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Risk Management of Sovereign Assets and Liabilities

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Abstract

In an environment of sizable and volatile capital flows and integrated international capital markets, large and unhedged net external sovereign liabilities expose countries to swings in international asset prices and to potential speculative currency attacks. The paper argues that an essential step in reducing emerging market vulnerability to such external shocks is to reform the institutional arrangements governing asset and liability management policies, so as to promote a transparent, publicly accountable, and professional incentive structure.

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SUMMARY

The integration of emerging market countries into the global economy and their greater access to external sources of financing have produced a significant increase in their exposure to volatility in international asset prices. Developing country sovereigns are especially exposed to international disturbances, because of their large stock of foreign currency assets and liabilities and the relatively risky structure of their debt portfolios. The paper argues that an essential step in reducing vulnerability to such external shocks is to reform the institutional arrangement governing debt policy, so as to promote a transparent, publicly accountable, and professional incentive structure. Experience suggests that such objectives are best achieved if debt management is assigned to a separate debt agency with a degree of autonomy from political influence. Assigning debt management to an autonomous agency enables a clear separation of responsibilities between debt policy and monetary policy and allows the authorities to pursue a clearly defined objective without being hampered by the management structure or pay scale of the public sector.

An appropriate vehicle for communicating the objectives of the sovereign authorities to the debt agency is a set of benchmarks for the foreign currency debt portfolio, specifying the currency composition, the maturity structure, and permissible instruments. A key element of this framework is to disclose to the public on a regular basis both the benchmark portfolio and the performance of the debt manager relative to the benchmark. Such public disclosure is essential for creating a transparent and accountable debt management policy.

Reserves management would also benefit from public scrutiny that holds the central bank accountable for its investment decisions and performance. To reconcile its investment objectives with its liquidity constraints, the central bank can split its reserves into separate liquidity and investment portfolios. Benchmarks for both portfolios should be established and publicly disclosed.

I. INTRODUCTION

The integration of emerging market countries into the global economy and their greater access to external sources of financing has produced a significant increase in their exposure to volatility in international asset prices. Developing country sovereign entities are especially exposed to international disturbances, because of their large stock of foreign-currency assets and liabilities (relative to national income) and the relatively risky structure of their debt portfolios (currency composition and maturity profile). In an evolving, and at times volatile, international financial environment, the benefits experienced by countries from prudent macroeconomic management and structural reforms can be severely compromised by the losses caused by unexpected changes in foreign interest rates and exchange rates.

Major multinational firms (both financial and nonfinancial) have adapted to the volatility of financial markets through the use of hedging techniques and derivative instruments to manage their risk exposures. This approach has been facilitated by important advances in financial technology in the last decade, and by specialized risk management techniques developed by institutional funds managers. In contrast, many sovereign entities—some of them major players in international financial markets with large financial assets and liabilities—have lagged, by and large, behind the private sector in this respect. The recent experience of a small, but growing, number of countries that have reformed the management of sovereign assets and liabilities demonstrates that sound risk management can lessen the impact of external financial developments on national wealth, and potentially increase returns on foreign reserves and reduce borrowing costs.

Current literature on risk management is rich in its treatment of portfolio allocation problems, but it provides little guidance for sovereigns on how to manage the risk exposure of their assets and liabilities. By drawing on the experience and the well-established methodologies of large institutional investors and pension funds, and on the experience of sovereigns that have reformed their debt management policies, this chapter examines (i) the risks involved for a government in carrying a large open foreign currency exposure; (ii) the design of institutional arrangements that provide appropriate incentive structures for debt and reserves management; and (iii) the establishment of benchmark portfolios embodying the preferences of the policymaker for incurring currency, interest-rate, and credit risks, as well as reflecting the macroeconomic and institutional constraints of the country. These issues raise thorny questions about the optimal currency exposure of a sovereign; the extent of interaction between debt management policy, reserves management, and monetary policy; the degree of independence of debt management from political oversight; and the extent to which reserves management should be under public scrutiny. Although the paper primarily targets emerging market economies and small industrial countries, which are more vulnerable to swings in foreign currencies and interest rates, the framework discussed is applicable to most countries.

II. FOREIGN CURRENCY EXPOSURE OF SOVEREIGN LIABILITIES

The external exposure of developing countries' sovereign liabilities has increased steadily during the past two decades, from 7 percent of GDP in 1975 to about 30 percent in the mid-nineties (Figure 1). In 1995, the external debt held or guaranteed by developing country sovereigns was almost three times larger than their foreign currency reserves, exposing governments to a large net currency risk exposure (Table 1). External debt also exposed developing countries to foreign interest rate risk. Indeed, about half of developing countries' external debt in 1995 was exposed to foreign interest rate risk, as 20 percent of the external debt was short-term (under a one year maturity), and 40 percent of the remaining long-term debt was at floating rates (mostly indexed to LIBOR).

Several developing countries have experienced the impact of adverse movements in foreign currencies and interest rates in the past twenty years. In the early 1980s, the debt servicing burdens of countries in Southeast Asia, Latin America, and Africa were severely affected by the steep appreciation of the dollar, the worldwide increase in interest rates, and the sharp decline in commodity prices. The debt crisis resulted in output and employment losses, financial sector crises, and the exclusion of these countries from international financial markets, which was only regained in the early nineties.

In the first half of this decade, several Asian countries that had overcome the 1980s debt crisis because of their prudent fiscal policies experienced significant increases in their debt burden due to their exposure to the Japanese yen. Between 1980 and 1994, East Asian and Pacific countries increased their borrowing in Japanese yen from below 19 percent to 30 percent. Although the increase in yen-denominated borrowing was due partly to large concessional loans from Japan to Asian countries, and the growing role of the yen in international trade and finance, it also reflected the desire of Asian borrowers to benefit from low interest rates on yen loans compared to U.S. dollar loans. Most of the countries did not hedge their yen exposure either in local currency or in the U.S. dollar, which accounts for a large part of their foreign currency revenues. As a result, the appreciation of the yen vis-à-vis the dollar and the Asian currencies in the 1990s led to a significant increase in the dollar value of their external liabilities (Table 2). The share of yen-denominated debt in total debt was subsequently reduced to 27 percent in 1995, and the share of yen-denominated foreign reserves increased.

In Indonesia, for example, a third of the increase in the dollar value of the external debt between 1993 and 1995 was due to cross-currency movements, primarily the appreciation of the yen. Indonesia's exposure to the yen has been especially costly as about 90 percent of its export revenues were denominated in dollars, while 37 percent of its external debt was denominated in yen. In the Philippines, which has a third of its external debt denominated in yen, the appreciation of the yen accounted for about half of the increase in the dollar value of the external debt in 1995. In China, the appreciation of the yen is estimated to have increased the servicing costs of the public debt by about \$5 billion. In Malaysia, the sharp appreciation of the yen in 1994 increased the dollar value of the external debt by 6 percent. In

India, the external debt increased by almost 7 percent in 1995, almost exclusively on account of exchange rate changes.² The subsequent depreciation of the yen in 1996 offset some of the losses incurred by these countries.

The degree of vulnerability of developing countries to external shocks is largely a function of the maturity profile of their foreign-currency debt. Events in Mexico during 1994-95 illustrate how reliance on short-term foreign-currency can make a country vulnerable to liquidity crises, as the need to refinance a substantial volume of short-term debt in turbulent foreign exchange markets creates additional market pressure.³ One of the lessons of the Mexican experience is that the external risk exposure of the government (currency composition, maturity profile, share of floating rate debt, concentration of maturities) is equally indicative of its vulnerability to external shocks as its debt leverage. Indeed, the Mexican crisis was partly attributable to financial markets' concerns about the currency composition and maturity of the public debt and not by its actual level, which was relatively low by OECD standards—51 percent compared to an OECD average of 71 percent (Calvo and Goldstein, 1995). The vulnerability of the Mexican economy to a financial crisis was exacerbated by the \$29 billion of tesobonos maturing in 1995, with about \$10 billion maturing in the first quarter, in light of the low level of foreign reserves (\$6.3 billion) as of end-1994. Had the maturity of the tesobonos been longer and not bunched in the same quarter, the exchange rate crisis may not have turned into a debt-servicing crisis.

The large stock of foreign-currency debt held by developing countries is a consequence of several historical and structural factors, including low domestic saving rates relative to domestic investment, a lack of domestic borrowing instruments, and reliance on official financing (multilateral and bilateral), which tends to be denominated in donor countries' currencies. Foreign-currency debt has also been issued to signal the government's commitment to a policy of stable exchange rates or prices. In a game-theoretic framework, policymakers can signal the time-consistency and credibility of their policies to the public by raising the cost of reneging on their commitments.

More recently, as emerging markets have regained access to international debt markets, the choice of currencies and the maturity structure of their foreign-currency borrowing has been often driven by the lower risk premia and coupon rates, and the

²Changes in external debt are measured in dollar terms, as the latter is the main trade or invoice currency for Asian developing countries. The dollar is also the main currency against which Asian domestic currencies are managed (e.g., Indonesia, Philippines, Thailand).

³See International Capital Markets (August 1995) for a discussion of the role of short-term foreign currency debt in the Mexican crisis.

corresponding initial budget savings.⁴ Such debt strategies may be underestimating the risks associated with unhedged foreign-currency borrowing for several reasons.

First, the capacity of governments to generate foreign currency revenues to repay their obligations is generally limited, as government assets are predominantly the discounted value of future taxes denominated in the local currency. Second, it is unlikely that the output, welfare, and reputational costs that a developing country may suffer in the event of an adverse external shock are fully taken into account in emerging markets' external borrowing strategies. Although the probability of occurrence of crises is low, their potential disruptions to the economy can be substantial. Indeed, a net foreign exchange exposure exacerbates the impact of external shocks on the economy, and limits the policy options of the authorities during a financial crisis. A sovereign with a large net foreign currency exposure would have difficulty pursuing an expansionary monetary policy during a financial crisis, to reflate the economy, as it may cause a sharp decline in the domestic currency. A depreciation of the exchange rate would worsen the country's indebtedness and risk profile, and magnify, rather than dampen, the financial crisis (Mishkin, 1996). In the event of an adverse real exchange rate shock, a government may also face the dual cost of an increasing external debt servicing cost and a declining foreign currency value of its revenues (Dooley 1997). In addition to the potential capital losses that a government may incur on its debt portfolio, its ability to access international markets to refinance its maturing debt is likely to be hindered.

Furthermore, the lower cost of foreign-currency debt vis-à-vis domestic currency debt does not just reflect the creditworthiness of sovereign borrowers, but also the presumption on the part of external creditors that their claims would have implicit seniority over domestic claims. Such implicit seniority arises from a covenant structure (e.g., cross-default and *pari passu* clauses) which allows for extensive legal recourse on the part of the external creditor. For example, cross-default clauses covering a wide array of lenders and instruments may deny the sovereign borrower the possibility of restructuring only a narrow, but particularly pressing instrument, such as short-term note obligations falling due, without precipitating an advancing of the due dates of most other short- and long-term issues. Similarly, *pari passu* clauses make it difficult for sovereign borrowers to negotiate a bond restructuring unless the great majority, if not all, of bond holders are included. In the absence of an agreement, creditors also have extensive rights under existing statutes to seek legal recourse in the relevant jurisdictions. Such recourse could result in a significant impairment of trade and financial flows involving the debtor countries, as well as impairment of its external debt. It is unlikely that the costs of the macroeconomic adjustment needed to prevent an interruption in servicing external debt in

⁴Several emerging market governments (e.g., Argentina, Colombia, Hungary, Mexico, and Turkey) have issued debt denominated in yen or deutsche mark in the past few years, without having a significant exposure to those currencies on the revenue side. Following the negative impact of the yen's appreciation in 1994-95, a few of these countries (Colombia, Hungary, Mexico) began reducing or hedging their yen exposure.

the event of adverse economic developments are fully taken into consideration by a government when deciding on the size of its external exposure.

Third, there is no conclusive empirical evidence that the diversification benefits of unhedged foreign-currency borrowing outweigh the added risk from the effect of nominal and real exchange rate fluctuations on the debt portfolio.⁵ In contrast, there are numerous studies of internationally diversified portfolios that show that investors can lower their risks without significant changes in returns by completely hedging their exposure to exchange rate movements, i.e., purchasing power and interest rate parities do not hold.⁶ During the 1980s, irrespective of investors' base currencies, the returns on currency-hedged foreign bond portfolios were less volatile than the returns on unhedged portfolios. Although such studies apply to portfolios held by institutional investors, sovereign entities are unlikely to predict the direction of exchange rates more accurately than they do.

In view of the risks associated with large open foreign currency exposures, as well as the existence of deep and liquid domestic capital markets, the governments of most industrial countries have limited their issuance of foreign-currency debt (Table 3). Among large advanced economies, Germany, Japan, and the United States do not issue foreign currency debt, while France and the United Kingdom only issue a small fraction of their debt in ECUs. In Canada, foreign currency debt represents about 3 percent of total public debt (reflecting debt accumulated in the past and debt issued to finance foreign reserves), and the budget deficit is funded entirely in domestic currency. In recent years, a number of small advanced economies, including Belgium, Denmark, and New Zealand have stopped issuing foreign-currency debt, except for replenishing their foreign reserves. In Ireland, gross foreign-currency borrowing is limited to the level of maturing foreign-currency debt. Spain and Sweden issue foreign-currency debt, but hedge their currency risk through swaps or swap options.

In developing countries, however, governments often need to access international debt markets to offset a shortage of local savings, lengthen the maturity of their debt, diversify their interest rate risk exposure across various asset markets, accumulate foreign exchange reserves, or develop benchmark instruments enabling domestic private entities to issue abroad. When derivative markets (e.g., forward, futures, swap, options) in the domestic currency are available, governments can immediately hedge their foreign currency borrowing, thereby limiting their exposure to foreign exchange and interest rate movements. The foreign currency can be hedged into the domestic currency, or, when difficult, into a currency closely correlated to the domestic currency that has liquid derivative markets. Issuing currency-hedged foreign

⁵The overall risk of the portfolio may be reduced if the domestic currency cost of domestic debt is negatively correlated with the domestic currency cost of foreign currency debt.

⁶See for instance Perold and Schulmann (1988), Eaker, Grant, and Woodard (1993), Glen and Jorion (1993), and Kritzman (1993).

debt would preclude a borrowing strategy solely targeted at reducing interest rate costs and softening internal budget constraints.

Almost all industrial countries and many emerging markets have access to derivative instruments to hedge their foreign exchange risk. Several emerging markets including Indonesia, Malaysia, Thailand, Brazil, Chile, have currency swap markets with maturities up to 5 or 10 years. In other emerging markets (e.g., Mexico, South Korea, Taiwan, and the Philippines), forward markets—the embryos of swap markets—are rapidly developing.⁷ The increasing sophistication of international derivative instruments also has expanded considerably the ability of governments to respond to opportunities to exploit market niches and expand their investor base—for example, to include Japanese or German retail investors—without bearing the cross yen/dollar exchange risk. Furthermore, World Bank borrowers may use a recently established scheme to improve the management of the currency and interest rate risks of their IBRD loans. Under the new World Bank scheme, borrowers can amend the terms of their existing currency pool loans—currency composition and floating rate/fixed rate mix—to reflect their desired debt management strategy (IBRD, 1996).⁸ The scheme would allow eligible countries to restructure their external debt without using their swap credit lines with commercial banks, and at low transaction costs.

Reducing the currency risk exposure of emerging markets sovereign debt and lengthening its maturity profile is a medium-term strategy and a gradual process, and is contingent on the development of domestic capital markets and of hedging instruments denominated in the local currency. During the transition, the government should manage its net foreign currency risk exposure effectively, so that its vulnerability to exchange rate and foreign interest rate fluctuations is bounded.

III. INSTITUTIONAL ARRANGEMENT FOR THE MANAGEMENT OF SOVEREIGN LIABILITIES

Efficient management of the external risk exposure of sovereign liabilities requires institutional arrangements that provide appropriate incentive structures for debt management, technical expertise and sophisticated information systems, and strict internal management procedures. In many developing countries, it is still difficult to create such incentive structures, attract qualified staff, acquire the technical expertise and systems, and develop the controls necessary to manage effectively the overall sovereign risk exposure.

⁷The ability of governments to swap their foreign-currency debt may also be constrained by their credit lines limits with financial institutions, as swap transactions reduce such credit lines.

⁸Currency pool loans are multicurrency obligations, with the U.S. dollar, deutsche mark, and Japanese yen accounting for at least 90 percent of the dollar value of the currency pool. The currencies are targeted until 2001 in fixed currency ratios of 1 dollar for every 125 yen and 2 deutsche mark equivalent. All currency pool loans are made at a variable rate reflecting IBRD cost of funding.

Furthermore, in several developing countries, debt management policies lack transparency and accountability, and are not guided by risk management practices. The lack of transparency and accountability allows debt managers to compromise the country's debt profile for short-term political gains, by, for instance, issuing short-term debt solely because it demands lower interest rates, or borrowing in foreign currencies with low interest rates.⁹ Although the budgetary costs can be reduced by these actions, the economic cost can be much higher and the sovereign's risk profile can be significantly worsened. An opaque institutional structure allows a policymaker with a short horizon to manipulate the structure of the public debt to its own benefit, as the economic and political gains are immediate, while the potential costs (higher refinancing costs and higher expenditures) are transferred to the future. Investors' expectations that the risk of higher refinancing costs may lead to higher taxes or default rates, however, translate into a higher risk premium on the government debt.

The lack of transparency in debt management is further exacerbated by the fact that debt management is often not centralized within a single institution, as state, provincial, local governments, or parastatal institutions are involved in debt issuance. In addition to confusing the decision making process and subjecting debt management to potential political pressures, such dispersion induces haphazard and uncoordinated borrowing, and hence an inefficient debt structure. Moreover, the exposure of the public debt to financial risks is unlikely to be assessed and hedged accurately under such a disperse structure, thereby increasing its vulnerability to shocks.

Since the early 1990s there has been a heightened awareness among governments of the importance of sovereign debt management, particularly in an environment of increasingly mobile and volatile capital flows and integrated international capital markets. Several OECD countries and some emerging markets have undertaken ambitious reform efforts. Several principles emerge from their experiences. First, to preserve the integrity and independence of the central bank, it is preferable to separate debt management policy from monetary policy. Second, it is desirable to shield debt management policy from political interference to ensure transparency and accountability in its conduct. Third, debt management could be significantly improved if it was entrusted to portfolio managers with knowledge and experience in modern risk management techniques, and if their performance was measured against a set of criteria defined by the Ministry of Finance. Finally, it is important to allocate sufficient resources for hiring high quality staff and to acquiring sophisticated systems to support the staff.

⁹Domestic debt mismanagement (excessive concentration of debt in short-term maturities, illiquid and costly debt issuance techniques, bunching of maturities) is also widespread in a number of countries.

A. Separating Debt Management from Monetary Policy

In contrast to the integrated management of assets and liabilities by corporations, which manage financial risks by matching the currency composition and maturity of their assets with those of their liabilities, the management of sovereign assets and liabilities is usually not commingled. In the majority of countries, central banks are in operational charge of reserves management, while Ministries of Finance maintain operational authority over liabilities management. Such separation of responsibilities in managing sovereign assets and liabilities is viewed as optimal by governments because of the potential conflicts of interest between monetary policy and debt management, which may compromise the independence of the central bank. A central bank with a dual mandate for conducting monetary policy and debt management policy, for instance, may be reluctant to raise interest rates to control inflationary pressures, as this would have an adverse effect on its domestic liability portfolio. A central bank may also be tempted to manipulate financial markets to reduce the interest rates at which government debt is issued or to inflate away some of the value of nominal debt. A central bank may also be tempted to inject liquidity in the market prior to debt refinancing, or to bias the maturity structure of the debt profile according to the stance of its monetary policy.

Conflicts of interest between debt policy and monetary policy may also arise if the central bank is in charge of managing the foreign-currency debt portfolio of the government. For instance, the daily management of the liquidity of the foreign currency debt in the foreign exchange market—converting foreign bonds proceeds into local currency, or converting local currency funds for foreign currency debt repayments—may conflict with the intervention policy of the central bank. The central bank's sales and purchases of securities to meet foreign currency debt requirements also could be perceived by financial markets as having a signaling effect on its exchange rate policy, thereby undermining its effectiveness.

Although separating debt policy from monetary policy is desirable to support the integrity of the central bank, only close coordination between the Ministry of Finance and the central bank would ensure that debt management policy is consistent with monetary policy. Without proper coordination, the participation of the Treasury in the foreign exchange market may have significant monetary implications, and may be at odds with the intervention policy of the central bank. Specifically, the central bank needs to be fully informed of the daily transactions of the agency in charge of debt management, so that it can adjust its day-to-day management of liquidity and intervention policies to offset the impact of these transactions on the market. This is particularly the case when the central bank has to meet the foreign currency needs of the Treasury, such as exchanging the foreign currency proceeds of an external bond issue to local currency, or converting local currency funds into foreign currency for interest or principal repayments on the foreign currency debt. Full cooperation between the two institutions also requires that the central bank informs the debt manager of the composition and maturity of its reserves portfolio, and update it on a regular basis, so that the debt manager can take it into account in its debt management policy.

Potential conflict of interests between monetary policy and debt policy have induced several countries to separate the two functions. In New Zealand, all debt management functions carried out by the central bank, as agent of the debt office, have been conducted without reference to monetary policy considerations since 1988. The New Zealand debt office makes all pricing decisions on Treasury bills and government bonds, and advises the Minister of Finance on the size and structure of the domestic borrowing program. The foreign reserves of the central bank are integrated in the debt office's asset and liability management process, however. Specifically, the debt office directly finances the central bank's foreign exchange reserves by maintaining foreign currency deposits at the central bank. Under this structure, the central bank manages its net foreign exchange exposure, while the debt office fully incorporates foreign reserves in its debt management.

In *Hungary*, the Ministry of Finance (MOF) took over the cost of servicing the net national foreign-currency debt in early 1997. While the National Bank of Hungary will remain formally responsible for the interest payments and amortization of the foreign loans issued under its name, it will receive transfers from the MOF broadly equivalent to the cost of servicing that part of external debt in excess of the foreign exchange reserves of the central bank at end-1996. The MOF will take full control of debt management in 1999, and the central bank will act only as the agent of the MOF. The shift of responsibilities from the central bank to the MOF was deemed necessary to ensure that the monetary policy objectives of the central bank did not interfere with any other of its functions or responsibilities.

In *South Africa*, the central bank has been until recently the government's agent for marketing its debt instruments, thereby exposing monetary and debt policies to the potential tensions described earlier. After a thorough review of debt policy, the South African authorities set out a new policy framework for debt management in 1996, delegating all policy issues related to state debt management to the Department of Finance. The central bank was made accountable to the Department of Finance on all matters related to debt management, and funding activities undertaken by the central bank on behalf of the government were ring-fenced from monetary policy operations. A high level body comprising representatives of the Department of Finance and the central bank was also established to coordinate monetary and fiscal policy objectives.

There are instances, however, where the central bank can be in charge of managing the foreign-currency government debt and the foreign exchange reserves without creating conflict of interests. This would apply to a government that only issues foreign-currency debt to finance foreign reserves. Denmark provides a case in point. The Danish government decided in 1991 to regroup assets and liabilities management under the central bank's authority. The rationale behind the decision was to improve coordination of the management of the public debt and the foreign reserves, and to reduce the net exposure of the government to exchange

rate risk.¹⁰ Managing the net exposure of assets and liabilities was deemed to be more appropriate than managing their isolated exposures because of the limited use of the foreign currency debt in funding budget deficits. Indeed, the Danish government only issues foreign-currency denominated debt to replenish foreign reserves when they deviate from a desired level, while only kroner-denominated debt is used to finance the government deficit. Although the central bank is in charge of managing the net portfolio, the decision on the currency composition and the desirable maturity of the net portfolio is taken jointly with the Ministry of Finance and the Ministry of Economic Affairs during quarterly meetings.

In most countries, however, sovereign foreign-currency debt is not issued solely to finance foreign reserves, but primarily to finance the fiscal deficit. Under those circumstances, it is preferable to forego the efficiency of a single agency managing the sovereign's net risk exposure to avoid conflict of interests.

B. Debt Management Framework

The separation of debt policy from monetary policy allows the central bank to fulfill its monetary objectives unfettered by debt policy objectives. In a similar vein, an efficient, transparent and accountable debt management policy necessitates an organizational structure independent from political influence, with clearly defined objectives and performance criteria, and run by qualified staff, according to sound risk management principles. A number of countries (e.g., Austria, Belgium, Ireland, New Zealand, Portugal, and Sweden) have concluded that, to achieve such objectives, debt agencies with some degree of autonomy from the political sphere should be set up. Specifically, the formulation of debt policy (e.g., level of the debt, limits on domestic-and foreign-currency borrowing) is a political decision and therefore should rest in the hands of the government. The actual management of the sovereign debt, however, can be extracted from the political domain and assigned to a separate and autonomous debt management office (DMO). Under this arrangement, the Ministry of Finance defines the medium-term strategy for debt management—based on its objectives and risk-preferences, and the macroeconomic and institutional constraints of the country—while the DMO implements that strategy and administers the issuance of the domestic and foreign-currency debt.

There are several advantages to a separate and autonomous debt management office. First, by recognizing that the structure of the sovereign debt portfolio is an integral part of public policy and deserves a distinct institutional presence, the authorities would signal to financial markets and their political constituency their commitment to a more transparent and accountable debt management policy. Second, an autonomous debt agency can be given a clearly defined objective, based on economic and market-based principles, and organized to achieve such an objective, without being hampered by either the management structure or pay

¹⁰ While the currency composition of the foreign debt and foreign reserves is matched, there is no immunization of interest risk.

scale of the public sector. In particular, an autonomous debt agency could maintain a flexible management and career path structure, and link the pay scale of its personnel to that of private sector practitioners. Such flexible pay structure would allow the DMO to attract highly qualified staff that are knowledgeable in the increasingly complex financial instruments and markets. Third, a DMO perceived by investors as credibly independent from the political decision making process would contribute to lowering the country's risk premium and the government's borrowing costs, as it would be less likely to engage in risky strategies designed to maximize short-term political gains.

The main task of a debt agency would be to manage the day-to-day risk exposure (liquidity, market and credit risks) of the sovereign debt portfolio, and to ensure that the sovereign has continuous and orderly access to international financial markets to meet its external obligations. The debt agency responsibilities also would include managing the domestic public debt portfolio. This entails managing liquidity risk by ensuring that future funding needs can always be met at the lowest cost, and are smoothly spread over a number of years without significant repayments bunched in single periods. DMOs can also enhance the liquidity of the government securities market by increasing the transparency and predictability of debt issuance, and creating liquid benchmark issues spread along the yield curve.¹¹ Greater transparency can be attained by planning and reporting in advance the financing requirements of the government, the maturity structure of future borrowing, and the auction dates of domestic debt issuance for the financial year. Greater predictability can be achieved by relying on regular and non-discretionary debt issuance, primarily through auctions. By increasing liquidity and attracting a larger investor base, the DMO can contribute to lowering the borrowing costs of the government.

Sovereign risk exposure is not limited to government debt, but includes debt contracted by all public and publicly-guaranteed entities (provincial, state or local governments, parastatals, and all other debt with a government's guarantee). Most governments, however, exclude publicly-guaranteed debt from their debt management policies until the guarantees are invoked, and hence do not accurately reflect the risk profile of the sovereign. It is therefore desirable that all public debt is centralized under the management structure of the DMO, and that the risk exposure of the sovereign debt is managed as a single portfolio.

Selected examples of debt management offices

Autonomous debt management offices have been established by law in a number of OECD countries, including Austria, Ireland, Portugal, and Sweden (Tables 4-7). Debt agencies were set up to improve the management of the public debt, by hiring qualified

¹¹When used in the context of domestic debt, a benchmark refers to a large and liquid debt security against which other debt securities (e.g., corporate, state enterprises) are measured and priced.

portfolio managers, incorporating modern risk management techniques in debt strategies, and providing a greater incentive for the staff to lower borrowing costs. Although these DMOs report to the Ministries of Finance, they maintain a significant degree of autonomy from the latter, have their own Board of Directors, follow specific investment guidelines against which their performance is evaluated, and remunerate their staff competitively. Denmark, Finland, the Netherlands, and New Zealand also provide their debt offices with a degree of autonomy from the political process; Australia, New Zealand, and to a limited degree, Denmark, impose specific performance criteria for their debt agencies.¹² Selected debt offices that have been reformed recently are surveyed below.

In *Ireland*, the government delegated in 1990 the borrowing and debt management functions of the Department of Finance and the domestic government bond market operations of the central bank to an autonomous debt agency, the National Treasury Management Agency (NTMA). The decision to establish the NTMA was justified on the grounds that it would provide clearly defined performance objectives to the agency and a degree of independence from other government objectives; and that the concentration of resources and expertise would result in better risk management and lower debt servicing costs. The main objective of the NTMA is cast with reference to a low-risk medium-term benchmark portfolio and aims at funding maturing government debt and annual borrowing requirements at a lower cost than that of the benchmark portfolio, while containing the volatility of annual fiscal debt service costs.

In *New Zealand*, the country's debt management strategy is implemented through the New Zealand debt management office (NZDMO), which has been responsible for managing the public debt since debt management policy became disentangled from monetary policy objectives in 1988. Although the NZDMO has been placed in a division of the Treasury, it maintains some degree of autonomy from the rest of the government, and has its own Advisory Board. The Board meets four times a year and comprises, among others, a senior member of the Treasury and experts in risk-management theory and practice. The role of the Board is to provide advice and oversight across a broad range of strategic and operational risk management issues and to establish greater transparency in the decision-making and supervision process around the DMO. The Treasurer or head of the NZDMO recommends the strategic benchmark for the sovereign debt, in terms of currency mix and interest rate sensitivity, and the tactical trading limits imposed on the portfolio manager.¹³ Both of these parameters have to be approved by the Minister of Finance.

¹²Typically, performance criteria are attached to how efficiently funding transactions are executed, and do not encompass the full debt management framework such as funding, liquidity management, and risk management.

¹³In view of the small amount of risk that the NZDMO is allowed to take, the position limits around the strategic benchmark portfolio are tightly defined.

The objective of the NZDMO is “to identify a low risk portfolio of net liabilities consistent with the Government aversion to risk, having regard for the expected costs of reducing risk, and to transact in an efficient manner to achieve and maintain that portfolio.” In order to minimize its net risk exposure, the NZDMO has gradually set the duration and currency profile of its liabilities to match that of its assets. As most of the government assets are denominated in New Zealand dollars, this strategy has entailed a gradual elimination of the net public foreign currency debt—which was achieved in September 1996—and a lengthening of the duration of the domestic public debt. A significant change introduced by the NZDMO is the marking to market of all its financial liabilities on a daily basis, and the incorporation of private sector risk management practices in its debt management. The performance of the portfolio managers is measured on a daily basis by comparing the market value of the actual debt portfolio to the strategic benchmark portfolio.

In *Sweden*, the National Debt Office (SNDO), which was founded in the eighteenth century, was moved from under the authority of the Parliament to that of the Ministry of Finance in 1989 to improve debt management practices. The primary objective of the SNDO is to minimize the costs of borrowing within the limits imposed by monetary policy, and to finance the day-to-day government budget deficit at the minimum possible long-term cost, subject to the government's risk aversion. The board of the SNDO—which is composed, among others, of the Under-Secretary of the Ministry of Finance and members of Parliament—establishes separate benchmark portfolios for the domestic and foreign currency debt, and lays down the permitted deviations from the benchmark portfolios. Within these broad guidelines, the SNDO manages currency allocation, the maturity structure and the market risk of the overall debt portfolio. The performance of the SNDO is evaluated by comparing the cost of the Central Government Debt to that of the benchmark portfolio for the fiscal year.

The performance of the SNDO, which is reviewed by the board on a quarterly basis, has been remarkable over the past four years. Between July 1991 and June 1995, the overall savings on both the kronor debt and the foreign currency debt, in relation to the benchmark portfolios, amounted to about 16 billion kronor. During that period, the SNDO also outperformed external managers, who are responsible for managing a small proportion of the foreign currency debt on the same principles than those of the SNDO. Between January 1992 and July 1995, the funding costs of external managers were 1.1 percentage points higher than the corresponding cost for the benchmark portfolio, whereas the SNDO's costs during the same period were 2.5 percentage points below those of the benchmark portfolio (SNDO, 1995).

In the past two years, a small number of emerging market countries have also reformed their debt management practices and introduced benchmarks for their external debt. In *Colombia*, the Ministry of Finance and Public Credit has implemented a series of measures to strengthen its liability management framework. The measures include increasing the staff in charge of managing and hedging its external debt portfolio, modernizing the data systems supporting the staff, and consolidating the external borrowing strategies of the central

government and the parastatal companies. Particular attention has been paid to attracting staff with the appropriate knowledge and experience in portfolio analysis and to offer competitive remuneration to retain the staff. The main reform introduced by the authorities is to manage the sovereign liability portfolio with respect to a set of low risk benchmark parameters specifying exchange rate, liquidity, and interest rate risks.

In *Hungary*, as noted earlier, the debt management office located in the MOF has been charged to service the cost of the net sovereign foreign debt. The authorities have decided to align the currency composition of the foreign-currency debt through hedging operations with that of the currency basket to which the national currency is pegged. Particular emphasis is being placed on lengthening the maturity of the debt, maintaining more than three-quarter of the debt in fixed rate instruments, and evenly spreading debt redemptions to avoid rollover risks.

While some other emerging market countries, including Argentina, Mexico, South Africa, and Turkey are currently reviewing their debt management practices, in most developing countries, debt offices are nonexistent, debt management objectives are cast in general terms, and there are no formal guidelines on the currency composition and the maturity structure of the public debt.

IV. INSTITUTIONAL ARRANGEMENT FOR THE MANAGEMENT OF FOREIGN RESERVES

The principles of transparency, accountability, and efficiency apply as well to the reserves management practices of central banks. With the exception of a few central banks (e.g., Australia, New Zealand), almost all monetary authorities are reluctant to disclose the composition and maturity structure of their reserves, the instruments in which they are invested, their use of derivative instruments, and the return on their investments. Central banks typically offer several reasons for maintaining such a high level of confidentiality: concerns that markets players would view movements in reserves as reflecting central banks expectations of future currency or interest rate movements, which may exacerbate currency fluctuations; concerns that other central banks would object to sharp changes in the level of their exchange rate due to shifts in reserves; and worries of being criticized for their investment decisions and performance.

Qualms about disclosing reserve management practices, however, apply more to the intervention policies of central banks than to their reserve management policies. The daily intervention policies of the central bank need to remain outside the realm of public knowledge, as there are benefits from surprise intervention in foreign exchange markets. It is unlikely, however, that adjustment in the currency composition of reserves, except if coordinated, would have any effect on the level of exchange rates. As such, the disclosure of the reserves management practices and investment performance of the central bank, on a regular but not frequent basis (e.g., quarterly or annually), would not constrain its monetary or exchange rate policy objectives.

Although the majority of central banks manage their foreign assets conservatively, several have incurred heavy foreign exchange losses due to speculative position-taking in foreign exchange markets. For instance, the Monetary Authority of Singapore (MAS) incurred heavy losses in 1981 due to a currency play on the U.S. dollar/deutsche mark parity. Following these losses, the management of foreign assets was split between the MAS and the Government of Singapore Investment Corporation (GSIC): the GSIC manages the bulk of the country's foreign assets, investing in long-term securities, equities, and real estate, while the MAS manages conservatively the foreign reserves needed for intervention purposes.¹⁴ In the early 1990s, the Mongolian central bank lost almost all its foreign reserves (about \$90 million), due to speculation on the foreign exchange markets. More recently, Bank Negara Malaysia reported large foreign exchange losses (\$3.5 billion in 1992, \$2.1 billion in 1994) due to speculative position taking against the British pound in 1992. Several other Asian, Latin American, and Middle Eastern central banks take daily positions in foreign exchange markets to increase the return on their reserves, without disclosure of their gains or losses to the public.¹⁵

Even though central banks' punting behavior is more the exception than the rule, the management of foreign reserves should receive some public scrutiny, as do other public policy decisions. In order to achieve this, the institutional framework governing the management of reserves should be broadly similar to that of debt management in its transparent decision making process, and its incentive structure. In particular, the central bank's Board of Directors would define a medium-term strategy for reserves management, based on the central bank's objectives, constraints, and risk preferences. A benchmark portfolio for foreign reserves could then be derived, specifying the currency distribution and maturity structure of foreign reserves, the maximum credit risk exposure of the portfolio, and the authorized financial instruments.¹⁶ The central bank's Board would then entrust the day-to-day risk management of the reserves to portfolio managers with strict guidelines on the permissible deviation from the benchmark. The implementation of the Board guidelines, and the reviewing (on a monthly or bi-monthly basis) of the performance of portfolio managers would typically be monitored by the central bank's Investment Committee. To provide the Investment Committee with an external yardstick for evaluating the performance of the internal portfolio managers, a portion of the reserves portfolio could be managed by external managers.

Several central banks have implemented a framework similar to the one just described and have created benchmarks for their foreign reserves, but the majority do not divulge the

¹⁴Such split of foreign assets between the central bank's reserves and the country's foreign assets is common in several other countries (e.g., China, Kuwait).

¹⁵Most of the evidence on central banks behavior in foreign exchange markets is gathered from market sources.

¹⁶The derivation of the reserves benchmark is discussed in more details in the next section.

composition of their benchmarks. We believe that the disclosure of the benchmark and actual reserves portfolios, of the derivatives positions of the central bank (forward and swap contracts), if any, as well as of the performance of internal and external portfolio managers would enhance the accountability of the central bank to the public, without hampering the conduct of monetary policy.¹⁷ In order not to interfere with the central bank's intervention policies, the frequency of disclosure could be annual or semi-annual. The central bank may need to share the currency composition and maturity of the reserves portfolio with the debt management office on a more frequent basis, however, to facilitate the coordination of their management policies.

V. STRATEGIC MANAGEMENT OF SOVEREIGN ASSETS AND LIABILITIES

A. Benchmarks for the Foreign-Currency Debt Portfolio

A key building block in the institutional framework of sovereign risk management is the derivation of a benchmark or target portfolio for the external public debt.¹⁸ A benchmark communicates the medium-term policy objectives of the policymaker to the portfolio manager and the framework within which it has to operate, and provides a measure against which the performance of the manager can be evaluated. Devising a benchmark for its external public debt encourages the policymaker to articulate and quantify its key objectives and cost/risk trade-offs, and to measure the currency, interest rate, liquidity, and credit risks that it is willing to tolerate on its portfolio. In essence, the establishment of a benchmark imposes discipline on the debt management policies of the sovereign.

The selection of a benchmark for the external debt entails specifying the desired currency composition of the debt, and for each of the currencies specifying the target duration, the maximum maturity, the breakdown between fixed and floating rate instruments, and the financial instruments permitted in the portfolio (e.g., bank loans, indexed-linked bonds, derivatives). Identifying and quantifying these factors is a challenging process, as they depend on the objectives and risk preferences of the policymaker, and the macroeconomic and institutional constraints facing the country. The composition of a benchmark is also strongly

¹⁷As demonstrated during the recent exchange rate crisis in Thailand, a central bank's vulnerability to a currency attack can only be assessed accurately if the net reserves position is disclosed, i.e., net of any forward and swap contracts.

¹⁸Benchmarks are mostly useful for the foreign currency debt portfolio. It is difficult to have a benchmark portfolio in the domestic market as the government is the largest borrower, and its securities act as benchmarks against which all other instruments are priced and measured. The government may have, however, a target domestic debt portfolio, specified in terms of duration; the target portfolio should serve as a reference point to the portfolio manager rather than as a benchmark to beat.

influenced by the numéraire in which costs are measured and the horizon over which such costs are estimated.

Objectives

Debt management objectives vary from one country to another, but in most instances focus solely on lowering annual budget costs rather than on lowering the long-term economic cost of public debt. In recent years, however, a growing number of governments (e.g., Australia, Belgium, Sweden) have redefined their debt management objectives as minimizing the financial, long-term cost of public debt, not just budgetary costs.¹⁹ In Belgium, the objective of public debt management is “to minimize the financial cost of the public debt, while maintaining market and operating risks at an acceptable level, taking into account the general objectives of budgetary and monetary policies.” In Australia, the debt management objective is to minimize the long-term portfolio cost, defined as the time-weighted total debt cost (economic cost), subject to an acceptable level of risk, defined in terms of the annual debt servicing costs (accounting measure of risk). Similarly, in Sweden, the overriding objective of the debt office is to minimize the long-term cost of the foreign currency debt.

In setting such objectives, governments face a trade-off between minimizing the budget cost of the public debt and lowering the volatility of debt servicing cost. The extent to which sovereigns place greater emphasis on the first or second part of their objectives would have a significant impact on the target maturity of the benchmark and on the proportion of fixed versus floating rate instruments in the portfolio.

For instance, if the government's main objective is to lower debt service costs, the target duration of the benchmark portfolio would be short (assuming an upward yield curve), and biased towards issuing short-term or floating rate instruments. A short duration debt, however, has to be refinanced more frequently, thus exposing the portfolio to greater repricing risk (refinancing at a higher interest rate) or bunching risk (repayment of principal occurring within a short period). As mentioned earlier, the Mexican crisis illustrated the risks of a short duration public debt.

If the government's main objective is to stabilize debt servicing costs, the target duration of the benchmark would be longer, and biased towards issuing long-term fixed rate debt. In this case, although annual debt servicing volatility would be lower, the mark-to-market value of the debt would be more sensitive to interest rate movements. The Irish debt benchmark portfolio, for instance, has a long maturity profile, reflecting the government's bias towards debt servicing stability. If the government's main objective is to minimize the volatility of the net present value of the debt on a year-to-year basis (a 1 year time horizon), however, then a debt with a maturity of one year would achieve such an objective.

¹⁹The optimal level of the debt is a fiscal decision that is taken as given in the paper.

Risks

The key question to address when selecting the composition of the benchmark is the extent of risks (liquidity, market, credit) or losses that the policymaker is willing to tolerate on its debt portfolio. The risk tolerance of the sovereign may prove tricky to estimate, however, as there is no single measure of sovereign risk. Wheeler (1997) recommends that the government align its risk preferences with those of the average or median citizen, who is typically risk averse. Indeed, as taxpayers cannot fully hedge or avoid the losses that the government incur on its assets and liabilities portfolios, they would demand from the government to follow a low-risk strategy. The risk preferences of a sovereign entity can also be approximated by taking those of institutions with a similar risk profile, such as pension funds, international financial institutions, life insurance companies, and long-term savings industries. A more systematic estimation of risk tolerance, however, would be to define it in terms of the maximum interest rate costs and excess volatility that can be sustained on the debt portfolio without jeopardizing the budget targets and medium-term objectives of the government. Any risk exceeding this tolerance level should be avoided.

The risk tolerance of a government ultimately depends on the size of the public debt, its currency composition, and its maturity. Any time the debt service cost is an important element in government expenditures, its variation becomes a key element to watch, and the sovereign is likely to be more concerned with the volatility of its debt. This is particularly the case for governments that have a limited ability to generate foreign-currency revenues or to access international markets. When the debt to GDP ratio is low, however, the sovereign has greater flexibility in terms of the choice of currencies in its portfolio and its duration. In particular, the sovereign may diversify its portfolio to include currencies with lower yield, or shorten the maturity of its portfolio to reduce interest rate costs, knowing that its overall exposure to the higher risks is limited.

Macroeconomic constraints

The two key macroeconomic policies that affect the currency composition and maturity profile of the external debt benchmark are the fiscal and monetary policies of the government. Budget targets, for instance, influence the desired duration of the benchmark. Budget targets may include maintaining the level of public debt to GDP below a certain percentage (e.g., to meet Maastricht criteria); reducing the government debt as a percentage of GDP over a certain horizon; or maintaining the public deficit below a certain percentage of GDP (e.g., stability pact after EMU). A cap on the debt-to-GDP ratio constrains the extent of volatility tolerated on the debt portfolio and biases the portfolio towards a longer duration. A cap on the budget deficit or on interest payments imposes a minimum average maturity on the portfolio, and constrains the proportion of floating rate debt, thereby limiting the risks of interest rate and exchange rate shocks destabilizing the budget targets.

A monetary policy geared towards pegging the exchange rate to a currency or a basket of currencies biases the choice of currencies in the benchmark portfolio towards the pegged currency (e.g., Hungary, Sweden); and limits the proportion of floating rate and short-term domestic debt in the portfolio (e.g., Belgium), to allow the central bank greater flexibility in influencing short-term rates through open market operations. The incompatibility of a pegged exchange rate policy with a short duration domestic debt was demonstrated during the 1992 ERM crisis. Several European central banks were constrained in their defense of their exchange rate during the crisis by the short duration of the public debt: both Italy and Spain had difficulty raising interest rates due to the short duration of their debt and the rapid impact of the higher rates on public expenditures. In countries where a large portion of the debt is at floating rate, monetary policy would also be constrained by the pass-through of interest rate hikes to domestic borrowers (e.g., the United Kingdom during the ERM crisis).

The trade flows of a country may also influence the choice of currencies in the external public debt benchmark, particularly when trade flows dominate capital flows, or when government's revenues are directly linked to the export of commodities denominated in foreign currencies (e.g., Colombia, Mexico, Saudi Arabia). In economies where the exchange rate is determined by monetary policy and capital flows, rather than by trade flows, the latter need not determine the foreign currency composition of the benchmark. The governments of several industrial countries with debt benchmarks (e.g., Belgium, Denmark, Ireland) do not take trade flows into account when deciding on the target currency composition of their benchmarks; they expect currency hedging to be undertaken by private entities and corporations.

Institutional constraints

An important institutional constraint that affects the target currency composition and duration of the benchmark is the extent of official borrowing (bilateral or multilateral) in the foreign currency debt portfolio, as the latter is generally denominated in the donors' currencies. Indeed, as more than half of developing countries' long-term debt is from official creditors, a significant part of the debt may be denominated in currencies that are not optimal from a risk management perspective. When developing countries have access to derivative markets or to the World Bank currency conversion scheme discussed earlier, they can hedge their exposure to some of these currencies.

Other institutional constraints that influence the composition benchmark include limiting the currency composition of the foreign debt to that of the foreign reserves portfolio (e.g., United Kingdom); maintaining a fixed percentage of foreign borrowing in a specific currency (e.g., ECU) to develop the debt market of that currency (e.g., France, Italy); or partly aligning the currency composition of the external debt with that of the national foreign assets (e.g., oil stabilization fund in Colombia), to create a natural hedge. National assets are often designated for special purposes, however, and may not necessarily be at the disposal of the sovereign to service its foreign debt.

Numéraire and horizon

The choice of a numéraire in which costs are measured is particularly important as it biases the currency composition of the portfolio towards that currency. Considering that the assets and revenues of most governments are denominated in the local currency, it would seem appropriate to measure the liabilities and interest payments of the government in the same currency; the risk-neutral numéraire for a sovereign portfolio is therefore the local currency.²⁰ The local currency could be taken as the numéraire even when a country pegs its exchange rate to a currency or to a basket of currencies. Taking the pegged exchange rate as the numéraire would only provide the sovereign with a nominal hedge against currency risk, as there is always a risk that the currency is devalued or the peg abandoned.

In order to avoid frequent changes in its composition, and maintain its neutrality from political considerations (budget cycle), a benchmark would need to be defined over a medium-term horizon (e.g., three to five years).

Analytical framework

Having identified its objectives, risk preferences, and constraints, the policymaker then has to choose an appropriate analytical framework to model the stochastic properties of the variables involved, and derive the benchmark debt portfolio. There is no unique methodology that can be used to derive a benchmark portfolio. Efficiency frontier models, which estimate the cost/risk characteristics of various currencies and interest rates in a portfolio, have been used by a number of countries (e.g., Belgium, Ireland, and New Zealand) to derive their benchmarks. Drawing the most efficient combination of expected costs, variances and correlations for the different currencies and interest rates, an efficiency frontier—representing a set of portfolios which offer the lowest expected cost for a given level of risk—is obtained.²¹ The most conservative approach would be to choose, among these portfolios, the minimum variance portfolio—the portfolio that yields the lowest costs at the minimum level of risk—as the benchmark portfolio.

The success of a benchmark as a risk management tool is closely linked to its robustness to changes in its underlying assumptions, including various financial market

²⁰Belgium, Denmark, Ireland, and New Zealand, among others, use their local currency as the numéraire for their foreign currency debt. In Colombia, the dollar is used as numéraire, as the closest substitute to the peso, due to its importance in trade and capital flows, and exchange rate management.

²¹Expected returns are implied from forward exchange rates, swap curves and the interest rate term structure, whereas variances and correlations are derived from historical data. In order to be risk-neutral, benchmarks should rely on expectations derived from market prices rather than on the government's forecasts of foreign currencies and interest rates.

outcomes or interest rates and exchange rates scenarios. Robustness can be assessed by comparing the performance of the benchmark under various price movements (e.g., lower and higher interest rates, a flattening or a steepening of the yield curve, and an appreciation or depreciation of the domestic currency vis-à-vis the foreign currencies included in the portfolio). Considering that debt management includes managing the exposure of the sovereign to low probability high risk events, the robustness of the benchmark to extreme market conditions (tail events) also has to be tested. This can be done by simulating the effect of market collapses, sharp changes in exchange rates (e.g., the ERM crisis, the Mexico crisis), interest rates, or commodity prices (oil shock) on the benchmark.²² The benchmark would be robust, if under all scenarios, its risk-adjusted cost performance is superior to all other portfolios. Depending on the results of the tests, the benchmark may have to be readjusted to reflect the risk tolerance of the sovereign to catastrophic events.

A benchmark is especially effective as a disciplining tool when its composition and the performance of the debt manager relative to the benchmark are made public. Such public disclosure is essential for creating a transparent and accountable debt management policy. Furthermore, in order to be used by policymakers to monitor the performance of their debt managers, a benchmark portfolio needs to be easily replicated in the marketplace as a low cost passive strategy; and structured to track available bond and money market indices (e.g., J.P. Morgan's or Salomon Brothers' Money Market and Government Bond Indices). A benchmark that includes complex currency or interest rate hedging strategies may be difficult and costly to replicate by the portfolio manager, either due to a lack of information on the instruments or to the high transaction costs. Finally, the composition of the benchmark needs to be reviewed regularly to incorporate important changes in the objectives and risk preferences of the government.

Selected examples of debt benchmarks

A number of countries have developed benchmarks for their public debt. In *Ireland*, the benchmark is designed to be consistent with the annual debt service budget within which the NTMA has to operate. As such, the review of the benchmark is annual and matches the budget cycle. The NTMA attempts to beat the benchmark both by funding at different dates than the benchmark, in order to take advantage of favorable market opportunities, and by issuing at different maturities than the maturities of the benchmark. The NTMA chooses its maturities subject to a limit on the amount of debt it is permitted to issue, and subject to guidelines on the proportions of foreign currency and floating rate debt. The performance of the DMO is evaluated by comparing the difference between the actual and benchmark portfolio at the end of the year, both of which are marked-to-market and net present valued in local currency. Although the currency composition and duration of the Irish benchmark is not

²²Stress tests can be simulated by adding standard deviation shifts to the parameters used in estimating the portfolio (e.g., adding one or two deviations to the currency and interest forward or swap rates), or by assigning probabilities to future market scenarios.

made public, the deviations of the actual portfolio from the benchmark tend to be small. As of December 1996, the foreign currency composition of the Irish debt was as follows: 28 percent in deutsche mark, Dutch guilder, and Swiss francs, 42 percent in pounds sterling and French francs, 20 percent in U.S. dollars, 3 percent in ECUs, and 5 percent in Japanese yen and 2 percent in other currencies (NTMA, 1997).

In *Sweden*, the benchmark serves as the limit within which the foreign currency debt may be exposed to currency and interest rate risks. Within the risk limits laid down by its Board, the SNDO takes positions in the foreign exchange and bond markets to bring the long-term cost of the debt below that of the benchmark portfolio. As of December 1996, the currency composition of the Swedish benchmark was 25 percent deutsche mark, 16 percent French Francs, 11 percent U.S. dollars, 10 percent British pound, 6 percent Japanese yen, and the rest in ECU and ECU-basket currencies. The currency composition of the benchmark primarily matches the weights of the currencies in the ECU basket (82 percent), while the US dollar and the Japanese yen are included in the portfolio for diversification purposes. The duration of the foreign currency debt portfolio is around 2.2 years. The interest rate structure of the benchmark is based on diversified borrowing along the yield curve to reduce shocks to specific parts of the yield curve, and to reduce bunching risk over a certain year.

In *Colombia*, the recently established external debt benchmark includes a higher portion of dollar debt (80-85 percent instead of the current 72 percent), in line with the currency exposure of government revenues. The rest of the portfolio is to be divided between deutsche mark (around 12 percent) and Japanese yen (around 3 percent). The selection of the benchmark reflects the structure of currency flows into the country and the risk tolerance of the government. The benchmark portfolio has a longer maturity profile than the actual external debt portfolio, and a smaller share of floating rate debt.

In *Hungary*, the currency benchmark for the foreign-currency debt (foreign and domestic) that is now serviced by the MOF matches the composition of the basket to which the national currency is pegged (70 percent deutsche mark, 30 percent U.S. dollar). The composition of the remaining foreign-currency debt held by the central bank, however, matches that of the foreign exchange reserves. In most developing countries, benchmarks for the external public debt remain non-existent.

B. Benchmarks for the Foreign Reserves Portfolio

The approach discussed in the previous section can be used, to a large extent, for foreign reserves management. The objectives of central banks are more narrowly and tightly defined than those of Ministries of Finance, however, and their risk preferences are generally more conservative. In most industrial countries and emerging markets, foreign reserves are used by central banks primarily for intervention purposes and to meet unexpected liquidity demand. In keeping with this objective, and due to the limited size of their reserves, central banks typically subordinate investment criteria in the management of their assets to liquidity criteria. Contrary to fund managers, the objective of central banks is to maximize the liquidity

of their portfolio subject to an acceptable level of return, rather than to maximize return subject to an acceptable level of liquidity.²³

Over the last decade, however, central banks' ability to manage either their daily liquidity needs or a speculative attack on their currency has improved significantly. First, the range of instruments available for intervention purposes and liquidity funding has expanded: central banks can collateralize their assets or use repurchase agreements to supply liquidity at short notice, without having to liquidate large amounts of securities; and many central banks can now add currency forwards and options to their armory to defend their exchange rate. Second, a number of bilateral or multilateral agreements have been established—credit lines or swap lines among central banks and with commercial banks, repurchase agreement facilities among central banks—to buttress foreign reserves. Furthermore, as evident in recent exchange rate crises, foreign reserves no longer constitute the main tool for defending a currency. Only a painful interest rate policy is capable of fending off a speculative attack. In the current environment, therefore, the liquidity constraint has eased, and central banks holding a large stock of reserves need not sacrifice their investment objectives to their liquidity constraints to the same extent.²⁴

Indeed, the two objectives—liquidity and return—can be reconciled by splitting the reserves portfolio into a liquidity portfolio and an investment portfolio, and applying different investment criteria for each portfolio. The liquidity portfolio, which would be aimed at meeting regular disbursements and unexpected liquidity demand and for intervention purposes, would be invested largely in the treasury bill markets of the main intervention currencies. The investment portfolio would include a broader set of currencies, maturities, instruments, and markets, and would apply investment principles similar to those of large institutional and pension fund managers.

The allocation of the assets between the two types of portfolios would differ from one country to another, depending on the exchange rate regime of the country, the size of reserves

²³Central banks overriding concern for liquidity is evidenced by examining the currency composition of their reserves. In 1995, 83 percent of all central banks' international reserves were invested in the three most important and liquid international currencies, the U.S. dollar (62 percent), the deutsche mark (14 percent), and the Japanese yen (7 percent). Developing countries invested 61 percent of their foreign reserves in U.S. dollars, 11 percent in deutsche mark, and 7 percent in Japanese yen; the majority of the foreign assets were invested in short-term government securities bill markets.

²⁴This is partly evidenced by the fact that central banks have increased the portion of long term securities, especially government securities, in their reserves portfolios since 1990. At end-1994, holdings of long-term securities accounted for 44 percent of total reserves. Furthermore, a number of central banks are investing their reserves in a broader range of instruments, and have extended the duration of their portfolio.

and their variability, and the structure of the economy. Countries with a fixed or pegged exchange rate regime would evidently allocate a higher proportion of reserves to the liquid portfolio than countries with a floating exchange rate regime.²⁵ For developing countries where current account flows dominate capital account flows and where the private sector is small relative to the public sector, foreign reserves are not used solely for intervention purposes, but also to smooth short-term trade flows and finance imports. As such, the level of reserves tends to fluctuate widely and is highly correlated with movements in the trade and current account. In those countries, the portion of reserves allocated to the liquidity portfolio would be high, while the portion allocated to the investment portfolio would be small (about 10 to 20 percent). For industrial countries and emerging markets with a diversified economy, however, foreign exchange reserves do not finance imports, which are funded by the private sector, and hence, there is no significant correlation between foreign reserves and current account flows. Furthermore, with the increased financial integration of the past decade, the volume of financial assets held by private investors has increased significantly in most emerging and developing countries, thereby increasing the importance of the capital account relative to the current account as a determinant of the optimal level of reserves. Indeed, in most emerging markets, the size of foreign reserves should be determined by the size of capital flows and the exchange rate regime and not by the size of imports. In those countries, the portion of reserves allocated to the investment portfolio can be larger.

In a similar vein to debt management, sophisticated management of foreign reserves entails deriving benchmarks for both the liquidity and investment portfolios. The optimization approach discussed earlier also may be used to derive the currency distribution and duration of the benchmark that would minimize its exposure to currency and interest rate risks.²⁶ The currency composition and duration of the benchmark portfolios would be influenced by the objectives of the central bank, the macroeconomic environment of the country (exchange rate arrangements, monetary policy, trade and current account flows, and currency denomination of debt service payments); institutional constraints (agreements among central banks of concerted or coordinated intervention, restrictions on the maximum exposure to certain markets and currencies); and risk preferences.

Typically, the currency composition of the liquidity portfolio would be limited to the three main intervention currencies—the U.S. dollar, the Japanese yen, and the deutsche mark—and the duration would be very short (0 to 3 months), with most of the assets invested in highly liquid short-term government debt. The currency composition of the investment

²⁵In this paper, we do not estimate quantitatively the optimal split between the two portfolios. In a broad sense, the portion of reserves allocated to the liquidity portfolio would be based on past intervention and withdrawal patterns, the variability of liquidity needs, and the estimation of future liquidity needs under various scenarios of currency attacks.

²⁶Several countries, including Australia, Denmark, Finland, Norway, and New Zealand, use portfolio optimization to derive their reserves benchmarks.

portfolio benchmark would include a broader array of currencies than the liquidity portfolio, although it should be invested predominantly in the major currencies (G-10 currencies). Indeed, the currencies included in the investment portfolio should be selected according to their stability and diversification benefits, with the overriding goal of preserving the real value of reserves, rather than the nominal value.

The target duration of the investment portfolio benchmark would be longer than that of the liquidity portfolio (ranging from one to three years), and closer to that of the external liability portfolio. Matching as closely as possible the currency composition and duration of the investment portfolio with those of the external public debt would reduce the net exposure of the public sector to currency and interest rate risks. As the investment portfolio would be less constrained by liquidity risk than the liquidity benchmark, the foreign reserves can be invested in a broader spectrum of maturities (up to 10 years) and securities, provided the investments fulfill the credit risk criteria of the central bank. In particular, foreign reserves may be invested in securities issued by government agencies, local governments, regional and international organizations, and highly rated commercial banks.

The target duration would vary across the currencies of the benchmark, however, due to differences in liquidity and yield curves in the various bond markets. Most short-term government securities markets, with the exception of the U.S. market, lack liquidity and depth. The duration of the U.S. dollar reserves portfolio may therefore have to be short to compensate for the longer duration of the non-dollar portfolio.²⁷ Similarly, although the investment benchmark specifies the maximum tolerable credit risk for the portfolio, the credit risk may differ among markets. For instance, the central bank may have to reduce or avoid taking a bank credit risk in countries that have liquid short-term government securities markets to offset its greater exposure to bank risk in countries with underdeveloped short-term government securities markets.

As in the case of debt management, the central bank's Board would define the permissible financial instruments in which reserves can be invested, the maximum credit risk tolerated on the portfolio, the market indices that would be used to track the performance of portfolio managers, and the discretionary guidelines imposed on managers. Both the investment portfolio benchmark and the performance of the managers should be made public. The liquidity benchmark may not be made public, as it is primarily used for intervention purposes.

²⁷According to BIS estimates, the duration for the deutsche mark and Japanese yen reserves portfolios is longer than the U.S. dollar portfolio, due to their less liquid short-term securities markets.

Selected examples of foreign reserves benchmarks

Although a number of central banks have developed benchmark for their reserves, we are only aware of a relatively few that officially reveal the currency composition and asset breakdown of their actual and benchmark reserves portfolio.

In *Australia*, the Investment Committee of the Reserve Bank of Australia (RBA) has defined a benchmark for foreign currency assets composed of 40 percent U.S. dollar, 30 percent yen, and 30 percent deutsche mark. One of the reasons for limiting holdings to these three currencies is their large and liquid government securities markets. The RBA did not include other major currencies in its portfolio either because of a lack of diversification benefits from adding more currencies or because of the lack of resources for monitoring a large number of financial markets. The target duration for the U.S. dollar assets is 12 months; 30 months for yen assets; and 30 months for deutsche mark assets. The weighted average of the maturity of investments cannot exceed three years, although the maximum maturity can extend to 10 years. Reserves are primarily invested in government securities, and to a lesser extent in bank deposits. The RBA prefers repurchase agreements secured with government bonds as collateral to bank deposits, as the return is higher than in the inter-bank market. Reserves are managed primarily by internal portfolio managers, but external portfolio managers are used for occasional reviews of benchmarks.

In *New Zealand*, the foreign reserves benchmark is composed of U.S. dollars (about 55 percent), Japanese yen (about 20 percent), deutsche mark (about 20 percent), and pound sterling and French francs (about 5 percent).²⁸ The central bank has separate investment benchmarks for each of the five currencies. For instance, the U.S. dollar portfolio has three components: a money market portfolio that tracks a money market index derived within the central bank; and a medium- to long-term bond portfolio that tracks the returns on the J.P. Morgan 1-10 years and 1-30 years U.S. government bond indices. The benchmark specifies that the minimum acceptable credit rating (Moody's) for investments for foreign reserves is Aa3. As of March 31, 1995, the breakdown of the reserves benchmark portfolio by instruments was: 67 percent in bonds, 16 percent in commercial bank deposits, 22 percent in other central banks deposits (including the BIS), and 6 percent in treasury bills.

Some central banks, such as the Hong Kong Monetary Authority (HKMA), do not reveal the actual composition of their reserves but acknowledge that they split their reserves into a liquidity portfolio, an investment portfolio and a hedging portfolio, and that they use benchmarks. The liquidity portfolio of the HKMA is invested in treasury bills of less than one year and, to a limited extent, in bank deposits of the G-7 currencies. The investment portfolio is also invested in liquid assets but with longer maturities (up to 10 years) bonds, and in equity indices (S&P-500).

²⁸See Reserve Bank Bulletin, 1995.

VI. TACTICAL MANAGEMENT OF SOVEREIGN ASSETS AND LIABILITIES

Sound risk management would necessarily require that, at times, the portfolio manager moves the actual debt or reserves portfolio away from the benchmark portfolio to adjust to changes in market conditions or to incorporate new expectations about market developments. As any divergence from the strategic benchmark portfolio introduces currency and interest rate risks, however, the Ministry of Finance or central bank would need to cap those risks by imposing strict guidelines on the maximum permissible deviation from the benchmark and the extent to which the sovereign portfolio may be exposed to market risks.

A. Discretionary Margins

The discretion of portfolio managers over the management of the sovereign debt and foreign reserves varies from one country to another, depending on the risk preferences of the sovereign, the size of the public debt and foreign reserves, and the expertise of portfolio managers. A government burdened with a large debt service cost relative to its budgetary expenditure would necessarily limit the extent to which debt managers can deviate from the benchmark portfolio, due to the large fiscal consequences of a risky strategy. In such instances, the debt manager would follow a passive investment strategy, solely ensuring that the actual debt portfolio follows the benchmark portfolio closely. Governments with a small debt burden and the means to acquire sophisticated risk management systems and experienced portfolio managers have greater flexibility in allowing their debt managers to pursue an active debt management strategy. For instance, debt managers may be encouraged to outperform the benchmark by deviating from the benchmark's currency weights and duration by a certain percentage, according to their expectations of future market movements. Active debt management may also involve taking advantage of arbitrage opportunities and irregularities in the market, through liquidity or credit transformation transactions.

In a similar vein, the central bank of a country belonging to a currency block has less freedom to change the currency composition of its reserves than a country with a floating exchange rate. Similarly, the central bank of a large country is more constrained in varying the currency allocation of its reserves than the central bank of a small country, due to its potential impact on foreign exchange markets.

In Sweden, the SDMO may deviate from the currency composition of the debt benchmark portfolio by 3 percentage points, and by 0.5 percentage point from the duration of the benchmark. Ireland does not reveal the extent of deviation tolerated on its debt portfolio, but acknowledges that it is small. In Denmark and Hungary, the maximum level of deviation from the benchmark has been set at 5 percent. In Belgium the government has opted to pursue a passive debt management strategy due to the high operational costs of active management. Canada has also renounced an active debt management policy and only focuses on minimizing refunding risks.

The majority of central banks do not reveal the margin of discretion granted to their portfolio managers. Australia and New Zealand are the two notable exceptions. In Australia, the Reserve Bank provides ample discretion to its portfolio managers in managing the reserves portfolio, partly on account of their limited impact on international financial markets (Tables 8 and 9). In New Zealand, the extent to which the portfolio manager can deviate from the reserves benchmark portfolio is based on a "funds-at-risk" approach: the manager has to ensure (with 95 percent confidence) that the value of the portfolio does not fall by more than three hundredths of a percent, on any one day.

Most of the discretionary margins imposed on portfolio managers, with the exception of New Zealand, are based on arbitrary rules and are not risk-adjusted. A more sophisticated approach to estimate the extent of market risk that a sovereign is willing to tolerate on its portfolio is the value-at-risk (VAR) approach.²⁹ The VAR approach can be used to measure within a certain degree of confidence (95 and 99 percent) the potential loss of the actual portfolio against the benchmark over a specific period (e.g., the next 30 days or 100 days). The portfolio's VAR is obtained by estimating the relationships between risk variables (e.g., exchange rates, interest rates, shifts in yield curves or swap curves) across the portfolio, and the effect of changes in these variables on the mark-to-market value of the portfolio. The expected change in the level and volatility of exchange rates and interest rates is extrapolated from historical prices and implied volatilities. The sovereign can then determine the maximum loss that it is willing to accept on its portfolio, and translate it into maximum deviation targets from the benchmark, or maximum daily shortfall on the portfolio. These VAR limits should be imposed on each currency of the portfolio rather than on the whole portfolio. The VAR approach is useful for a sovereign portfolio, as the latter generally does not contain options, which are more difficult to estimate, and is invested in the government securities of the main currencies, where historical volatilities and correlations are readily available. The VAR approach is particularly helpful to central banks, because of the shorter horizon of their portfolio.

B. Management of Currency and Interest Rate Risks

The most flexible financial tools for aligning the actual sovereign portfolio with the benchmark, and for hedging the portfolio from currency and interest rate risks are derivative instruments (e.g., currency and interest rate swaps, forward contracts, futures, and options).³⁰ Derivatives enable the portfolio manager to move the actual sovereign portfolio to the benchmark portfolio without selling large amounts of securities, which could disrupt financial markets, and to unbundle the various risks inherent to an underlying security and manage them

²⁹Sweden is also considering moving to a VAR approach.

³⁰A number of sovereigns, however, are not allowed to use derivatives by their constitution, or do not have the legal framework or technical capacity to manage the cash flows created by derivatives.

separately. All the derivative positions of the portfolio manager need to be carried within the guidelines of the policymaker, and should only be taken on the underlying debt or reserves portfolio, without any net or leveraged position.

A number of debt managers use derivatives to borrow in a wide range of markets, currencies, and maturities, while maintaining both the currency composition and duration of the actual portfolio in line with those of the benchmark. In Sweden, for instance, about two-third of the government's external borrowing is raised in U.S. dollars and Japanese yen, although the benchmark's allocation for these two currencies is 18 percent. Similarly, the maturities of the debt instruments are spread along the yield curve, although the modified duration of the benchmark portfolio is equal to two years (equivalent to 2.2 year duration). In both instances, swaps, forwards and futures are used by the Swedish DMO to bring the actual portfolio in line with the benchmark's weights.³¹ In Ireland, in addition to interest rate swaps, portfolio managers use bond futures to transform the interest rate profile of the foreign currency debt to the benchmark portfolio. In New Zealand, interest rate futures are used to manage the interest rate risk between the foreign reserves portion that acts as a liquidity buffer for debt repayments, and the short-term foreign-currency debt. In Australia, although foreign currency debt has not been issued since 1987, a foreign currency exposure has been maintained through domestic swap transactions; swaps have been used instead of direct offshore issuance because of the lower cost. In Denmark, derivatives are used to manage the net exposure of the sovereign portfolio, by matching the daily currency and interest rate exposure of the foreign currency debt with that of its foreign assets. Central banks' portfolio managers increasingly use derivative instruments to manage their currency and interest rate exposures, and to diversify their risk across several bond markets without incurring currency risk. The most common derivatives used are forward and swap agreements, futures, and, to a lesser extent, options.³²

The use of derivatives, however, introduces credit risk or counterparty risk to the exposure of the portfolio: in the case of a forward or swap transaction, counterparty risk arises because the counterparty to the transaction may not fulfill its obligation and default on the contract; in the case of a futures contract, counterparty risk arises if the exchange defaults on its obligation. The counterparty risk for exchange-traded derivatives is lower than for OTC derivatives, however, as exchanges have clearinghouses which have a supervisory and insurance role, do not keep open positions on contracts, and require call margins from

³¹The size of the swap portfolio (Kronor 440 billion) is equal to the foreign currency debt portfolio (Kronor 420 billion).

³²Both futures and forwards allow the manager to lock in the refinancing of the debt at the current exchange rate and remove the exchange rate risk during that period. The main difference between the two instruments is that the former are standardized contracts traded on exchanges and limited to a small number of currencies, whereas the latter are over-the-counter (OTC) transactions that are customized to the client and cover a larger number of currencies.

investors.³³ In order to reduce its exposure to credit risk, the sovereign should impose strict guidelines on portfolio managers, either by limiting their transactions to derivatives traded on reputable exchanges, or to trading OTC derivatives only with highly rated financial institutions (e.g., with at least a AA/Aa2 credit rating from Moody's and Standard & Poor's). Managing counterparty risk is especially important when the sovereign has a large swap portfolio: In Sweden, the SNDO's swap transactions are only conducted with institutions rated AA or higher, whereas in Australia, swaps are arranged with financial intermediaries rated AA- or higher. In Ireland, credit risk exposure is restricted to institutions with at least a AA rating.

Until recently, most developing countries have been either unable to access international derivative markets due to their high credit risk, or have had to pay prohibitively high premia or exhaust their bank credit lines to acquire derivatives securities with long maturities, thereby limiting their usefulness. Furthermore, in a large number of developing countries, derivative instruments in the local currency are either nonexistent or available only for short-term maturities. Several developing countries have since improved their international credit standing, through macroeconomic adjustment and microeconomic reform, thereby gaining greater access to international capital and derivative markets. This is demonstrated by the large number of Asian and Latin American countries that have investment grade statuses and are accessing international capital markets. A large number of emerging markets have also developed forward and futures contracts on the domestic currency and interest rates.³⁴

Management of currency risk

There are a number of derivative instruments and strategies that can be used by portfolio managers to reduce the currency risk exposure of the sovereign portfolio. A short-term foreign-currency exposure can be hedged with currency futures and forward contracts, while the most convenient instruments for hedging a long-term foreign-currency exposure are foreign currency swaps. The main advantage of currency derivatives is that they allow an investor to invest in the asset markets of a currency without taking on currency risk, or to invest in the currency markets without investing in the asset markets of that currency.

³³Any time a borrower buys or sells a futures contract, it has to maintain margin requirements at the exchange which fluctuate daily and which has to remain above a certain minimum balance, called the maintenance balance. The position is constantly marked to market. Thus when the price rises above the initial price, the seller pays the price differential to the exchange from the margin account and the buyer's account is in turn credited by the same amount. When the maintenance balance falls below a certain minimum, it has to be supplemented with outside funds, or is closed.

³⁴Futures markets exist in several emerging markets, including Brazil, Malaysia, and Chile. Forward markets, especially for short-term maturity contracts (up to 6 months), exist in several Asian and Latin American countries. Swap markets, although still rare, exist in some emerging countries, including India, Chile, and Brazil.

This separation between asset and currency markets allows managers to decouple currency risk from interest rate and liquidity risk, and to achieve interest rate diversification, while maintaining a targeted currency mix. For instance, a central bank may want to increase its investments in Japanese government securities without increasing its exposure to the Japanese yen. This would be achieved by buying a government bond and simultaneously entering into a forward or swap transaction to convert the yen into U.S. dollars. A central bank could also create synthetic money market instruments in markets lacking liquid short-term government securities by buying treasury bills in those markets and covering their exchange rate exposure with a currency swap.

In addition to futures and swaps, options are convenient instruments to manage risks. Options perform similar hedging functions as swaps and futures, but give the holder of the contract the right, but not the obligation, to buy or sell a financial asset at a specified price at or until a specified date. To obtain this right, the investor has to pay an up-front premium. The premium, unlike forward or futures contracts, is the maximum loss that an investor would incur on the contract. The advantage of options is that they allow the investor to hedge against the downside risk of exchange rates movements without foregoing the benefits of the up side. The use of options is particularly attractive to developing countries because they do not require the latter to block credit lines to guarantee their commitment on futures and forwards contracts. Options also enable developing countries to hedge a long-term exposure without being handicapped by their credit risk.

Although options are useful tools for managing financial risks, the size of the up-front cost may prevent cash constrained countries from using them. There are, however, several ways to reduce the premium on options. For instance, a central bank that holds a currency for monetary policy purposes but is worried about the downside risk could hedge part of its exposure by purchasing a put option on that currency and partially offset the premium on the put option by selling a call option, thereby limiting both upper and lower movements on the currency's value. The central bank could also lower the option premium either by hedging only against a large depreciation of the currency (i.e., a strike level out of the money), or by hedging a currency range rather than a single currency rate. For example, suppose Indonesia, which has a large yen-denominated debt but has most of its revenues in U.S. dollar, desires to hedge its foreign currency debt against an appreciation of the Japanese yen. Rather than hedging its currency exposure through a currency swap, thereby foregoing the benefits of a depreciation of the yen, the manager could hedge the portfolio against volatilities exceeding a 10 percent range.³⁵ To illustrate this example, taking a spot rate of ¥100 to the dollar, the goal of the manager would be to hedge the portfolio from fluctuations beyond the ¥90-110 range. The hedge, referred to as an exchange rate collar or range forward collar, would be constructed by (i) writing an out-of-the-money put option on the yen against the dollar, struck at one end of the desired fluctuation range ¥90; and (ii) buying an out-of-the-money call

³⁵This is based on the assumption that such a range is an acceptable currency risk exposure by the MOF.

option on the Yen against the dollar, struck at the other end of the range, ¥110. The premium payment on the call option would be offset by the premium received on the put option.

The option premium can also be reduced by using average rate currency options, which are options that hedge against the average rate of the spot rate during the lifetime of the option, as opposed to the spot rate at the expiration of the option. These options cost less (up to 20 percent) than straight call options because of the dampened volatility effect of the average rate as time passes. Countries that peg their currencies to a basket of currencies can hedge their exposure by buying average rate call options on the basket of currencies. The premium on such options is low because the counterpart can cover its currency risk by crossing the currencies.

Basket currency options can also be used to hedge a multicurrency portfolio. A basket option creates an index that represents the value of the portfolio of foreign exchange positions against the base currency. There are several advantages to these options. First, depending on the extent of cross-currency correlations in the basket, the premium on basket options can be up to 20 percent lower than that on standard options. Second, basket options allow the manager to ensure that the value of its portfolio does not fall below a certain level—determined by the strike price of the option—while benefiting from the upside gains.

Options are not only useful for risk management purposes but also for credit enhancement. Sovereign can enhance the attractiveness of their bonds, for instance, by including a put option on their bond—the option to call the bond before maturity—thereby reducing the risk exposure of the lender to a default risk. Sovereigns can also improve the terms of borrowing by offering the lender the choice to convert the principal of the loan at maturity to another currency. In this case, only interest rate payments will be subject to currency risk. In both instances, the borrower would benefit from a lower interest rate on the borrowing, albeit at the expense of a higher risk exposure. Attaching strings to the issuance of bonds is especially beneficial for developing countries accessing international capital markets for the first time, as it reduces their borrowing cost and provides them with a wider spectrum of lenders. A number of countries (e.g., Mexico, Argentina, and Brazil) that re-entered international capital markets in the early 1990s attached put options, ranging from one to three years, on their bonds (World Bank, 1993). In fact, almost 20 percent of the total bonds issued by developing countries in the early nineties had put options attached to them.

Management of interest rate risk

Domestic debt is for a large number of countries the main component of their total debt, and, hence, interest rate risk is the key risk to manage. Indeed, an important task of the portfolio manager is to constantly adjust the sovereign portfolio to changes in interest rates, to prevent significant deviations from the benchmark portfolio. For instance, when interest rates increase, the duration of the actual portfolio shortens, thereby inducing the manager to lengthen it to bring it back in line with the benchmark duration. The most efficient and cost effective method for altering the duration of the portfolio is to take positions on the yield

curve through interest rate swaps, futures, and options rather than to trade the underlying securities. The manager could instantly reduce the duration of its portfolio while maintaining the asset allocation unchanged, for example, by selling a 7-year Treasury futures contract and buying a 5-year contract.

The day-to-day responsibilities of the portfolio manager also entail hedging the short-term and floating rate debt components of the sovereign portfolio, as the latter are the most vulnerable to interest rate risk. About half of developing countries' foreign currency debt is exposed to interest rate risk: in 1995, almost 40 percent of developing countries' long-term debt was at variable rates, and almost 20 percent of their total external debt was short-term. As most of developing countries' U.S. dollar-denominated short-term and variable debt is indexed to LIBOR, it is relatively easy to hedge against variations in LIBOR by selling Eurodollar futures contracts.³⁶ By selling a Eurodollar futures contract, the manager locks the debt at a fixed rate for the duration of the contract: any increase in LIBOR that results in higher interest payments is covered by profits on the futures position. In order to hedge interest rate risk for more than one payment period, Eurodollar futures can be combined in a sequence of contracts, referred to as a strip hedge. Strip hedges which involve a long sequence of contracts tend to be illiquid, however, and demand a high premium.

In addition to futures, interest rate swaps (IRS) and swap-options—options to enter into a swap agreement—can be used to hedge against LIBOR movements and to convert the variable rate debt into fixed rate debt. In a typical IRS transaction, the portfolio manager agrees with a commercial bank to exchange a stream of fixed interest payments for a stream of floating interest payments for the duration of the bond. The commercial bank assumes the risk of this conversion by taking a premium over the expected floating rate during that period. IRS are popular instruments because no premium is paid at the beginning of the transaction, the risk premia is low, and their maturities extend up to 10 years. In IRS transactions involving long maturities, however, countries with poor debt servicing history or high foreign currency debt may have difficulty finding institutions that are willing to take their counterpart risk.

The exposure of the debt portfolio to interest rate fluctuations can also be hedged through the use of interest rate caps or floors.³⁷ Interest rate caps, which are equivalent to put options, ensure the borrower that interest payments will not exceed a certain level—the cap—during the duration of the loan. In the event that interest rates rise above that level, the seller of the cap would reimburse the cap holder for all interest payments above the cap.

³⁶A Eurodollar futures contract is an obligation to buy or sell at a predetermined price on a specified date a Eurodollar time deposit that is indexed to the LIBOR. Eurodollar futures have maturities ranging from three months to three years, although maturities above two years tend to be less liquid.

³⁷Caps or floors are typically contingent on the LIBOR rate or the price of oil.

Interest rate floors, which are equivalent to call options, ensure the borrower that if the interest rate falls below a certain level—the floor—the borrower agrees to sell the asset at the strike price.³⁸ Interest caps on floating rate debt, or interest floors on fixed rate debt are especially useful for ensuring that the sovereign's annual interest payments do not exceed budget targets. Although caps and floors can cover long maturities (up to 10 years), their premia tend to be high. By combining interest caps and floors to create collars or cylinders, which define lower and upper bounds to the borrower's interest payments, the premium can be reduced or eliminated: the up-front payment on the cap is partly offset or financed by the premium received by selling the floor. This hedging strategy can be maintained on a rolling basis with a new position taken every time the collar matures.

Finally, other interest rate risks that the portfolio manager may have to hedge against include nonparallel yield curve shifts, which occur when the level of interest rates does not change uniformly across all maturities; changes in the slope of the yield curve, which occur when yields for shorter maturities change at a different rate than yields for longer maturities; changes in the shape of the yield curve, which occur when changes in the yields for the middle maturities are different from yield changes at the extremes of the yield curve; and yield spread risk, which is the risk of a widening of yield spreads between different markets of the same currency (e.g., the U.S. Treasury bills and Eurodollar deposits).

VII. CONCLUSION

In a world of mobile capital flows and integrated capital markets, governments holding large and unhedged foreign-currency liabilities are exposed to risks that they may not always be able to manage adequately. An important step towards reducing the vulnerability of emerging market economies to volatility from international capital markets is to improve the institutional arrangement governing debt policy, so that it promotes a professional, transparent, and publicly accountable incentive structure. The experience of the governments that have already reformed their debt management practices suggests that such objectives are best achieved if debt management is assigned to a separate debt agency with a degree of autonomy from political influence. Under such an arrangement, the Ministry of Finance formulates and publicly announces its debt strategy, while the debt agency implements that strategy and manages the day-to-day exposure of the debt portfolio according to the investment guidelines of the Ministry of Finance.

Regrouping liabilities management under a separate and autonomous agency can improve the assessment and management of the risk exposure of the country to risks, and can shield the debt agency from political pressures. It also enables the authorities to endow the agency with a clearly defined objective, and organize it to achieve such an objective, without being hampered by either the management structure or pay scale of the public sector.

³⁸The premium of caps and floors is based on the length of the contract, the expected volatility of the interest rate, and the level of the cap or the floor.

Furthermore, assigning debt management to an autonomous debt agency enables a clear separation of responsibilities between debt management and monetary policy, thereby avoiding the conflict of interests that arise when a central bank is in charge of both functions.

An appropriate and transparent vehicle for communicating the objectives and preferences of the Ministry of Finance to the debt office is the establishment of benchmarks for the foreign currency debt portfolio. The benchmark portfolios, which can be derived from portfolio optimization, would specify the currency composition, the maturity structure, and the permissible instruments of the sovereign debt portfolio. A key element of this framework is to disclose to the public on a regular basis both the benchmark portfolio and the performance of the debt manager relative to the benchmark. Such public disclosure is essential for creating a transparent and accountable debt management policy.

Active management of the sovereign debt portfolio should only be undertaken when the resources to acquire reliable risk management systems and hire experienced portfolio managers are available. Otherwise, debt management should be limited to a low-cost strategy of replicating the benchmark passively. When portfolio managers are engaged in active management, the sovereign should cap the exposure of the debt portfolio to market and credit risks, by imposing strict limits on the margin of deviation of the portfolio manager from the benchmark.

Finally, contrary to current practices, reserves management would also benefit from public scrutiny that holds the central bank accountable for its investment decisions and performance. In order to reconcile its investment objectives with its liquidity constraints, the central bank can split its reserves portfolio into a liquidity portfolio—aimed at meeting regular liquidity demand and for intervention purposes—and an investment portfolio, managed according to investment principles similar to those of large institutional and pension fund managers. As in debt management, public disclosure of the benchmark and actual reserves portfolios, as well as the performance of portfolio managers would encourage the adoption of sound reserves management practices.

Table 1. Long-Term Public and Publicly Guaranteed External Debt Outstanding and Reserves Excluding Gold in Selected Developing Countries, 1995

(In billions of U.S. dollars)

	Long-Term Public and Publicly Guaranteed External Debt Outstanding	Total Reserves Excluding Gold
Asia		
China	94.7	75.4
India	79.7	17.9
Indonesia	65.3	13.7
Malaysia	15.9	23.8
Philippines	29.9	6.4
Thailand	17.2	36.0
Europe		
Czech Republic		13.8
Hungary	23.6	12.1
Poland	41.1	14.8
Russian	100.3	14.4
Turkey	50.1	12.4
Western Hemisphere		
Argentina	62.2	14.3
Brazil	96.6	49.7
Colombia	13.0	8.1
Mexico	94.0	16.8
Venezuela	28.5	6.3
Memorandum item:		
All developing countries 1/	1,448.6	538.4

Sources: International Monetary Fund, *International Financial Statistics (June 1997)*; and World Bank, *Global Development Finance 1997*.

1/ The World Bank data. International reserves include the country authorities' holding of SDRs, the reserve position in the IMF, foreign exchange holdings, and gold.

Table 2. External Debt Profile of Selected Asian Countries, 1995

	China	India	Indonesia	Malaysia	Philippines	Thailand
External debt (in U.S. dollars)	118.1	93.8	107.8	34.4	39.4	56.8
External debt (in percent of GNP)	17.2	28.2	56.9	42.6	51.5	34.9
External public debt (in percent of GNP)	13.8	24.0	34.5	19.7	39.1	10.6
External public debt/reserves (in percent)	1.2	3.5	4.4	0.6	3.9	0.5
Short-term debt (in percent of total debt)	18.9	5.4	20.7	21.2	13.4	32.2
Share of long-term debt at variable rates	29.6	24.4	48.1	57.3	39.2	62.8
Currency composition of long-term debt (in percent)						
U.S. dollars	57.9	53.3	21.5	45.1	31.5	26.6
Deutsche mark	1.7	6.5	4.9	1.1	1.5	2.3
Japanese yen	20.7	13.7	35.4	31.7	36.9	48.1
Other	19.7	26.5	38.2	22.1	30.1	23.0
Changes in debt stocks due to cross-currency valuations (1990-95)	6.8	6.8	12.7	3.2	4.4	5.5

Source: World Bank, *Global Development Finance 1997*.

Table 3. European Union Countries, North America, and Japan:
Foreign Currency Debt, 1996

(In percent of total government debt)

Country	Foreign Currency Debt	Year 1/
European Union countries		
Austria	17.50	1996
Belgium	11.40	1995
Denmark	14.30	1996
Finland	42.92	1996 2/
France	4.80	1995
Germany	0.01	1995
Greece	30.60	1996
Ireland	26.40	1996
Italy	6.10	1996
Luxembourg	3.50	1995
Netherlands	0.00	1996
Portugal	17.70	1996
Spain	7.30	1996
Sweden	28.20	1996
United Kingdom	4.60	1996
North America		
Canada	2.64	1996 3/
Mexico	89.00	1996
United States	0.00	1996
Japan	0.00	1996

Source: Country desks.

1/ The years for which the latest data are available.

2/ For central government.

3/ Data as of March 31, 1997 for the federal government.

Table 4. Institutional Structure of Debt Offices in OECD Countries: Debt Offices Within the Treasury

	Australia	Belgium	Netherlands	New Zealand	Turkey
1.1	Position of Debt Management Office (DMO) in government organizations.	Treasury.	Agency in Treasury.	Branch of the Treasury.	General Directorate in Treasury.
1.2	Chief Executive Officer reports to:	MoF.	Treasurer.	MoF.	The Undersecretary and the Minister.
1.3	Board of Directors.	No.	No.	Advisory Board.	No.
1.4	Degree of independence from political power.	Not independent.	Independent.	No specific independence.	Independent under normal circumstances.
2.1	Does the DMO have specific performance criteria?	No specific criteria.	General criteria for the maturity and the cost of borrowing.	Qualitative performance criteria relating to all services.	No.
2.2	Who evaluates the performance criteria?	No specific evaluation.	The Parliament.	Secretary of Treasury.	...
2.3	Is there a penalty in case of a loss?	No.	...	...	...
3.1	Is there a legal limit for domestic borrowing?	Limit on the cost of borrowing.	There is only an implicit limit (budgeted borrowing requirement).	No legal limit.	Only for G-Bonds the limit is twice the budget deficit.
3.2	Who decides for the new limits?	DMO and the Treasurer.	...	MoF may alter the program.	For G-Bonds, the Parliament.
4.1	Who gives the final decision in an auction?	The Treasury.	The Agent (chief executive of DMO).	DMO.	The Undersecretary of Treasury.
5.1	Involvement of DMO with Cash Management Budget Office.	Closely related.	Closely related.	Carried out by DMO. Closely related.	Direct involvement.
6.1	Duties other than debt management (in case of a crisis).	Political authority is needed for a direct off-shore issuance.	On a foreign exchange market crisis makes special denominated issues with suitable terms.	None.	In consensus with monetary policy, may become an effective instrument to handle the crisis.
7.1	Comparative wage of a DMO officer.	Equivalent to civil servant, mar. lower than Central Bank.	Equivalent to civil servant, lower than banks (private).	Comparable to civil servant, comparable to banks.	Equivalent to civil servant, lower than banks (private).
8.1	Fiscal Agent.	The Central Bank. The Reserve Bank of Australia.	The National Bank of Belgium and financial intermediaries.	The Registry Reserve Bank of New Zealand.	The Central Bank.
8.2	Agency Services.	...	Handling the coupons and debiting the Treasury account.	Money collections, issuance, payments, and registration.	Handling the auctions, selling bonds on TAP, redemptions and interest payments, and keeping deposit accounts.

Table 4. Institutional Structure of Debt Offices in OECD Countries: Debt Offices Within the Treasury

	Australia	Belgium	Netherlands	New Zealand	Turkey
9.1	Size of book-entry form stock.	More than 90 percent.	All Treasury certificates and part of other public loans.	3 percent.	100 percent.
9.2	Number of track-keeping staff.	5 Treasury officers for book-entry, 25 Central Bank staff for all areas of registry.	1 person.	29 staff.	20 Treasury officers.
10.1	Who handles the statistical follow-up and projection?	Debt management branch of the Treasury.	Fin. Reporting and Comp. prog. Dep. of the Agency.	...	Budget and Domestic Dept. Provisions in Treasury.
11.1	Basis of Accounting.	Cash basis for Budget Accounts. Accrual basis for Financial Statements.	Cash and accrual basis.	Cash accrual and market-to-market basis.	Each basis for the budgetary purposes; accrual basis for following up the stock.

Source: Organization for Economic Cooperation and Development (OECD).

Table 5. Institutional Structure of Debt Offices in OECD Countries: Autonomous Debt Offices

	Austria	Ireland	Sweden
1.1	Position of Debt Management Office (DMO) in Government Organizations.	Autonomous Corporate Body owned by MoF (AFFA).	Autonomous Agency under the MoF.
1.2	Chief Executive Officer reports to:	MoF.	...
1.3	Board of Directors.	Yes.	Yes.
1.4	Degree of independence from political power.	Highly independent.	Independent, except for a few issues (foreign exchange).
2.1	Does the DMO have a specific performance criteria?	No specific criteria.	- For foreign exchange funding. - For domestic funding.
2.2	Who evaluates the performance criteria?	...	Board of Directors and MoF.
2.3	Is there a penalty in case of a loss?	...	There is a limit only for foreign exchange funding.
3.1	Is there a legal limit for domestic borrowing?	Yes, the limit is set by the Financial Law.	There is a limit only for foreign exchange funding.
3.2	Who decides for the new limits?	The Parliament.	...
4.1	Who gives the final decision in an auction?	AFFA (DMO).	The officer in charge of auctions.
5.1	Involvement of DMO with Cash Management/Budget Office.	Closely related.	Takes for granted.
6.1	Duties other than debt management (in case of a crisis)	On request of MoF, gives opinion on budget financing.	Has to act parallel to the monetary policy (especially for foreign exchange crisis).
7.1	Comparative wage of a DMO officer.	Higher than civil servants; comparable to banks.	Higher than civil servant, lower than banks (private).
8.1	Fiscal agent.	The Postal Savings Bank. Also for cash management, other private banks.	The Swedish Central Securities Depository (VPC).
8.2	Agency services.	...	Redemption of loans; payments of coupons.
9.1	Size of book-entry form stock.	73 percent.	100 percent till 1993.
9.2	Number of track-keeping staff.	Two officers.	Swedish Central Securities and one person in Debt Office.
10.1	Who handles the statistical follow-up and projection?	MoF.	The Debt Office.
11.1	Basis of accounting.	...	Cash basis supplemented by cost accounting.

Source: Organization for Economic Cooperation and Development (OECD).

Table 6. Institutional Structure of Debt Offices in OECD Countries: Debt Offices Within the Central Bank

	Denmark	United Kingdom
1.1	Position of Debt Management Office (DMO) in Government organizations.	Treasury and Bank of England.
1.2	Chief Executive Officer reports to:	Treasury Minister.
1.3	Board of Directors.	No.
1.4	Degree of independence from political power.	Independent within the limits set by the remit.
2.1	Does the DMO have a specific performance Criteria?	Performance against the remit.
2.2	Who evaluates the performance criteria?	Ministers.
2.3	Is there a penalty in case of a loss?	...
3.1	Is there a legal limit for domestic borrowing?	Limit by the funding remit.
3.2	Who decides for the new limits?	...
4.1	Who gives the final decision in the auction?	Bank of England.
5.1	Involvement of DMO with Cash Management Budget Office.	Closely related.
6.1	Duties other than debt management (in case of a crisis).	Money markets and foreign exchange and reserve management.
7.1	Comparative wage of a DMO officer.	Comparable to civil servants. Lower than banks (private).
8.1	Fiscal Agent.	Bank of England.
8.2	Agency Services.	Advisory Treasury. Discreting, timing of sales and deciding the acceptable price level of bids for stock.
9.1	Size of book-entry form stock.	90 percent (optional).
9.2	Number of track-keeping staff.	...
10.1	Who handles the statistical follow up and projection?	Treasury for projections and Bank's Financial Statistical Division and Government's Central Statistical Office.
11.1	Basis of Accounting.	Cash and accrual basis for calendar and fiscal year.

Source: Organization for Economic Cooperation and Development (OECD).

Table 7. Institutional Structure of Debt Offices in OECD Countries: Debt Offices Within the Ministry of Finance

	Canada	Germany	Greece	Japan	Mexico	Switzerland
1.1	Position of Debt Management Office (DMO) in Government Organizations.	Department in MoF.	MoF.	Department in MoF.	Directorate in MoF.	Unit in MoF.
1.2	Chief Executive Officer reports to:	MoF.	...	MoF, the Government.	General Director, MoF.	MoF.
1.3	Board of Directors	No.	...	No.	No.	Monitoring Committee.
1.4	Degree of independence from political power	Independent except for important matters.	...	Dependent.	Independent within the broad objectives of the Development Plan.	Independent, except for some restriction on type of institution.
2.1	Does the DMO have specific performance criteria?	No specific criteria.	...	No formal criteria.	A general (flexible) performance criteria for the people.	No specific criteria.
2.2	Who evaluates the performance criteria?	...	...	...	The Undersecretary.	...
2.3	Is there a penalty in case of a loss?	...	...	...	The Director of Public Debt is responsible.	...
3.1	Is there a legal limit for domestic borrowing?	Yes, a limit is set by federal legis. authorizations (Budget Law).	No, except for the limit to T-Bill issues.	Yes, a limit is set by Budget Law.	Yes, a limit is set according to the Federal Budget.	No legal limit.
3.2	Who decides for the new limits?	The Parliament.	Interest rates are set by MoF; amount is determined by subscription in the market.	The Diet (legislative branch of Parliament).	The Congress.	...
4.1	Who gives the final decision in an auction?	Division State Secretary or MoF according to the implications.	...	Minister of Finance.	General Director and Undersecretary.	Debt Management Unit.
5.1	Involvement of DMO with Cash Management Budget Office.	...	...	Related within the MoF.	Closely related.	Active involvement.
6.1	Duties other than debt management (in case of a crisis).	In situations with political implications, may behave according to the decision of MoF in cooperation with Bundesbank or the Cabinet.	...	None.	Government economic cabinet board decides what to do.	Management of assets, interest rate, and currency risk hedging.

Table 7. Institutional Structure of Debt Offices in OECD Countries: Debt Offices Within the Ministry of Finance

	Canada	Germany	Greece	Japan	Mexico	Switzerland
7.1	Comparative wage of a DMO officer.	Equivalent to civil servant; difficult to compare to banks.	...	Equivalent to civil servant; lower than banks (private).	Equivalent to civil servant; lower than banks (private).	Equivalent to civil servant; lower than banks (private).
8.1	Fiscal agent.	The Bank of Canada	...	The Central Bank; the Bank of Japan	Any private bank, usually Citibank.	The Swiss National Bank
8.2	Agency services.	Advising, recordkeeping, issuing, redeeming, international payment registration and deposit account.	...	Issue, auction, redemption, international payment, registration.	Issuing in international capital markets.	Being counterparty in money market; functioning as custodians; handling auctions; collecting stamp duty.
9.1	Size of book-entry form stock.	More than 90 percent.	0 percent.	98 percent.	Approximately 40 percent.	2.5 percent of bonds and 96.5 percent of short-term papers.
9.2	Number of track-keeping staff.	CDS staff (privately owned non-profit institution).	...	25 staff.	12 staff.	4 people in Accounts Department of Treasury.
10.1	Who handles the statistical follow-up and projector?	Bank of Canada.	MoF.	Government Debt Division for statistical follow-up; Budget Bureau for projections.	(Domestic Debt) Director of Public Debt, General Director of Finance Projections, Treasury Department, CB General Director of Government Accounting.	Financial Plan and Budget Division and Treasury back office.
11.1	Basis of accounting.	Cash basis.	...	Cash basis.	Real (cash basis).	Cash basis.

Source: Organization for Economic Cooperation and Development (OECD).

Table 8. Benchmarks for Foreign Currency Assets of Australia

	U.S. Dollars	Yen	European Currencies
Currency and asset composition (percent of total assets)			
Benchmark	40	30	30
Discretionary range	20-60	10-50	10-50
Duration (months)			
Benchmark	12	30	30
Discretionary range	0-18	0-36	0-36

Source: Reserve Bank of Australia, 1996.

Table 9. Comparison of Actual and Benchmark Returns for Australia's Reserves Portfolio

	Rates of Return (in SDRs) percent		Value of Difference between Actual and Benchmark Returns
	Actual	Benchmark	(\$A million)
1991-92	9.8	8.9	165
1992-93	16.3	11.6	420
1993-94	4.0	3.8	31
1994-95	5.2	7.4	-331
1995-96	4.0	3.7	40

Source: Reserve Bank of Australia, 1996.

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