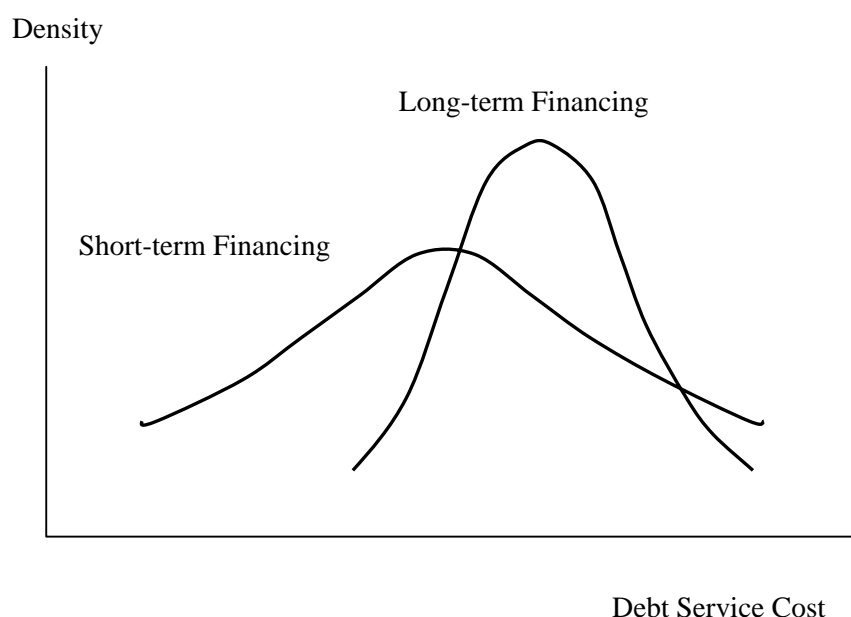
IV.2. Methodologies of Strategic Benchmarking

Given the government primary budget forecasts and hence, borrowing requirements for debt management time horizon, say next five years, sequential steps can be followed to obtain efficient frontier and to identify target benchmark portfolio.⁵

1) Derivation of Efficient Portfolio Frontier

As can be seen in Figure 3, there exist an expected cost and risk tradeoff between short-term financing and long-term financing. With usual upward sloping yield curves, short-term financing implies a lower expected debt-service-cost but higher volatility than long-term financing. This is because first, short-term interest rates are in general more volatile than long-term interest rates, and second, short-term financing requires more frequent refinancing over the debt management horizon. Hence, across possible debt portfolios corresponding to respective borrowing strategies, there will be a tradeoff between expected value and standard deviation of debt-service-costs. We can obtain the efficient portfolio set by selecting portfolios that yield lowest expected costs at each level of standard deviation.

<Figure 3> Expected Cost-Risk Tradeoff in Short-term and Long-term Financing



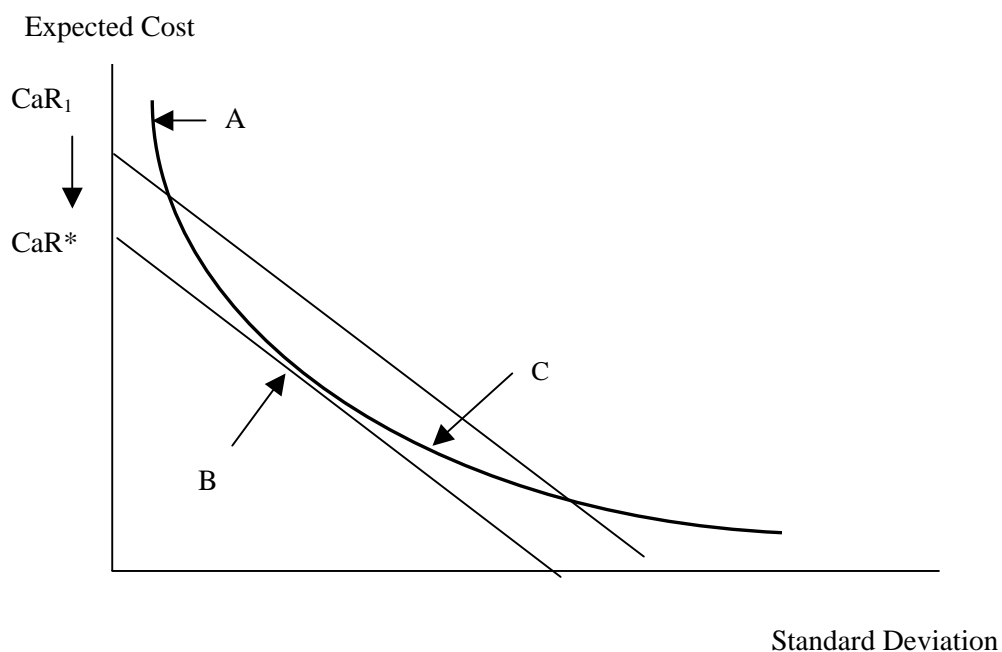
For instance, the borrowing (issuing) program can be assumed to be time-invariant over the next five years and the efficient portfolio set to be realized five years from now is derived over various combinations of borrowing programs. To guarantee actually achievable optimality of the benchmark portfolio, the current sovereign debt structure is given as an initial condition, and official primary budget deficit forecasts are used as inputs to compute the yearly borrowing requirements. The efficient portfolio set is obtained by conducting full-blown simulations over the future evolution of interest rate term structures. To simulate future term structures, either historical method (bootstrapping – AR(1)) or Monte Carlo method, calibrated by actual data, can be chosen.

⁵ This section is mainly based upon Hahm and Kim (2003).

2) Identification of Optimal Benchmark Portfolio

As can be seen in Figure 4, the efficient frontier can be represented as a downward sloping curve (thick line). The portfolios above and inside the frontier are achievable ones but not cost efficient given a level of risk. The portfolios below and outside the frontier are unattainable ones given the current cost-risk trade-off structure. Now the problem is which portfolio must be chosen among the efficient ones as a target debt portfolio for the government.

<Figure 4> Efficient Frontier and Cost-at-Risk (CaR)



In controlling the level of debt-service-cost risk, a natural risk target is cost-at-risk (CaR), which is defined as the maximum possible yearly interest cost that can be

realized in a given year at a given (for instance, 95%) confidence level.⁶ Controlling debt-service-cost risk by CaR is consistent with recent theories of portfolio selection with a short-fall constraint in order to control down-side risk. Note that if μ and σ represents the expected value and standard deviation of annual debt service cost, respectively, then the CaR measure can be represented as follows:.

$$CaR = \mu + 1.645\sigma \quad (1)$$

$$\mu = CaR - 1.645\sigma \quad (2)$$

Suppose that the government has an explicit maximum tolerable cost-at-risk limit, then a feasible portfolio set can be identified from the CaR limit. Note that the 95% CaR is represented as a downward sloping line with the slope of -1.645 in the plane of expected value and standard deviation under the assumption of a normally distributed debt-service-cost. The value of the line at the vertical axis (expected cost axis) is the 95% CaR.

As in Figure 4, if the government establishes a maximum tolerable 95% CaR at CaR_1 , then the feasible portfolio set is now identified as a range constrained by the downward sloping maximum tolerable CaR line starting from CaR_1 at the vertical axis and the efficient frontier. Hence, while portfolio A is an attainable efficient portfolio, it is not a feasible portfolio since it is located above the maximum tolerable CaR_1 line indicating that its implied 95% CaR is higher than CaR_1 . Portfolio C is located inside the feasible choice set, and can become a candidate for the benchmark portfolio.

The final step is to identify a benchmark portfolio from the feasible choice set.

⁶ While the value-at-risk (VaR) is measured based upon the market value of underlying portfolios, the CaR is an application of VaR on debt-service-cost. See Jessen (1998a, b) and Kim and Hahn (2000) for detailed discussions of CaR and applications to sovereign debt management.

Given the feasible efficient portfolio set and exogenous risk targets, a portfolio which minimizes deviations from the exogenous medium-term targets can be selected as the benchmark portfolio. That is, the benchmark portfolio is identified by minimizing a penalty function defined as a weighted average of deviations from the respective medium-term risk targets. For instance, in the absence of other exogenous medium-term targets and under the objective of minimizing the 95% CaR, we can identify the benchmark portfolio by shifting down the CaR line in Figure 4. In figure 4, portfolio B is the benchmark portfolio, where the CaR line is tangent to the efficient frontier.

Note that, while the short-run fluctuation in the market value of government debt portfolio is not direct concerns for the government in sovereign debt management, many countries are explicitly adopting duration targets in an attempt to control medium-term market risks as well as liquidity risks. Hence, alternatively, if the government considers an exogenous duration target in addition to the minimization of CaR, we can apply the following penalty function to identify the optimal benchmark portfolio:

$$\text{Minimize } f = \rho \cdot |dur - dur^*| / dur^* + (1 - \rho) \cdot (CaR - CaR_m) / CaR_m \quad (3)$$

- where ρ : relative weight attached to the duration target ($0 \leq \rho \leq 1$)
 dur : portfolio duration
 dur^* : exogenously given medium-term target duration
 CaR : 95% cost-at-risk (CaR)
 CaR_m : minimum CaR among all attainable portfolios

Note that the optimal borrowing strategy is simultaneously identified with the benchmark portfolio. That is, we can choose a borrowing strategy which will end up with the optimal portfolio on the feasible portfolio set, where the implied duration of the

portfolio is closest to the exogenous medium-term target and its associated CaR value is lowest. Likewise, we can add other exogenous medium-term targets such as the slope of maturity profile into the penalty function if those factors need to be considered in identifying the optimal benchmark portfolio. The optimal portfolio chosen in this way functions as a benchmark against which actual government debt portfolio and specific borrowing programs can be evaluated.

3) Exogenous Medium-Term Risk Targets

In the benchmarking framework outlined above, to identify the benchmark portfolio, it is essential to have a set of well-articulated medium-term risk targets. The medium-term risk targets function as a vehicle to translate exogenous considerations outside the system into explicit constraints in identifying the benchmark portfolio. This section discusses relevant criteria to establish medium-term risk targets for Korea.

A. Domestic Government Debt Portfolio

● *Duration*

The medium term target duration for domestic debt portfolio can be determined by the following two criteria:

- Duration Implied by the Benchmark Government Bonds Issuance

The first criterion is the implied duration of the steady state debt portfolio obtained under the government strategy to foster government debt market. For instance, as of March 2000, the funding strategy preferred by the government was the following composition of fixed rate bonds: 1 year 25%, 3 year 50%, and 5 year 25%, which would lead to the implied duration of 1.7.

- Other Countries' Domestic Debt Benchmark Durations

Other countries' domestic debt duration benchmark could be considered in determining the duration target. As shown in Table 3, the benchmark domestic debt duration in European countries was around 4.0 as of 1999.

<Table 3> Duration of Domestic Sovereign Debt Portfolios (as of 1999)

Austria	Belgium	Denmark	Finland	Holland	Italy	Portugal	Spain	Sweden	UK	Average
4.5	4.2 (3.75-4.75)	4.1 (3.5-4.1)	3.9	- (4.0)	2.5	3.0	3.2	- (3.5)	6.8	4.0 (3.9)

Note: Figures in the parenthesis are target durations.

Source: Unpublished compilation of the World Bank

- ***Maximum Tolerable CaR***

For domestic debt front, a useful guideline in determining maximum tolerable CaR would be the sum of government contingency fund maintained for emergency budgetary expenses plus normal expected interest cost from the budget.

- ***Target Redemption Profile***

A smooth redemption profile reduces the risk associated with the need to refinance a large proportion of the debt in a period with high interest rates. The redemption pattern is therefore of importance in managing liquidity and interest rate risks. Target redemption profile depends on the government borrowing strategy. In domestic borrowing, benchmark borrowing strategy is often employed in order to foster government debt market. By making benchmark bond markets more liquid, the government can reduce borrowing costs and minimize liquidity risk. The target redemption profile of the government debt portfolio to be obtained under the preferred

government debt issuing strategy can be used as a medium-term target redemption profile. For instance, according to the benchmark bond issuing strategy, - 1 year 25%, 3 year 50%, and 5 year 25%, its implied steady state redemption profile can be used as a medium term target profile.

B. External Government Debt Portfolio

● *Currency Composition*

The target currency composition for external sovereign debt can be determined considering the following criteria:

- Correlation Structure among Effective Cross Country Interest Rates

An optimal portfolio weight can be computed based on the effective U.S. dollar translated interest costs on US dollar, Euro, and Japanese yen denominated bonds. Given the variance-covariance structure among those three currency instruments computed from historical data on exchange rates and interest rates, it is possible to obtain optimal weights to minimize expected costs of external debt portfolio.

- Currency Composition of the Bank of Korea's Foreign Exchange Reserve

Currency composition of the BOK's investment portfolio would be a natural target since, in Korea, the main purpose of foreign currency denominated government debt is to accumulate foreign exchange reserves. From the perspectives of an asset-liability management, it gives a natural hedge if liability is structured in accordance with the asset-side in terms of its currency composition and duration, etc.

- Currency Composition of the Current Account Inflows

The third criterion is the currency composition of current account inflows such as exports, as they are principal vehicle of procuring foreign exchange in a crisis situation.

● ***Duration***

The exogenous target duration can be obtained considering the following criteria:

- *Duration of the BOK's Foreign Exchange Reserve Portfolio*

Just as we consider the currency structure of official foreign exchange reserves, the duration of the government external asset can be considered as a target duration for debt portfolio. For instance, as of October 1998, the modified duration of the central bank investment portfolio was 2.38.

- *Other Countries' Target Durations on External Sovereign Debt*

As of 1999, European Countries were maintaining their foreign currency debt durations in the range of 2 to 3 as can be seen in Table 4. The average duration for external sovereign debt was around 2.2.

<Table 4> Duration of External Sovereign Debt Portfolio

Belgium	Denmark	Portugal	Australia	Sweden	Average
2.2 (0.75-2.25)	2.0 (1.5-2.5)	3.1	1-1.5	2-3	2.2

Note: Figures in the parenthesis are target durations.

Source: Unpublished compilation of the World Bank

● ***Target Redemption Profile***

While the benchmark borrowing strategy is emphasized in domestic borrowing, in the case of external debt, countries often adopt opportunistic borrowing strategies in order to capture low cost borrowing opportunities unexpectedly arising in international financial markets. In the case of opportunistic borrowing, relative to the domestic debt profile, a slightly steeper downward sloping redemption profile can be maintained for external debt.

V. Institutional Issues and Concluding Remarks

As described above, Korea's sovereign debt has rapidly increased in the post-crisis period. The rapid growth of sovereign debt may not continue and soon be stabilized with the recovery of the Korean economy. However, given the stance of recent accommodative fiscal policies and gradual realization of contingent liabilities such as restructuring bonds, social securities and public pension fund deficits, the increasing trend of government debt may be persistent in Korea. Although not unsustainable, the presence of substantial amount of government debt itself undermines the effectiveness of fiscal policies, increases domestic interest rates through higher inflation expectation, and thus distorts financial flows undermining growth potential.⁷ Indeed, it is an important task for policy makers to restore fiscal soundness by prudentially managing sovereign debts from longer-term perspective. The task is also critical to restore national creditworthiness in the international financial community and thus to avoid recurrence of financial crisis in the future.

The scope of government debt management covers both debt level management and debt structure management. Aside from the debt management software framework discussed above, an effective institutional framework including relevant organizational structure must be laid out. The realm of macro debt management is closely interrelated with fiscal policies as the government fiscal stance directly affects the level and growth rate of government debt. The stance of fiscal policy is often influenced by political

⁷ For an excellent discussion of sustainability and related issues on sovereign debts in developing countries, see Eaton (1989), Eaton et al (1986), Cohen (1991 and 1995), among others. For the application and analysis of Korea's external debts around the financial crisis, see Hahn (1999).

process and hence normally short-term oriented. The micro debt structure management requires a substantial expertise and deep understanding on various financial instruments and market developments.

Although the ultimate responsibility of debt management belongs to the ministry of finance as a principal debt management authority in many countries, various functions and operations of debt management are often delegated from the ministry of finance to other institutions such as central bank or an independent debt management agency. The institutional housing of debt management functions varies widely across countries. However, there is a growing trend to separate debt management operations from the monetary authority and create a separate agency specialized in managing government debt.

Many countries have established an independent debt office and increasing number of countries are considering setting up of a fully equipped independent debt office. The Swedish National Debt Office (SNDO), the Irish National Treasury Management Agency (NTMA), the Austrian Federal Financing Agency (OEBFA), the Portuguese Government Debt Agency (IGCP) are examples of independent and full-fledged debt offices. The New Zealand Debt Management Office (NZDMO), the Australian Office of Financial Management (AOFM), the Hungarian Government Debt Management Agency (AKK), the Belgium Federal Public Debt Agency (TDA) are examples of fully devoted debt offices installed under the Treasury or Ministry of Finance.⁸

The rationale behind an independent debt office is three-fold. First, with an independent debt office, it is possible to maintain longer-term perspectives on sovereign debt management. If the fiscal authority undertakes both fiscal policy and debt

⁸ For the survey of organizational structure of debt management units in various countries, see Cassard

management, short-term budget saving tends to be more emphasized, which may increase risks and long-term cost of borrowing. In this sense, sovereign debt policy making process needs to be separated from normal fiscal policy process to a reasonable degree.

Second, while micro debt management requires substantial knowledge on financial markets and risk management, it is inherently difficult to recruit and retain professionals within the government due to substantial wage gap. Creating an independent government body specialized in debt management facilitates staffing as it is easier to apply differential compensation schemes. Finally, while debt management requires specialists, government officials often pursue a different career path. With an independent debt office and by offering a separate career path for experts, it is possible to establish a specialist function within the public sector directly linked to the financial sector.

The debt management function in Korea has been largely primitive and fragmented before the 1997 financial crisis. Currently, government debt management functions are shared among the Ministry of Finance and Economy (MOFE), the Ministry of Planning and Budget (MOPB), and the Bank of Korea (BOK). With the occurrence of the financial crisis and as the government began incurring budget deficits, the importance of macro debt level management has received a wide public attention. The government budget office was separated from the Ministry of Finance and Economy (MOFE) and merged with the newly created Ministry of Planning and Budget (MOPB). The MOPB is currently responsible for making budgetary policies and preparing regular medium-term fiscal plans. The MOPB has been maintaining quite a prudential stance regarding

and Folkerts-Landau (1997).

the evolution of government debt, and fiscal consolidation policies have been pursued to limit budgetary expansion. As for the front and back office functions, given the small size of government debt in the pre-crisis period, basic front and back office functions were delegated to the Bank of Korea.

However, as for the middle office function to maintain the soundness of micro debt structure, the debt policy and risk management function has been largely absent within the government. The treasury department at the MOFE is responsible for this middle office functions. However, funding strategy from the perspective of fostering government bond markets has been relatively emphasized. The concept of sovereign debt risk management is still relatively new and not fully understood within the government.

As argued before, it is both necessary and beneficial to establish a specialized and independent debt management office consolidating the fragmented and dispersed debt management functions. The front and back office functions delegated to the BOK can be consolidated with the newly created middle office. Apart from the execution of funding operations, a professional organization equipped with systematic analytical tools and appropriate expertise needs to be established. Indeed, middle office and risk management functions have become an essential part for government debt management.

However, the establishment of a fully equipped independent debt office may take years. In the mean time, as an interim solution, it is necessary to establish a core middle office unit within the government. Creation of a debt management middle office could be a temporary solution to a more fully equipped organizational unit. In recognition of the needs, in February 2000, the MOFE established a task force unit at the Treasury Bureau in order to assume a basic middle office function. However, both the duty and

staffs of the debt management unit need to be substantially strengthened. The objectives of the debt management middle office unit must be clearly defined to actively manage sovereign debt structures from medium-term perspective by preparing and implementing relevant debt policies. The debt management unit is also required to provide detailed analytical support to the government unit responsible for macro management of the government debt. Detailed functions must include the following among others:

- Periodic risk analysis and establishing benchmark debt portfolios
- Supporting preparation of and evaluating medium-term fiscal plans of the MOPB
- Preparing and implementing detailed debt management policies to achieve benchmark portfolio given the government borrowing requirements
- Policy advising for the development of well-functioning government bond markets
- Improving and maintaining the middle office risk management system

Finally, an institutional channel for cooperation and communication among the concerned authorities – MOFE, MOPB and BOK, say, a sovereign debt management committee, needs to be established. For effective debt management, it is necessary for above authorities to share timely information and have a systematic feedback on various debt management issues. This institutional channel will also be helpful to facilitate policy coordination among the fiscal, monetary, and debt management policies. In addition, the channel needs to be linked with the monitoring and supervisory systems for private debts that could potentially become government liability such as external private debts of financial institutions and liabilities of public enterprises.

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