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EXCHANGE RATE RISK MEASUREMENT AND MANAGEMENT: ISSUES AND APPROACHES FOR PUBLIC DEBT MANAGERS

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Abstract

This paper presents conventional and alternative exchange-rate risk measures for government bonds, and outlines liability management operations for dealing with currency exposure. These risk measures and liability management operations are analyzed from the perspective of a sovereign debt manager. In particular, we examine the VaR statistic as a prominent measure of exchange rate risk exposure, along with an integrated VaR approach for the simultaneous estimation of a bonded portfolio's interest rate and exchange rate risk; the expected shortfall measure of exchange rate risk; and the spectral risk measure. The liability management operations outlined are debt buybacks, debt swaps and currency derivatives. These operations are extensively used by public debt managers of both developed and emerging market countries to mitigate or eliminate exchange rate risk of public debt portfolios and to reduce external debt servicing costs. Also, the Cost at Risk is introduced as an approach to assess debt strategies, and best practices in managing the exchange rate risk exposure of public debt are provided. Further, experiences of external public debt management from selected south-east European countries are offered to illustrate the application of sovereign liability management operations in this region.

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I. Introduction

One of the most important considerations in public debt management is the measurement and management of the foreign exchange risk exposure embedded in a country's public debt structure.[1] Sovereign debt managers pay a lot of attention to the measurement and management of the public debt's currency exposure as they try to estimate the level and, in particular, the cost of servicing the external debt in domestic currency terms. Accordingly, precise knowledge of this exposure helps them to (1) assess the potential volatility in debt servicing costs due to exchange rate fluctuations, (2) appropriately budget contingent liability funds for debt servicing and, thus, contribute to tax smoothing and (3) engage in liability management operations, including derivative transactions, to mitigate foreign exchange-related risks and possibly reduce debt servicing costs (Missale, 1997; International Monetary Fund and the World Bank, 2001 and 2003).

In the past decade, many developed countries tried to measure and manage the exchange rate risk of their public debt portfolios through various sophisticated techniques and operations (e.g., Canada, Denmark, France, New Zealand, Sweden, United Kingdom) (Bergstrom, Holmlund, and Lindberg, 2002; OECD, 2005; Pick and Anthony, 2006; UK-HM Treasury, 2006; Denmarks Nationalbank, 2007). Most of these countries now use integrated approaches of exchange rate-, interest rate-, credit- and liquidity-risk measurement and management of their public debt, while a few are currently experimenting with integrated sovereign asset and liability management approaches. Also, an increasing number of emerging market- and middle income-countries have recently tried to develop their capabilities in public debt management, in an effort to reduce the foreign exchange risk of their public debts, diversify their investor bases and promote their domestic capital markets (e.g., Brazil, Czech Republic, Latvia, Mexico, Poland, Turkey) (Mexico-Public Credit Unit, 2005; OECD, 2005; Silva, 2005; Balibek, 2006; Szczerbak, 2006; Brazilian National Treasury, 2007; Czech Republic Ministry of Finance, 2007; Latvia-The Treasury, 2008).

The predominant approach in measuring the foreign exchange risk exposure of public debt has been the Value at Risk (VaR) methodology and its many variants, including the integrated market risks (exchange rate and interest rate risk) VaR approach. The VaR technique has gained prominence among debt managers due to its straightforward application and wide use by banks and corporates for similar exercises (Marrison, 2002; Papaioannou, 2006b). Alternative risk measures, such as the

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1. This paper deals with government bonded debt, where a significant share of this debt is foreign-currency denominated and/or foreign-currency linked. In this connection, other important considerations of public debt management include measurement and management of the interest rate risk exposure associated with a country's debt maturity profile, the liquidity risk exposure associated with financing obligations and credit risk exposure associated with default concerns.

expected shortfall and the spectral risk measures, have not been widely adopted by debt managers thus far. Among the most commonly used liability management operations for managing foreign exchange rate risk of public debt structures are debt buybacks, debt swaps and derivative operations, while the Cost at Risk (CaR) approach is increasingly used to assess debt strategies. These measurement and management techniques are detailed in the paper, along with some relevant liability management operations used in the south-east Europe (SEE) area.

Based on recent experience from a selected group of SEE countries, only a few countries in the region were engaged in sovereign debt management operations, including Croatia, Greece, and Turkey. Further, these operations tended to be of a limited nature, despite large currency exposures in the public debt portfolios of most of these countries. This could be attributed to (i) the relatively small international bond issuance by SEE countries; (ii) extensive reliance on concessional borrowing, especially by the smaller emerging market and developing economies in the SEE region; and (iii) lack of deep and liquid domestic government debt markets, which restrict debt exchanges of foreign-currency debt for domestic-currency debt.

The paper is organized as follows: Section II presents the main methodologies used for the measurement of foreign exchange risk in public debt portfolios, including the VaR, expected shortfall and spectral risk measures; Section III outlines the main liability management operations used by debt managers in mitigating currency risk, and provides examples of some relevant strategies and instruments; Section IV outlines the CaR as an approach to assess debt strategies in a stochastic framework; Section V presents experiences of some south-east European countries with external public debt management; Section VI provides some best practices in measuring and managing foreign exchange rate risk of public debt; and Section VII concludes with some comments on the lessons from recent foreign exchange debt management experience.

II. Exchange risk measurement of public debt

Sovereigns with substantial portions of their debts denominated in foreign currencies assume commensurate exchange rate risk exposures – when their positions are left unhedged.[2] Measuring the exchange rate exposure is often not an easy task, given the comovements between exchange rates and interest rates and the prevailing high correlations among bond markets (Papaioannou, 2006a; Medeiros, Papaioannou and

2. For the purposes of this paper, foreign currency debt is defined as debt issued abroad in foreign currency, debt issued domestically in foreign currency and domestic-currency debt linked to the exchange rate, while domestic-currency debt is defined as debt issued domestically in domestic currency and debt issued abroad in domestic currency.

Souto, 2008). In most Debt Management Offices around the world, VaR-type models are used to measure (i) the exchange rate risk by combining the sensitivity of the portfolio to exchange rate changes and the probability of a given exchange rate change (one risk factor) (Jorion, 1997) and/or (ii) the market risk (exchange rate and interest rate risk) by combining the sensitivity of a portfolio to exchange rate and interest rate changes (two risk factors). Other measures of market risk that have been proposed in the literature as superior to VaR, such as expected shortfall and spectral risk measures, are not extensively used in debt strategy modeling owing mainly to their more complex formulations.

A. A VaR approach to exchange rate risk – one risk factor

Assume that a government (which does not use the U.S. dollar as its legal tender) issues a U.S. dollar-denominated bond with a single payment $C_\$$ at time t. This government is now exposed to exchange rate risk due to potential changes in the local currency-dollar exchange rate (in addition to interest rate risk due to changes in U.S. interest rates, $r_\$$). The exchange rate exposure can be measured by the VaR metric (Papaioannou, 2006a). For absolute changes in exchange rates (one risk factor), the VaR for this bond is often calculated using a parametric VaR approach. Since the present value of the bond in local currency, L, is the value in U.S. dollars multiplied by the exchange rate, FX, i.e.,

$$PV_L = FX \times PV_\$ \qquad \text{(II.1)}$$

$$= FX \times \frac{C_\$}{(1+r_\$)^t} \qquad \text{(II.2)}$$

the sensitivity of the present value of the bond in local currency to changes in FX is the derivative with respect to FX:

$$\frac{\delta PV_L}{\delta FX} = \left[\frac{C_\$}{(1+r_\$)^t} \right] = d_{FX} \qquad \text{(II.3)}$$

and the change in the present value due to a change in FX is given by:

$$\Delta PV_L = \Delta FX \times \frac{C_\$}{(1+r_\$)^t} = \Delta FX \times d_{FX} \qquad \text{(II.4)}$$

Then, the standard deviation of PV_L is the standard deviation of the exchange rate, σ_{FX}, times and the VaR is 2.33 times the standard deviation of the present value for normally distributed exchange rates and 99 percent confidence level. Or,

$$VaR = 2.33 \times d_{FX} \times \sigma_{FX} \qquad \text{(II.5)}$$

If exchange rates deviate significantly from normality, the use of standard deviation multiples based on the normality assumption (such as 2.33 for the 1 percent worst case) leads to an underestimation of risk. In this case, a correction factor, ζ, for the standard deviation needs to be introduced to take account of leptokurtic or "fat tailed" distributions of exchange rates. The correction factor is such that ζ=1 if the distribution of exchange rates is normal, and ζ>1 if it is leptokurtic, with ζ being an increasing function of the unconditional kurtosis. Accordingly, the VaR estimate would now take into account both distributional characteristics, the standard deviation and kurtosis. An explicit relationship between the correction factor, ζ, and kurtosis, k_e, for t-distributions has been derived by Bangia, Diebold, Schuermann, and Stroughair (1999):

$$\zeta = 1.0 \div \left[\phi \times 1n\left(k_e / 3\right) \right] \qquad \text{(II.6)}$$

where

ϕ = a constant, whose value depends on the tail probability VaR measure (e.g., 1 percent). The estimate of ϕ is obtained by regressing the VaR measure that incorporates the correction factor with historical VaR for the specific tail probability. For a normal distribution, k_e=3 and, therefore, ζ=1.

Then, equation (II.5) becomes:

$$VaR = 2.33 \times d_{FX} \times \zeta \times \sigma_{FX} \qquad \text{(II.5a)}$$

B. An integrated VaR approach to market risk – two risk factors

Assume again the same government that issues a U.S. dollar-denominated bond with a single payment. In this section, we consider both interest rate and exchange rate risks that the government is exposed from respective changes in the U.S. dollar interest rates and the local currency-dollar exchange rate. For absolute changes in exchange rates and interest rates (two risk factors), a parametric VaR for this bond can again be calculated. As above, the present value of the bond in local currency, L, is the value in U.S. dollars multiplied by the exchange rate, FX, i.e.,

$$PV_L = FX \times PV_\$ \qquad \text{(II.7)}$$

$$= FX \times \frac{C_\$}{\left(1 + r_\$\right)^t} \qquad \text{(II.8)}$$

The change in the present value of the bond in local currency due to changes in U.S. interest rates is given by:

$$\frac{\delta PV_L}{\delta r_\$} = FX \times \left[\frac{-t \times C_\$}{\left(1 + r_\$\right)^{t+1}} \right] \qquad \text{(II.9)}$$

and, therefore,

$$\Delta PV_L = FX \times \left[\frac{-t \times C_\$}{(1+r_\$)^{t+1}} \right] \times \Delta r_\$ \qquad \text{(II.10)}$$

Again, to get the (linear) change in the present value of the bond due to a change in FX, we take first the derivative with respect to FX:

$$\frac{\delta PV_L}{\delta FX} = \frac{C_\$}{(1+r_\$)^t} \qquad \text{(II.11)}$$

and, therefore, the change in the present value due to a change in FX is given by:

$$\Delta PV_L = \Delta FX \times \frac{C_\$}{(1+r_\$)^t} \qquad \text{(II.12)}$$

And, the change in the present value of the bond due to both a change in interest rates and a change in FX is given by the sum of the individual changes:

$$\Delta PV_L = FX \times \left[\frac{-t \times C_\$}{(1+r_\$)^{t+1}} \right] \times \Delta r_\$ + \frac{C_\$}{(1+r_\$)^t} \times \Delta FX \qquad \text{(II.13)}$$

Defining the derivative of the present value with respect to U.S. dollar interest rates $d_{r,\$}$, and the derivative with respect to *FX*,d_{FX}, *as*:

$$d_{r,\$} = FX \times \frac{-t \times C_\$}{(1+r_\$)^{t+1}} \qquad \text{(II.14)}$$

$$d_{FX} = \frac{C_\$}{(1+r_\$)^t} \qquad \text{(II.15)}$$

we can rewrite the equation for the change in the present value, equation (II.13), as:

$$\Delta PV_L = d_{r,\$} \times \Delta r_\$ + d_{FX} \times \Delta FX \qquad \text{(II.16)}$$

Since the objective is to get the standard deviation of PV_L, first, we note that changes in interest rates are correlated with changes in FX. Also, we assume that $d_{r,\$}$ and d_{FX} are fixed. Thus, the variance for the bond's present value can be calculated as:

$$\sigma_{PV}^2 = (d_{r,\$} \times \sigma_{r,\$})^2 + (d_{FX} \times \sigma_{FX})^2 + 2 \times \rho_{r/\$,FX} \times (d_{r,\$} \times \sigma_{r,\$}) \times (d_{FX} \times \sigma_{FX})$$

(II.17)

Further, as changes in interest rates, $\Delta r_\$$, and changes in FX, ΔFX, are random variables, we can estimate their variances from historical data. Thus, the variance for interest rates (using, for example, historical daily data) can be calculated as:

$$\Delta r_{\$,t} = r_{\$,t} - r_{\$,t-1} \qquad \text{(II.18)}$$

and

$$\sigma_{r,\$}^{2} = \frac{1}{N-1} \times \sum_{t=1}^{N} \left(\Delta r_{\$,t} - \overline{\Delta r_{\$}} \right)^{2} \qquad \text{(II.19)}$$

and the variance for exchange rates (using, for example, historical daily data) as:

$$\Delta FX_{t} = FX_{t} - FX_{t-1} \qquad \text{(II.20)}$$

and

$$\sigma_{FX}^{2} = \frac{1}{N-1} \times \sum_{t=1}^{N} \left(\Delta FX_{t} - \overline{\Delta FX} \right)^{2} \qquad \text{(II.21)}$$

while the correlation can be estimated as:

$$\rho_{r/\$,FX} = \frac{1}{N-1} \times \left[\frac{\sum_{t=1}^{N} \left(\Delta r_{\$,t} - \overline{\Delta r_{\$}} \right) \times \left(\Delta FX_{t} - \overline{\Delta FX} \right)}{\sigma_{r,\$} \times \sigma_{FX}} \right] \qquad \text{(II.22)}$$

Then, the VaR can be estimated as:

$$VaR = 2.33 \times \sigma_{PV}$$

$$= 2.33 \times \sqrt{\left(d_{r,\$} \times \sigma_{r,\$} \right)^{2} + \left(d_{FX} \times \sigma_{FX} \right)^{2} + 2 \times \rho_{r/\$,FX} \times \left(d_{r\$} \times \sigma_{r,\$} \right) \times \left(d_{FX} \times \sigma_{FX} \right)} \qquad \text{(II.23)}$$

C. Alternative to VaR measures of market risk

Various alternative-to-the-VaR measures of exchange rate (and interest rate) risk exposure have been developed over the past few years. Several of these alternative measures, as well as scenario and stress analyses, were proposed in response to the VaR approach's inability to address extreme events. Among these measures are the Expected Shortfall Measure (ESM) and the Spectral Risk Measure (SRM).[3] The ESM at the α percent confidence level, or αESM, is defined as the average of the worst 1- α losses (Dowd, 2005). [4] Or,

$$\alpha ESM = \frac{1}{1-\alpha} \int_{\alpha}^{1} q_{p} dp \qquad \text{(II.24)}$$

3. Risk measures are often expressed in terms of losses and, hence, the amount at risk is given in absolute value terms.

4. The ESM is equivalent to the conditional value-at-risk (CVaR) (Acerbi and Tasche, 2002; Rockafellar and Uryasev, 2002).

where q_p is the p quantile of the present value of the (continuous) loss distribution p. As in the VaR, the ESM is based on the confidence level, and will be greater than or equal to the VaR for any given confidence level.

However, the ESM, as the VaR, may be criticized as an (exchange rate) risk measure that is inconsistent with the traditional notion of the public debt manager's risk aversion. In particular, it can be shown that the ESM would be preferred only if the risk manager is risk neutral between better and worse tail outcomes. This is because a risk manager who prefers the ESM is assumed to place equal weight on all losses exceeding the VaR value. (In the case that the VaR is a preferred risk measure, the risk manager is assumed to have negative risk aversion, as he (consciously) places no weight on losses exceeding the VaR.) However, a typical risk manager is risk averse and, therefore, would prefer a risk measure that takes into consideration risk aversion, such as the SRM (Grootveld and Hallerbach, 2004).

The SRM is defined as the weighted average of the whole loss distribution, i.e., the weighted average of all quantiles. Or,

$$SRM = \int_0^1 w(p) q_p dp \tag{II.25}$$

where the weighting function, $w(p)$, is defined by the public debt manager's risk tolerance/aversion function and, therefore, can take any form. For the SRM to be consistent with risk aversion (and, hence, a coherent measure), the risk aversion function may take the following exponential form (Acerbi, 2004):

$$w_b(p) = \frac{be^{-(1-p)b}}{1-e^{-b}} \tag{II.26}$$

where b is the public debt manager's degree of absolute risk aversion (ARA). The SRM can be derived by substituting equation II.26 into equation II.25 and specifying a value of $b \in (0,\infty)$. Or,

$$SRM = \int_0^1 \frac{be^{-(1-p)b}}{1-e^{-b}} q_p dp \tag{II.27}$$

Thus, the risk aversion function and, in turn, the SRM depend on one parameter, the ARA coefficient. Note that the class of spectral risk measures includes the ESM as a special case, obtained by assigning the same weight to losses in excess of VaR and a zero weight to other observations.[5] That is, the ESM has a step weighting function that takes a zero value for cumulative probabilities that are less than the confidence level and a fixed value for probabilities greater than or equal to the confidence level. In contrast, the SRM that has a weighting function that reflects the risk tolerance/

5. The class of spectral risk measures is closely related to the class of distortion risk measures (Dowd, 2005).

aversion of the public debt manager may take any form, e.g., an exponential function with increasing weights to the loss observations as the cumulative probability increases.[6]

It should be noted that, although the ESM and the SRM have not been used extensively in public debt management, results from actuarial risk studies indicate that the VaR, ESM and SRM risk measures generate broadly similar estimates of risks associated with various types of mortality positions (Dowd, Cairns and Blake, 2005).

III. Exchange risk management of public debt

After the foreign exchange risk exposure of the public debt is measured, sovereign debt managers may engage in strategic and/or opportunistic active liability (debt) management operations, including debt buybacks, debt swaps and derivatives transactions, to minimize or mitigate this risk and possibly reduce debt servicing costs (Medeiros, Polan, and Ramlogan, 2007)[7].[8] Further, under an integrated sovereign asset and liability framework, debt managers may employ liability management operations to match the currency composition of public debt portfolios with that of sovereign assets (primarily international reserves) and/or the country's trade invoicing, or with the foreign currency that the domestic currency is pegged to, if a fixed exchange rate system is in place (Lu, Papaioannou, and Petrova, 2007; Blommestein, 2006). In general, these operations aim to alter the currency structure of the debt stock and/or the debt servicing profile, so that debt service payments are smooth and match the relatively stable flow of government revenues.

However, foreign currency-denominated debt buybacks and foreign-for-domestic debt swaps directly affect foreign exchange reserves and, therefore, need to be undertaken within the overall macroeconomic framework. As these liability management operations aim primarily to reduce external debt vulnerabilities, they should be closely coordinated with the country's fiscal and monetary policies to ensure consistency of policies and improvement of macroeconomic performance in a financial-crises prevention framework. Further, derivatives operations for managing the exchange rate risk of countries' public debt remain relatively limited in scope and use, thus impacting countries' macrofinancial management rather marginally. Clearly, the use of derivatives operations would be low if foreign exchange hedging costs are high. This

6. Recall that the VaR places its weight on a single quantile that corresponds to a specified confidence level.

7. An opportune time for liability management operations by sovereigns with foreign currency-denominated debt, e.g., to fund foreign-currency debt buybacks with local currency, is when the foreign currency is weak and/or bond prices are declining in secondary markets.

8. Passive liability management operations, like bond issuance in a particular currency, may also be used to manage the foreign exchange rate exposure of a country's public debt portfolio.

is especially the case for many emerging-market and most developing-country currencies. Overall, if liability management operations succeed in reducing the public debt stock, debt service payments and associated risks, taxes are lowered and growth is boosted, while macrofinancial stability is maintained.

A. Debt buybacks

The larger the share of the foreign-currency denominated debt in a country's public debt, the larger the public debt's vulnerability to unhedged exchange rate changes and, therefore, the greater the scope for debt buyback and swap operations intended to reduce exposure to foreign currency risk. As mentioned earlier, debt denominated in, or indexed to, foreign currencies adds volatility to debt servicing costs, as measured in domestic currency, owing to exchange rate movements. In principle, these operations aim to reduce the foreign exchange risk embedded in a public debt portfolio through reduced dependence on foreign borrowing.

If debt buybacks are financed through a drawdown of international reserves or other liquid assets, they will lower the government debt stock by the face value of the buyback. In turn, this will result in direct government debt-service savings, but also in indirect debt payment savings owing to the reduced average interest rate for the remaining debt stock (in general, the reduction in the average interest rate comes as a consequence of the lower debt stock outstanding). In addition, if debt is bought back when it is trading at a discount in the secondary market, debt-principal savings can also be realized.

In the past, secondary market purchases of discounted debt had been advocated as a way of resolving a country's debt overhang. Krugman (1988) defined debt overhang as the state in which the present value of potential future resources available to service the debt is less than the present value of the future debt service payments. This was a practical definition that emerged in the aftermath of the sovereign debt crises of 1980s, when many policy makers and academics prescribed various solutions, including debt buybacks, to overcome excessive debt burdens of countries. However, the potential benefits of debt buybacks and debt swaps in reducing debt overhangs and averting macroeconomic crises are still under debate (Bulow and Rogoff (1998 and 1991); Dooley (1989); Aizenman, Kletzer and Pinto (2005)).

When a debt buyback is undertaken, the calculation of the debt-service savings takes into account the opportunity costs of the funds used in the buyback. If foreign debt is bought back with international reserves purchased from the central bank, the impact on debt payments often includes the difference between the central bank's earnings on international reserves and the government's borrowing costs on domestic assets. However, if a buyback is financed by assets from a government-owned asset management fund, its impact on debt payments usually includes the interest earnings foregone from the investment of the assets used in the buyback.

Furthermore, debt managers take into consideration secondary effects from debt buybacks, such as effects on domestic interest rates and bond prices, especially in cases of illiquid markets. Quantitative assessment of these effects is often important in determining whether the overall impact of a buyback is beneficial. Also, as debt buybacks can increase a public debt portfolio's immunity to currency shocks, the reduction of financial pressures stemming from currency-related liquidity and rollover risks should be included as additional benefits. Further, buybacks could reduce possible sovereign-balance-sheet foreign exchange mismatches, arising from the predominantly domestic-currency denomination of government revenues and other inflows.

B. Debt swaps

In many emerging market and developing countries, debt swaps (exchanges) are used for reducing the sensitivity of debt service payments to currency shocks. They entail the retirement of foreign and foreign-exchange-linked debt and its replacement with domestic-currency debt issued in domestic capital markets. The extent to which a country can undertake such debt swap operations is determined by the size and liquidity of its domestic capital markets. The limited ability of emerging markets to issue debt in domestic currency is primarily related to the prevailing lack of investor demand for domestic-currency government debt instruments. For countries that have experienced financial crises, this inability is termed "original sin" (Hausmann and Panizza, 2003). To overcome this constraint, some countries with notable macroeconomic performance and prudent policies have successfully issued domestic-currency debt in international capital markets (Colombia in 2004 and Brazil in 2005).

Debt swaps of domestic for foreign bonds presuppose certain development of domestic capital markets. In particular, as these swaps increase the domestic supply of bonds, they necessitate deep and liquid domestic bond markets to be able to absorb the extra supply. Therefore, in the context of reducing their dependence on foreign borrowing and the exposure to foreign currency risk, countries need also to direct their efforts towards creating well-functioning domestic government bond markets that primarily ensure minimum bond price distortions (International Monetary Fund, 2003).

The times considered opportune for undertaking debt swap operations are periods when domestic macroeconomic conditions and sovereign credit ratings have improved, and/or when international liquidity conditions are favorable.[9] Such conditions would warrant easier refinancing at reasonable domestic interest rates and, therefore, non-excessive debt service costs. In this way, vulnerability to exogenous

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9. Debt swaps, as well as debt buybacks, could reduce future government borrowing costs to the extent that they help improve a country's creditworthiness and, thus, lower country risk premia.

shocks, especially risks relating to abrupt currency movements and changes in international capital flows, will be reduced without adversely impacting debt service payments.

From past experience, however, switching from foreign currency or foreign currency-linked debt to domestic currency debt has been accompanied by higher debt servicing costs for most emerging market and developing countries. This has been the case owing to higher interest rates and higher risk premia stemming from less liquid domestic capital markets. Further, to the extent that a country can only issue short-term and floating rate domestic debt in the domestic government bond market to replace foreign currency debt, the rollover risk may increase substantially. In this case, there is a trade off between exchange rate risk and rollover risk, which directly depends on the share of foreign currency debt in the total stock of debt – the larger this share, the larger the impact on rollover risk.

C. Derivatives

Many developed countries use derivatives transactions to manage the exchange rate risk and servicing cost of public debt within a well-designed debt strategy. The most commonly-used foreign exchange derivatives instruments are cross currency swaps and currency forwards, and to a much lesser extent foreign exchange futures, options and swap-options. However, swap transactions create credit (counterparty) risk, which has also to be actively managed. Currency forward agreements are used to manage exchange rate risk over the short to medium term – typically, between three and six-month maturities. They are considered cost effective instruments to alter the currency exposure of a debt portfolio over the short term, and can usually be rolled over at minimal cost. As these instruments are short term, they do not give rise to specific credit risk concerns. Instead, they tend to have cash flow effects on the budget as changes in their value are realized every three or six months.

A number of emerging market and developing countries have also started using cross currency swaps to hedge the exchange rate risk of either new debt issued in a certain foreign currency or existing debt. In general, however, the use of derivative instruments in many of these countries remains limited owing to both their relative illiquidity, reflecting in part an underdevelopment of the underlying markets, and a broad aversion to the perceived speculative nature of these instruments.[10] Further, it should be stressed that derivatives could be misused in public debt management, as has been the case with the use of swaps in one Euro zone country before entering the EMU (Piga, 2001).

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10. This perception stems partly from the need to form views on the future direction of certain exchange rates and/or interest rates when calculating debt service costs.

In most cases, public debt managers use foreign exchange derivative instruments for achieving an optimal debt portfolio composition (managing the foreign exchange risk) or for cheaper funding (reduction of the cost of borrowing). For example, currency swaps are often used to convert the currency denomination of new debt to a target currency for attaining lower cost foreign-currency funding, while the foreign exchange risk exposure of the servicing and repayment obligations of the contracted debt remains hedged. In particular, this may be the case when a country is able to raise funds in a foreign currency that is not closely correlated with the currencies of its foreign exchange receivables or the currency profile of its foreign exchange reserves (asset-liability management considerations).

Further, exchange rate derivatives may be used to alter the currency composition of an existing debt portfolio in order to attain a desired currency exposure at the lowest possible cost. This entails engagement in derivatives transactions to cover the exchange rate risk of debt payments from potential adverse currency movements, based on some tactical view on foreign exchange rates. Nonetheless, foreign exchange derivatives instruments are used within approved limits to take tactical views on exchange rates. In addition, currency derivatives may be used to hedge interest rate risks when interest rate derivatives are illiquid or available only for short maturities (owing to the underdevelopment of the underlying treasury bill and bond markets).

In pricing cross currency swaps employed in public debt management, collateral – often used to reduce credit risk – complicates their valuations. Also, especially for low-rated sovereigns, the placement of relatively sizeable collateral affects adversely the cost effectiveness of using such derivatives instruments. However, currency swaps are considered to have lower transaction costs than debt buybacks and debt swaps, although swap rates tend to increase with the level of indebtness. Further, the mark-to-market valuation of derivatives used in the management of exchange rate risk of debt – international accounting standards require that all derivative transactions be marked to market (and be recorded as on-balance sheet items) – makes the assessment of the risk-management effectiveness of derivatives more difficult.

Finally, it should be stressed that many emerging markets and, in particular, developing countries may not be able to use exchange rate derivatives instruments in the management of their public debt portfolios because of either relative unavailability of these instruments in their domestic markets, or of high costs to access global derivatives markets - mainly owing to insufficiently established or poor credit ratings. In this case, reaching the desired currency exposure should be done through debt buybacks or debt swaps, if feasible, or contracting new debt in the target currency. Of course, this would take longer than using derivatives to attain the desired currency exposure of debt.

IV. Assessment of debt strategies – a CaR approach

In deciding about the optimal debt strategy, a debt manager traditionally analyses various sets of issuance strategies (e.g., foreign-currency versus domestic-currency debt, fixed-rate versus floating-rate debt, short-term versus long-term maturities) that allow financing of a given fiscal deficit and/or liability management operations under the constraint that the country's debt risk indicators remain within prespecified limits (Bolder, 2003). In essence, each debt issuance strategy and/or liability management operation is assessed on the basis of its implied debt service costs and its impact on the relevant risk indicators (e.g., duration, convexity, VaR). Stress (scenario) tests determine further the impact of changes in various debt risk factors (e.g., exchange rates, interest rates) and the underlying macroeconomic conditions, including extreme events (e.g., excess movements in risk factors that resemble historical episodes), on relative debt costs and risk indicators. Based on the robustness of these strategies to risk shocks, the debt manager ranks the strategies under consideration. A shortcoming of this approach is that the probability of occurrence of changes in the various risk factors does not play a role in such a ranking.

A relatively newer approach to assess debt strategies is the Cost-at-Risk approach, which allows debt issuance strategies and liability management operations to be ranked on the basis of their performance under different shocks in risk factors with certain probability (Denmarks Nationalbank, 1998). In theory, the ranking of strategies and operations is determined within an optimization framework, where an objective function (with main arguments the debt costs and risk indicators) and constraints (the set of debt bonded instruments and the prevailing macroeconomic framework) are explicitly specified by the debt manager (Bolder, 2003). In practice, however, the optimization is proxied by stochastic simulations of changes in various types of risk for a set of debt strategies and instruments, which are then assessed on the basis of their impact on relative debt costs and certain risk indicators (Hahm and Kim, 2003). These simulations (stress tests) allow determination of the robustness of the prespecified set of debt strategies and, in turn, ranking of these strategies accordingly (Brazilian National Treasury, 2005). It should be noted that the CaR approach does not take into consideration refinancing and credit risks, and that the debt issuance strategies and/or liability management operations implied by this approach may not always be feasible (Adamo *et al*., 2004).

The CaR approach entails determination of probabilistic trajectories for the debt risk factors and the macroeconomic setting, including the fiscal deficit (and primary balance). In this framework, joint determination of shocks in financial risk factors (in particular, interest rates, exchange rates) and main macroeconomic variables (in particular, fiscal deficit, GDP, inflation rate) allows the evaluation of different debt strategies on the basis of the relative impact of, for example, various fiscal positions (each assigned a probability of occurrence) on the debt service cost or the structure of the outstanding debt. In this regard, the CaR approach allows an assessment of debt costs with a probability structure. Thus, the CaR approach is equivalent to the VaR methodology, with the maximum increase in debt-servicing costs from changes in financial or economic risk factors (based on a given probability) in CaR being used in place of the maximum value that is expected to be lost in a bonded debt portfolio from changes in market-risk factors (with a given probability of a change in these factors) in VaR (Arbelaez, Roubini, and Guerra, 2003).

When the CaR approach is implemented, the impact on debt-servicing costs and risk indicators of a projected bonded debt portfolio is assessed jointly with that of the assumed paths for the fiscal deficit and/or the GDP (Bolder, 2002). Since the probabilistic trajectories for the risk factors and the macroeconomic setting drive the CaR results, the assumed evolution process for these inputs is of paramount importance for this analysis. In particular, the assumed term structure of interest rates and exchange rate processes may significantly affect the CaR calculations, especially for countries with sizeable exposure to changes in market-risk factors (de Jong, 2000). A simplified variant of the CaR approach is the "Cash-flow at Risk" (Cf-a-R) approach, which focuses exclusively on the debt-flow costs resulting from a projected debt portfolio over a specified time horizon (Silva, Cabral, Baghdassarian, 2006). The Cf-a-R approach also depends crucially on the assumed paths of the risk factors that drive the debt service cost.

Modeling of the term structure of interest rates for the purposes of calculating CaR measures varies in different countries, depending on the underlying government bond markets and the prevailing macroeconomic environment (de Medeiros, 1999). Models for determining the interest rate term structure are also routinely reviewed and recalibrated by debt managers, as the structure of government debt markets undergoes continuous changes both in terms of available instruments and liquidity conditions (Demmel, 1999). Commonly used term structure models are the one-factor CIR (Cox, Ingersoll, and Ross, 1985) model, or its extensions, the NS (Nelson and Siegel, 1987) model, the HL (Hull and White, 1994a and 1994b) model, the HJM (Heath, Jarrow, and Morton, 1992) model, and the DK (Duffie and Kan, 1996) model. These modeling techniques of the yield curve are widely used by both developed and emerging markets (e.g., the CIR model is used, among others, by Denmark (Denmarks Nationalbank, 2000), Canada (Bolder, 2002) and Brazil (Silva, 2005); an extension of the NS model by Sweden (Jensen and Kjaergaard, 2005); and the HJM model by Hungary (Rez, 2006)).

Further to modeling the evolution of financial risk factors, the debt management framework of most countries also assumes paths for the fiscal deficit and/or the GDP. These paths may be exogenously given, or be determined endogenously in the CaR framework. By endogenizing the projections of the fiscal deficit and/or GDP, usually through the employment of a peripheral (satellite) reduced-form macroeconomic model, possible inconsistencies between these projections and the presumed evolution paths for the risk factors are typically avoided. Several developed countries have already moved towards an endogenous determination of the paths of these macroeconomic variables (e.g., Canada, France, the United Kingdom).

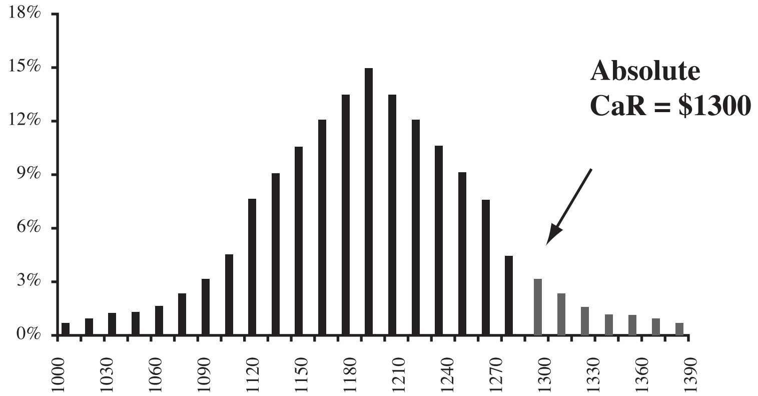
The performance of the considered various predetermined debt strategies is then evaluated and ranked in terms of some specific CaR measures. These measures often include the absolute CaR at a specified confidence interval (e.g., 99 percent CaR level), the relative CaR, the relative CaR as a proportion of the projected cost or the projected fiscal deficit or the projected GDP, the expected average annual cost over the specified time horizon, and the variance in this cost. Based on preset targets for (all or some of) these CaR measures, the debt manager selects one or more strategies (Secretaria de Hacienda y Credito Publico de Mexico, 2006; Bolder, 2003). In effect, this process determines the target benchmark portfolio(s), which are often used to design a country's actual issuance schedule and liability management operations.

As an illustration of the usefulness of the CaR approach in debt management and the complexities involved in its implementation, we present Brazil's experience with the CaR operational framework in formulating its debt strategy. The CaR indicator has been used to measure the volatility of Brazil's federal public debt stock value. The objective is to determine the margin by which the debt stock can exceed the expected value in a specific period, at a specified level of significance, as a result of fluctuations in the economic variables that define the cost of that debt (Silva, Cabral and Baghdassarian, 2006; Valle 2008). In the latter study, the CaR measure provides, at a given probability, the maximum value that the debt stock can reach within a given period.

Calculation of the CaR entails simulation of the probability distribution of the debt stock at the end of a specific period, based on stochastic scenarios for interest rates, the exchange rate and inflation. The absolute CaR is defined as a specific percentile (e.g., 95^{th} percentile) of the total value of the debt stock at the end of the period, while the relative CaR is defined as the difference between the absolute CaR and the average of the (simulated) distribution for the debt stock at the end of the period. Figure 1 shows that the 95 percent absolute CaR level in a hypothetical probability distribution of Brazil's debt stock is $1,300, which indicates that, with a 95 percent probability, the maximum amount by which Brazil's debt stock will exceed the projected debt stock value in a given year is $1,300.

Since the debt servicing cost is determined by the evolution of the different interest and exchange rates, as well as inflation, each of these variables is assumed to be determined by a stochastic process. For the (risk-neutral) interest rate, a one-factor equilibrium CIR model is used. For the real exchange rate, a CKLS model is adopted with an exchange rate exponent in the volatility term equal to one (Chan, Karolyi, Longstaff and Sanders, 1992). However, the cost of carrying foreign exchange debt depends on the nominal exchange rate, which is obtained from the real exchange rate and the domestic and foreign price indices. The domestic price index is assumed to follow a Geometric Brownian motion, while the foreign price index follows a deterministic process. The nominal exchange rate is then calculated by multiplying the real exchange rate with the ratio of the domestic over the foreign price index. By applying Ito's lemma to the last relation, the nominal exchange rate process is obtained. In this framework, the fiscal path is exogenously given.

Figure 1. Hypothetical Probability Distribution of Brazil's Debt Stock



Monte Carlo simulation methods are then used to derive a cost-risk efficient frontier for the public debt. A debt composition is efficient when its associated cost is the lowest given any chosen risk level. The set of all such compositions defines the efficient frontier, which reflects the cost-risk trade-offs that are faced by the debt manager. Given the government's choice of an acceptable level of risk, it is possible to choose a specific optimal debt portfolio on the frontier, i.e., a benchmark. Note that debt sustainability considerations often determine the maximum acceptable cost level (see Brazilian National Treasury's web site).

V. The south-east Europe experience with external public debt management

The SEE countries exhibit varying levels of external – defined as foreign-currency denominated and/or foreign-currency linked – public debt and apply different public debt management practices.[11] As evidenced from Table 1, external general govern-

11. For the purposes of this analysis, the SEE area comprises the following countries: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Cyprus, FYR of Macedonia, Greece, Montenegro, Romania, Serbia, Slovenia and Turkey.

ment debt in the SEE area ranged from 0.9 percent of GDP in Greece and 5.8 percent in Slovenia to 27.7 percent in Montenegro and 22.5 percent in Bosnia and Herzegovina at the end of 2006.[12] Also, the share of external to total general government debt varied widely, from 0.9 percent in Greece and 21.4 percent in Slovenia to 97.8 percent in Bosnia and Herzegovina and 71.9 percent in Montenegro. These differences reflect primarily the heterogeneity in the economic and financial systems of the SEE countries.

In particular, Greece and Slovenia's low level of external government debt and small share of external to total government debt reflect these countries' EU membership status and the consequent predominance of the Euro in their government debt portfolios.[13] For the other SEE countries, except Cyprus, the higher share of external debt in total general government debt mirrors the rather limited availability of domestic financing sources and the lack of domestic borrowing instruments owing to the relative underdevelopment of their domestic government debt markets. Moreover, these statistics indicate that many countries in the SEE region, especially emerging markets and developing economies, have a large foreign exchange exposure in their public debts that needs to be measured and managed appropriately.

This need is reflected in many SEE countries' public debt management strategies, as they specify the reduction of exposure to foreign exchange and interest rate risks as objectives. For example, Croatia's public debt management strategy envisages external debt management operations aimed at reducing the exchange rate risk exposure of public debt by replacing foreign-currency debt with domestic-currency debt. Also, Bulgaria and Romania's public debt management strategies call for a reduction in the foreign-currency debt share in total government debt in an effort to eliminate currency risk and to develop domestic capital markets. Further, Greece's public debt management strategy aims at reducing debt servicing costs through buybacks and debt exchanges and at diminishing currency and interest rate risks through issuance in Euro-denominated instruments, increase of the average refinancing period and use of financial derivatives. Serbia's public debt management objectives include the minimization of financial risks to which the public debt portfolio is exposed,

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12. For example, for EMU countries, the public debt is considered sustainable if the ratio of total general government debt to GDP is below 60 percent (Maastricht Treaty). For EM and developing countries, some studies set the limit at 50 percent for countries without debt crises and 15 percent to 30 percent for countries where debt crises emerge frequently (Reinhart, Rogoff, and Savastano, 2003), while other studies maintain a limit of 40 percent (Manasse, Roubini, and Schimmelpfenning, 2003).

13. Based on IMF's World Economic Outlook (IMF, 2007), Cyprus, Greece and Slovenia (EU members) are classified as advanced economies, while the rest of the SEE countries are classified as emerging market and developing countries.

especially the reduction or elimination of currency and interest rate risks. Finally, Turkey's public debt management strategy states that it aims at the attainment of a public debt structure where currency and interest rate risks remain at acceptable levels (Hellenic Republic, 2007; International Financing Review, 2005-2006; Raspudic Golomejic, 2007; Republic of Bulgaria, 2007; Republic of Croatia, 2006; Republic of Turkey, 2006).

Table 1. Public External Debt Indicators of Selected South-East European Countries, end-2006

Country	Long-Term Foreign Currency S&P Rating (May 2008)	GDP (US$, Billion)	General Government Total Debt (% of GDP)	General Government External Debt (% of GDP)	General Government - External / Total Debt (%)
Albania	Ba1[1]	9.3	55.5	17.0	30.6
Bosnia & Herzegovina	B2[2]	11.5	23.0	22.5	97.8
Bulgaria	BBB+	31.2	20.4	14.4	70.6
Croatia	BBB	41.5	41.6	16.8	40.4
Cyprus	AA+	18.1	65.3	14.3	21.9
Greece	A	268.4	95.4	0.9	0.9
Macedonia, FYR	BB+	6.2	31.6	16.5	52.2
Montenegro	BB+	2.5	38.3	27.7	71.9
Romania	BBB-	121.9	18.0	10.6	58.9
Serbia	BB-	34.8	35.6	20.9	58.7
Slovenia	AA	38.2	27.1	5.8	21.4
Turkey	BB-	403.5	60.7	17.1	28.2

Source: Various national publications; Standard & Poor's, Ratings-Sovereign Risk Indicators, February 2008; Fitch, Sovereign Data Comparator, December 2007; author's calculations

Notes: 1. Moody's rating, roughly equivalent to an S&P rating of BB+ (Albania does not have an S&P rating).
2. Moody's rating, roughly equivalent to an S&P rating of B (Bosnia and Herzegovina does not have an S&P rating).

However, only a few SEE countries with relatively high levels of general government debt as percentage of GDP were reported to have performed liability management operations to mitigate or eliminate the foreign exchange or interest rate risks in their public debt portfolios during 2005-2006. For example, Croatia performed international liability management operations by buying back sovereign foreign-currency debt and issuing domestic-currency bonds. Greece, in addition to issuing Euro-denominated debt securities, used (i) cross-currency swaps to mitigate the currency exposure of its public debt; (ii) buybacks to smoothen redemptions; and (iii) interest rate swap transactions to mitigate interest rate risk arising from its large floating-rate bond issuance. Also, Turkey carried out its first international liability management operation (debt swap) in September 2006. Specifically, it launched a US$ 1.5 billion 10-year Global bond consisting of US$ 1.17 billion exchanged for seven high-coupon, short-dated bonds and US$ 330 million of new cash. The new bond was intended to smoothen the country's redemption profile and establish a new liquid benchmark security for normalizing Turkey's Eurobond curve. In contrast, most debt operations by SEE countries were reported to have concentrated on prefunding and rolling over existing debt (Central Bank of Cyprus, 2006; International Financing Review, 2005-2006; Republic of Slovenia, 2006).

The limited engagement in such liability management operations may be attributed to several factors, among them the fact that many countries in the SEE region do not have external bonded debt at all (e.g., Albania, Bosnia and Herzegovina, Montenegro) or do not have yet a sizeable one. Also, some SEE countries have a high proportion of concessional debt (e.g., Albania, Bosnia and Herzegovina, Macedonia, FYR, Montenegro, and Serbia), which tends to be denominated in donor countries' currencies. Further, domestic government bond markets in many SEE countries are not well developed and local expertise in dealing with liability management operations are lacking (International Monetary Fund, 2007b; Parnargieva, 2005; Pavlicic, 2007; Republic of Serbia, 2007; Romania, 2007; World Bank Treasury, 2007).

Finally, although debt buybacks and debt exchanges by SEE countries have been limited so far, there is scope for further liability management operations as the dependence of these countries on concessional financing is reduced and their financial development progresses.

VI. Best practices in foreign exchange risk management of public debt

Many international organizations, including the IMF and the World Bank, have developed and disseminated principles of sound practice in public debt management, including foreign exchange risk management, over the last decade. Despite these efforts, most of the proposed broad principles, including those on exchange risk management, have yet to become universally accepted by debt managers as the standard in conducting liability management operations. This section tries to provide some general best practices for effective currency risk management, based on recent developed and emerging market countries' experiences with managing the exchange risk of their public debts. In particular, public debt managers with significant exchange rate exposure need to abide by a comprehensive framework of best practices for disciplined currency risk management decisions. These practices may include:

1. Public debt managers should clearly state the objectives of foreign exchange risk management within a well-defined medium-term debt management framework. The desired output should be a strategic benchmark debt portfolio that

defines the optimum debt structure of debt, including the optimum share of foreign-currency debt in total debt. Obviously, a benchmark portfolio changes with changes in debt management objectives, structure of the debt and other conditions.

In a liability management framework, the optimum currency composition of debt is usually determined by the minimization of projected debt servicing costs (assumed overarching objective of debt management in most countries) subject to constraints regarding (i.e., not exceeding) certain foreign exchange-, interest rate-, credit- and liquidity-risk levels (secondary objectives of debt management).

If an asset-liability management framework is employed, the optimum currency composition of debt is often determined by an optimization that takes into account both the minimization of projected debt servicing costs and maximization of the return of the country's assets (in particular, international reserves and projected primary balances) subject to constraints regarding specified risks and the country's asset-liability structures. The latter approach, in essence, espouses the view that the currency composition of the debt (liabilities) should closely match that of the assets in a sovereign's balance sheet.

In practice, the local-currency versus foreign-currency composition of debt tends to be influenced by political decisions, which may not always conform with the optimum currency composition derived from such optimization procedures.

2. After the optimum benchmark portfolio is determined, public debt managers need to present strategies (including liability management operations) for the attainment of these objectives and set a timeframe for achieving such currency composition of the debt.

   The strategies to be used for the attainment of the desired currency composition should involve transparent and credible liability management operations, which, in general, should be undertaken with the help of external financial advisors. In particular, the design of these operations needs to clearly indicate that they generate the desired outcome of the currency composition of debt with increased precision.

   The timeframe for reaching a certain optimum currency composition should be relatively short. However, depending on the particular circumstances, an adjustment to such an optimum may be envisaged to be gradual and, thus, the timeframe may need to be longer.

3. Increasingly, the decision about the currency composition is taken by the debt manager based on scenario analysis of various foreign exchange paths spanning the simulation period of the debt management exercise. This analysis is

often carried out by the risk management team (middle office of the Debt Management Office), and provides the broad perspective for the final currency-composition decision.

4. Public debt managers should posses the appropriate personnel and information technology systems for front-office execution, middle-office strategic analysis and back-office settlement in managing the associated risks, including the exchange rate risk, of a debt portfolio. In particular, information systems that ensure efficient monitoring of risks in a debt portfolio are essential for timely liability management operations.

5. For debt buyback and debt swap operations to succeed in their intended purposes, careful selection of the timing of these operations and extensive due diligence regarding investor interest and demand should be undertaken. For example, the case for such sovereign liability management operations becomes stronger when the currency(ies) of denomination of the external public debt is (are) weak and/or secondary-market bond prices are falling.

   Given the inherent reputational and credit risks in these operations, inadequate knowledge (and possible inappropriate targeting) of the investor base could lead to unsuccessful outcomes, especially for emerging market and developing countries. In particular, if a debt swap does not attract sufficient investor interest, both the bond to be refinanced and the bond that will replace it run the risk of becoming illiquid with adverse consequences for future refinancing costs.

6. When using derivatives (in particular, currency swaps) to manage the exchange rate risk of the debt portfolio, real-time market information should be used to calculate cash flows, determine required margin (collateral) movements and evaluate potential new transactions. This is necessary to ensure that risks associated with derivatives transactions are appropriately managed.

VII. Concluding remarks

Measurement and management of the exchange rate risk exposure of the debt stock of a sovereign can become a real challenge. At present, the VaR methodology is considered as one of the best practical approaches to assess exchange rate risk. The VaR measure of exchange rate risk combines information on the sensitivity of the value of changes in exchange rate-risk factors with information on the probable amount of change in these factors. It calculates the level of loss that there is only, say, a 1 in 100 chance that a loss worse than the calculated VaR can occur. The VaR level is estimated based on the current value of a portfolio (position) and the calculation of the probability distribution of changes in the value over the next assessment period (based on historical data). From the probability distribution over the next assessment period we can infer the confidence level for the 99-percentile loss. Other alternatives to VaR risk measures, such as the expected shortfall and spectral risk measures, have not yet been used extensively by debt managers.

Active foreign exchange risk management of a public debt portfolio, through debt or currency swaps, can effectively reduce the country's external vulnerabilities to currency fluctuations and other external shocks. However, it should be pointed out that such management of the public debt's foreign exchange risk exposure may be costly owing to the possible higher domestic interest rates when switching to domestic-currency debt (when using debt buybacks or debt swaps) or to the embedded currency swap costs (when using currency swaps). Frequently, these costs are assessed as less important in comparison to the benefits of reduced reliance on international investors' sentiment and possible sudden capital stops and/or prevailing global liquidity and risk appetite conditions.

Many developed, emerging market and, to a lesser degree, developing countries undertook various foreign-exchange related liability management operations during 2005-2006. This was facilitated by the prevailing favorable international liquidity conditions and further deepening of local government debt markets, as well as by a marked diversification of the investor base towards more strategic buy-and-hold buyers. Further, available information indicates that SEE countries were engaged in limited liability management operations during this period, despite the large currency risk exposure in their public debt portfolios. This inhibition could be attributed to the relatively small international bond issuance by SEE countries, especially by the smaller emerging market and developing countries in the region, and the insufficiently developed domestic government debt markets.

The active management of sovereign debt portfolios experienced in 2005-2006 was interrupted by the credit market turmoil that started in the summer of 2007. Widespread liability management operations are expected to resume when international financial market conditions improve and the current global liquidity squeeze turns around, provided that countries persevere with fiscal consolidation and reforms that aim to develop further their local capital markets. In particular, reforms need to continue in the areas of strengthening the regulatory framework, widening the local investor base and broadening the set of local capital market instruments, including derivatives.

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