

# Development Discussion Papers

## **Reforming the Public Sector's Risk Management in Emerging Markets**

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## **Reforming the Public Sector's Risk Management in Emerging Markets**

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### **Abstract**

External borrowing involves market risk stemming from changes in interest rates and exchange rates. In light of the recent crises in the emerging markets, private and public risk management has been identified as one of the key reform areas. In focusing on sovereign debt, this paper proposes a value-at-risk (VaR) approach similar to risk management tools employed by commercial banks. The paper also examines recent developments in the derivatives markets and discusses the potential importance of insurance-based instruments to hedge risk. Finally, the paper focuses on institutional reforms, in the absence of which the implementation of more sophisticated risk management strategies would appear unlikely.

**Keywords:** derivatives markets, insurance, moral hazard, market risk, VaR

**JEL codes:** G22, F 32, O16

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## **1. Introduction**

The need to improve external liability management is one of the key lessons that have been drawn from the recent crises in the emerging markets. As the Council of Foreign Relations Task Force (1999, p. 173) emphasizes, joining the “Good Housekeeping Club” entails, *inter alia*, two things: “It means prudent debt management: discouraging liquid liabilities of the public and private sectors from getting way ahead of their liquid liabilities and avoiding the buildup of large currency mismatches.” And, more specifically: “It means shunning heavy reliance on short-term borrowing and on longer-term debt contracts with options that allow the creditor to demand accelerated repayment if conditions worsen.”

That prudent debt management is of critical importance is not an entirely new insight. In 1988, motivated by the debt crises of the 1980s, the United Nations Development Programme commissioned a Report on debt management and established on its basis a Joint Programme for debt management with UNCTAD and the World Bank (UNDP, 1997). According to the report’s findings, the crises were not least the result of the authorities’ lack of knowledge regarding, for example, the timing and amounts of debt servicing obligations. Indeed, in a number of cases the lack of reliable information caused serious problems for the subsequent rescheduling of debt. Thus, a key component of the technical assistance under the umbrella of the Joint Programme has focused on compiling and checking debt information.

While several countries have made considerable progress in monitoring external debt, their increased integration into the international capital markets has brought about new challenges in terms of monitoring and managing market risk. Arguably, an

important reason why the recent crises were able to strike with such violence may be sought in the fact that few people, if any, were actually aware of the amount of market risk these countries were exposed to. Employing better risk management tools has therefore been given high priority in reforming the banking systems, which at least in Asia played a key role in the turmoil (Radelet and Sachs, 1998).

As this paper argues, however, improving the public sector's own risk management is equally important. In many emerging markets the public sector accounts for a substantial share of the country's international issues of bonds and notes and other instruments. In some countries, moreover, the public sector has also borrowed significant amounts from foreign banks. With foreign financing thus representing a considerable percentage of the public sector borrowing requirement, the authorities remain equally exposed to the vicissitudes and volatility of international capital flows.

Reforming the public sector's risk management involves measures that in many respects are similar to those prescribed for financial institutions. Specifically, this paper proposes a *value-at-risk* (VaR) approach which should help the authorities identify and alleviate excessive market risk. In managing risk, as the paper discusses, the increased breath and depth and sophistication of the derivatives markets has appreciably widened the range of hedging instruments. Furthermore, new opportunities of risk management have emerged in the form of *alternative risk transfers* (ART), a new class of insurance products. However, employing market-based risk management techniques requires sophisticated public sector institutions which are shielded from political interference. In many countries independent public debt agencies are still lacking. Therefore, as the

paper argues, important institutional reforms are needed to join the “Good Housekeeping Club.”

The rest of the paper is organized as follows. Section 2 analyzes the structure of external liabilities in the emerging markets. Section 3 proposes a VaR for assessing the public sector's exposure to market risk arising from its external liabilities. Section 4 focuses on modern hedging techniques. Section 5 deals with institutional reforms. Section 6 summarizes and concludes.

## **2. The Risk Exposure of Emerging Markets**

In many emerging market economies that have gained access to international debt markets, the currency composition and maturity structure of their external borrowing have been driven by the authorities' desire to reap immediate fiscal benefits of borrowing with the lowest unhedged nominal interest rates rather than by a debt management strategy. In the first half of the 1990s, the debt burden of several Asian countries, for example, increased significantly owing to their large and unhedged exposure to the Japanese yen. The IMF (1997, p.39) estimates that a third of the increase in the dollar value of Indonesian external debt between 1993 and 1995 was attributable to cross-currency movements, particularly the steep appreciation of the yen. The problem was exacerbated by the fact that around 90 percent of Indonesia's export revenues were denominated in US dollars, while at the time more than one-third of the countries debt was denominated in yen. Similarly, in the Philippines the appreciation of the yen is estimated to have accounted for about half of the increase in the dollar value of the country's debt in 1995.

According to BIS data, international debt securities issued by emerging market countries totalled USD 827.6 billion as of end-June 1999, with the overwhelming share denominated in foreign currencies. Indeed, excluding Hong Kong and South Africa, the share of international issues denominated in domestic currencies amounted to only about 1 percent. In terms of total debt securities, international issues accounted for more than two-thirds. Some countries, notably Indonesia, the Philippines, Taiwan, and Thailand, have issued securities only on the international markets.

In several countries the public sector represents a significant share of international securitized debt. This is particularly true for Eastern Europe but also for Argentina, Brazil, China, Mexico, Russia, and Turkey. Interestingly, in some of them the public sector has borrowed more heavily (or even exclusively) in the international markets relative to the domestic market. Overall, international debt securities issued by governments and state agencies in emerging market countries totalled nearly USD 200 billion at mid-1999, ie., almost one-quarter in terms of all outstanding debt issued by emerging market countries in international markets.

**Table 1. Selected Emerging Markets: Domestic and International Debt Securities** (as of mid-1999, in billions of USD)

	<u>Domestic Debt Securities</u>		<u>International Debt Securities</u>		
	Total Amount Outstanding	Public Sector	Total Amount Outstanding	Public Sector	Issued in National Currency
<b>Africa, Eurasia</b>					
South Africa	-	-	6.2	3.6	6.2
Turkey	40.7	40.7	15.6	13.5	-
<b>Asia</b>					
China	196.4	127.6	17.6	8.9	-
Hong Kong	30.5	5.6	35.9	8.3	15.1
India	123.7	94.5	5.5	-	-
Indonesia	-	-	16.4	0.7	-
Korea	263.9	65.0	49.9	22.3	-
Malaysia	60.7	22.9	13.9	2.0	-
Philippines	-	-	12.7	4.2	0.2
Singapore	18.6	16.6	6.1	0.1	-
Taiwan	-	-	7.7	-	2.0
Thailand	-	-	15.1	2.2	-
<b>Eastern Europe</b>					
Czech Republic	18.7	14.3	2.1	0.6	-
Hungary	16.0	15.5	12.6	12.3	-
Poland	28.6	28.6	3.4	1.8	1.3
Russia	11.8	11.8	19.8	17.1	0.1
<b>Latin America</b>					
Argentina	76.0	24.0	58.7	40.7	1.3
Brazil	460.1	379.0	40.6	10.9	-
Mexico	46.9	38.6	60.2	30.9	-

Source: Bank for International Settlements.

Industrialized countries, by contrast, have borrowed almost exclusively in their home markets. Overall, more than 90 percent of securitized debt that was outstanding at mid-1999 was issued domestically. As far as their public sectors are concerned, the ratio was even lower. Indeed, international debt securities accounted for less than 5 percent in terms of total securitized public debt. In some countries (Germany, Japan, and the United States), whose central governments do not issue foreign currency debt at all, the public sector's exposure to foreign exchange risk has been negligible. In other countries, such as Spain or Sweden, where the share of foreign currency debt issued by the public sector has been relatively higher the authorities typically use swaps and swap options to reduce or limit their exposure to market risk.

In addition to issuing securities in the international debt markets, governments have also borrowed from foreign banks (Table 2). While in most countries the public sector's liabilities vis-à-vis foreign banks have accounted for a relatively small share in terms of the countries' total borrowing from foreign banks, in some cases, especially in Latin America, the percentage has been significant. In Argentina and Mexico, public sector borrowing from foreign banks has played an important role not only with respect to the countries' overall exposure versus foreign banks but also regarding the overall foreign financing of the public sector borrowing requirement. In these two cases, foreign banks accounted for 26 and 38 percent of foreign debt of the public sector, respectively. In some other countries, notably Turkey and China, foreign banks also play a comparatively important role.

Borrowing from banks implies a particularly high degree of risk. In fact, in most countries a substantial share of bank claims has a maturity of less than one year, allowing banks to withdraw huge amounts at short notice. As a result, countries may become illiquid, a risk that is particularly serious in the case of currency and maturity mismatches (Sachs, 1999). To a considerable extent, such mismatches may reflect market failures (Chang and Valesco, 1999). However, another important reason may be sought in the lack of adequate risk management.

### **3. The Value-of-Risk of Public Sector Debt**

Given the public sector's exposure to asset price volatility, how can the authorities in the emerging markets strengthen their risk management? As Blejer and Schumacher (1998) have argued, public institutions should employ value-at-risk (VaR) approaches similar to those that are now mandatory for commercial banks in the G-10 countries. Indeed, the underlying idea of VaRs - namely to assess the vulnerability of a particular portfolio by calculating the maximum potential loss over a certain target horizon within a given confidence interval (Jorion, 1997) - appears highly relevant for the public sector as well. If the potential loss exceeds an acceptable level, the VaR should signal the need to reduce the overall portfolio risk through appropriate measures.

**Table 2: Consolidated International Claims of BIS Reporting Banks on Selected Emerging Markets (as of mid-1999, in billions of USD)**

	Claims		Maturity Distribution <sup>a)</sup>		
	Total	Public Sector	≤ 365 days	<1≤2 years	2< years
<b>Africa, Eurasia</b>					
South Africa	21.3	3.7	62.7	5.8	24.2
Turkey	35.1	8.1	54.9	7.8	28.6
<b>Asia</b>					
China	51.8	8.4	46.8	6.9	37.9
Hong Kong	120.9	0.9	79.7	3.9	16.1
India	22.6	5.0	37.4	10.1	43.4
Indonesia	43.8	9.2	49.6	8.0	38.6
Korea	63.5	5.2	53.7	11.3	17.4
Malaysia	18.6	2.6	42.3	5.9	39.9
Philippines	16.5	3.0	49.6	8.3	37.2
Singapore	112.6	0.7	78.0	2.1	9.7
Taiwan	19.5	0.6	77.5	4.9	12.6
Thailand	34.7	2.1	54.9	8.2	31.2
<b>Eastern Europe</b>					
Czech Republic	9.9	0.6	51.3	6.1	30.8
Hungary	14.5	2.8	29.1	10.0	30.4
Poland	17.2	2.3	41.1	5.2	39.1
Russia	52.0	3.0	27.3	7.2	62.9
<b>Latin America</b>					
Argentina	66.7	14.7	56.8	6.9	29.7
Brazil	62.3	13.1	56.8	5.2	31.0
Mexico	63.8	18.8	41.6	4.6	41.7

a) in percent (does not add up to 100 because of unallocated amounts).

Source: Bank for International Settlements.

Specifically, Blejer and Schumacher (1998) have developed a VaR model for central banks, arguing that the monetary authority behave in a manner closely resembling a conventional commercial failure when forsaking a commitment to a pre-announced nominal regime. Cornelius (forthcoming) has extended this approach by amalgamating the relevant central bank and treasury accounts and taking into account such contingent liabilities of the public sector as state guarantees for non-sovereign borrowing or trade and exchange rate guarantees. Essentially, these approaches aim at providing an early-warning signal that the authorities' macroeconomic policy stance may be unsustainable.

These VaR approaches include both assets and liabilities and thus focus on the entire balance sheet. However, VaRs can also be construed so as to concentrate exclusively on an institution's liabilities. For example, the Swedish National Debt Office (SNDO, 1999b) is using various risk measures that are based on the VaR concept. Charged with the task "...to minimise the long-term cost of the debt while also taking risks into account...", these instruments are applied to the entire portfolio of liabilities, including domestic debt. As the SNDO notes in this context, the market values at risk that are relevant in an analysis of the structure of the state debt are significantly longer term than those captured by conventional VaR models, which normally have a time horizon of no longer than one month – often as short as 24 hours.

However, very short horizons may also be of interest for public sector VaRs, especially if the focus of the analysis is narrowed even further by concentrating only on foreign currency debt (SNDO, 1999a). Suppose, for example, that the Philippine authorities have a debt portfolio consisting of three liabilities, namely a USD 10 million bank loan, a bond issue of JPY 150 billion, and a public guarantee for a EUR 5 million

loan. Suppose further that the authorities are interested in the extent their debt portfolio is exposed to in the next 24 hours with respect to changes in the respective exchange rates vis-à-vis the Philippine peso, but also with regard to movements in the cross rates, given a confidence interval of 95 percent.

Employing the simple approach outlined in the appendix and taking into account the volatilities and correlations shown in Table 3, the VaR of the entire portfolio is VaR = PHP 9.725 million. In other words, there is only one chance in 20 that a loss greater than PHP 9.725 million occurs in the next 24 hours. As simulations show, however, this value is quite sensitive with respect to the extent to which the three liabilities are correlated. In the extreme case where the liabilities are completely uncorrelated, the VaR would be PHP 9.133 million. However, if the correlation coefficients were 1 the VaR would increase to PHP 11.761 million.

**Table 3. VaR simulations**

Liability	Position (PHP)	Volatility (day, CI=95%)	Correlation Coefficients	VaR (PHP)
USD	400	0.90		
JPY	600	1.35		
EUR	200	1.10		
JPY/USD			0.10125	
USD/EUR			0.12375	
JPY/EUR			0.09281	9.725
JPY/USD			0	
USD/EUR			0	
JPY/EUR			0	9.133
JPY/USD			1	
USD/EUR			1	
JPY/EUR			1	11.761

Note: PHD values in millions.

In reality, of course, things are more complicated, posing important challenges for risk managers (IIF, 1999). For instance, the distribution of asset price changes for many securities usually has thicker tails than predicted by a normal distribution assumed in our example (i.e., extreme movements seem to occur much more frequently than is the case under a Gaussian assumption). Furthermore, complex derivatives possess non-linear payoff structures. A large number of financial institutions have therefore begun to employ nonparametric VaR approaches, for which relatively few assumptions are made about the underlying distribution. Monte-Carlo methods, which entail the creation of complete numerical simulations, have proved particularly popular. Others have experimented with extreme value theory in order to derive a functional tail form on the basis of a limited amount of data.

Given these uncertainties, it would appear even more important to subject VaRs to stress tests, an approach, which involves calculating outcomes under extreme scenarios. By violating some key assumptions and analyzing low-probability adverse events, such tests may be used to examine causal relationships among core market factors which can become excessively strained during a period of market turmoil (Crouhy, Galai, and Mark, 1998, p. 16). More importantly, however, stress tests may help risk managers understand the process of getting to the final number, which might be more important than the final number itself.

#### **4. The ART of risk hedging**

While VaRs could play an important role in monitoring market risk, the increasing breadth, depth, and sophistication of international financial markets have

greatly expanded the possibilities to manage it. Foreign swap markets, for example, allow Asian borrowers to exploit market niches and expand their investor base, say, by including European retail investors, without bearing the cross euro-dollar or euro-yen exchange rate risk. Likewise, they may use the interest rate swap market to manage the maturity structure of their external debt. According to BIS data, interest rate swaps have enjoyed particularly strong growth over the last decade or so. While the size of the market was estimated at some USD 685 billion in 1987, the notional value of outstanding interest rate swaps reported by the members of the International Swap and Derivatives Association amounted to almost USD 22.3 trillion. During this period, the value of currency swaps rose tenfold to around USD 3.6 trillion.

While the USD has remained by far the most important currency for interest rate and currency swaps, its dominance has declined in recent years. In 1987, the USD accounted for about 80 percent of the total market size. However, by 1997 its share has fallen to 27 percent and 35 percent, respectively. The swap market has to a large extent remained an interbank market, accounting for more than half of the total value. As far as end-users are concerned, governments have become increasingly active but still account for only about 10 percent of the non-interbank swap markets. As indicated above, an important reason for this may be seen in the fact that governments in most industrialized countries borrow only in their own currencies. For them, there is obviously no need to hedge currency risks through swaps.

**Table 4. Annual Turnover in Derivative Financial Instruments Traded on Organized Exchanges Worldwide**

(in millions of contracts traded)

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Interest rate futures	219.1	230.9	330.1	427.0	628.6	561.0	612.2	701.6	760.0
Short-term instruments	76.0	87.3	144.9	180.0	282.3	266.5	283.6	313.9	338.6
3M eurodollar	39.4	41.7	66.9	70.2	113.6	104.2	97.1	107.2	119.3
3M euroyen	15.2	16.2	17.4	26.9	44.2	42.9	38.2	36.4	30.9
3M euro-DM	3.1	4.8	12.2	21.4	29.5	25.7	36.2	44.3	55.0
Long-term instruments	143.1	143.6	185.2	247.1	346.3	294.5	328.6	387.7	421.5
US-treasuries	78.2	69.9	71.7	80.7	101.5	87.8	86.0	101.4	113.8
10Y JGBs	16.4	12.9	12.1	15.6	14.1	15.2	13.6	12.9	11.9
Bunds	9.6	12.6	20.6	33.6	57.2	52.1	74.6	101.6	136.2
Interest rate options	52.0	50.8	64.8	82.9	116.6	225.5	151.0	116.8	129.7
Currency futures	29.7	30.0	31.3	39.0	69.7	99.6	73.7	73.6	54.4
Currency options	18.9	22.9	23.4	23.8	21.3	23.2	26.3	21.1	12.1
Stocks, index futures	39.4	54.6	52.0	71.2	109.0	114.8	93.8	115.9	178.0
Stocks, index options	119.1	121.4	133.9	144.1	197.5	187.3	172.3	178.2	195.0
Total	478.3	510.5	635.6	788.0	1142.9	1211.5	1129.4	1207.1	1329.3
North America	312.3	302.7	341.4	382.3	513.5	455.0	428.3	463.5	530.0
Europe	83.0	110.5	185.0	263.5	398.0	354.7	482.8	482.8	525.9
Asia-Pacific	79.1	85.8	82.8	98.4	131.9	126.4	126.9	126.9	170.9
Other	3.9	11.6	26.3	43.7	99.4	275.4	193.4	134.0	102.5

Source: Bank for International Settlements.

Futures, options, and other derivatives provide additional opportunities. As Table 4 shows many derivatives markets have also expanded extremely rapidly over the last ten years. As a matter of fact, the number of total contracts traded in the derivatives markets almost tripled between 1990 and 1998. Interest futures accounted for more than half of the 1.33 billion contracts traded in 1998. In terms of the notional principal amounts outstanding, interest rate futures amounted to about USD 7.7 trillion.

With almost 130 million contracts traded in 1998, the notional value of interest rate options at the end of that year is estimated at roughly USD 4.6 trillion. Currency futures and options were traded to a significantly lesser extent, and their notional value at end-1998 was relatively small at less than USD 40 billion and 20 billion, respectively.

In the late 1980s virtually all derivatives were traded in the United States. Today, however, the European markets rival North America in terms of the number of contracts traded on the exchanges. By comparison, the Asian-Pacific region is of much lesser importance, accounting for only about 10 percent of the global number of contracts. The relatively strongest expansion, however, concerns the emerging markets which enjoyed a tenfold increase in 1990-98.

While the phenomenal growth of the derivatives markets has attracted much attention, the insurance industry has also developed a number of important innovations that provide new opportunities in order to hedge risks. As a matter of fact, insurance-based solutions may have a non-trivial cost advantage (Shireff, 1999). While insurers judge the risks they are underwriting from the perspective of their entire portfolio, thus benefiting from the effects of diversification, capital markets investors tend to judge a security or derivative on the individual probability of default. As a matter of fact, for

some investors the universe of possible investments is restricted to instruments with investment-grade rating.

This cost advantage has been an important factor for the increasing popularity of so-called ART products. Having enjoyed rapid growth in the last few years, the ART market includes a large variety of risks that until recently were considered uninsurable. In a high-profile case, for example, British Aerospace recently paid a premium of USD 70 million in order to protect USD 3.9 billion of the firm's leasing income until 2013, a hedging strategy that has been viewed as considerably less expensive than securitizing the risk (Clow, 1999). Other examples include policies guaranteeing hotel occupancy rates, the coverage of residual values of leased cars, or revenues from movie productions. In yet other cases, which are particularly relevant from the perspective of this paper, underwriters have offered products that limit the negative impact of unexpected shifts in exchange rates, interest rates, or commodity prices (Fairlamb, 1999).

Reinsurers have responded to the rising degree of sophistication in the insurance market by offering so-called *Integrated Risk Management* (IRM) solutions. These products are designed to support cedents in their task of achieving their targeted operating result while reducing the risk of having to dissolve equity capital following a major loss on their liability and/or asset side of the balance sheet (SwissRe, 1998, p. 6). IRMs appear particularly interesting for insurers that offer holistic products, taking over clients' entire risks ranging from traditional risks to business and management risks to market risks. While traditional re-insurance helps free up underwriting risk capital, IRMs provide additional protection against investment losses so that a further amount of risk capital can be released in an efficient way.

Over the last decade or so, insurance risk itself has become an asset class that can be traded, with catastrophe (CAT) bonds representing by far the largest and most active market (for details, see Froot, 1999). CATs and related instruments are traded on the Chicago Board of Trade, CATEX New York, and the Bermuda Commodity Exchange. While these markets have suffered from the absence of major disasters in recent years, they have contributed to an increasing blurring of the insurance and capital markets. As the barriers between insurance, reinsurance, and the financial markets crumble, it would appear likely that the ART market gains further momentum. Currently, the global ART market is estimated at some 100 billion US dollars in terms of premiums, a volume that market observers believe could quadruple over the next 10 years (Fairlamb, 1999). This would still be only a fraction of the size of the swap and derivatives markets. Nevertheless, in individual cases it is believed that ART products could provide a serious alternative.

Could the public sector use the ART market by purchasing insurance against adverse movements in asset prices, especially exchange rates and interest rates? As with other products, the key issue is the pricing of insurance risk and selling it to investors. However, in the case of market risk facing the public sector the situation is substantially more complicated. While the authorities have no influence on cross-currency movements, their policies do affect other key variables. Potentially, insurance against adverse asset prices could undermine the authorities' determination to pursue sustainable policies, a key concern that has repeatedly been emphasized with respect to other forms of financial assistance, notably IMF lending. On the other hand, emerging markets have been able to obtain credit lines from commercial banks that may be used to fend off

financial turmoil. Nevertheless, given that ART products do not involve the creation of debt, the problem of moral hazard may be relatively larger.

Dealing with the problem of moral hazard and making the public sector's market risk exposure insurable requires identifying dishonest crises and distinguishing them from what Dornbusch (1998) has termed "honest" crises. In Dornbusch's view, macroeconomic VaR approaches could play a critical role in this regard. To the extent that VaRs actually help the authorities alleviate excessive risk, financial turmoil that occurs despite the authorities' best efforts may be regarded as exogenous and therefore "honest". Under such circumstances, countries would have claims vis-à-vis insurers and could thus prevent themselves from becoming internationally illiquid. By contrast, a crisis would be viewed as "dishonest" if the authorities failed to implement a VaR analysis or ignored the results.

In practice, of course, the distinction between honest and dishonest crises is likely to be difficult. In order to minimize the risk of moral hazard, a substantial deductible may be required. Moreover, if VaRs are to play a role in determining whether financial turmoil could have been avoided, risk management must be highly transparent. Therefore, institutional reforms appear equally critical.

## **5. Institutional Reforms**

Improving market risk control and, more generally, reforming a country's external liability management entails various dimensions. As detailed in the UNDP (1997) report, five different functions of debt management can be distinguished: (1) The *policy* function formulates national debt policies and strategies. (2) The *regulatory* function sets the rules

for the operating units in debt management, coordinating their roles and supervising their work. (3) The *accounting* function breaks down each loan contract into debt servicing obligations and sets up an effective payments mechanisms. (4) *Supporting* functions include resource management, auditing, statistics, and information services. (5) The *operational* function, finally, develops and adopts strategies for approaches to sources of funds and for the handling of the debt portfolio, including market risk management.

Several countries have made encouraging progress at least in some of these areas. In 1995, the Argentine government, for example, installed a computerized debt data base, facilitating an adequate monitoring and control of disbursements and payments (UNDP, 1997, p. 23). This information system includes debt of the central government as well as of other entities of the public sector and has been interfaced with the Integrated Financial Information System of the Ministry of Finance. Moreover, a Functions Manual defines the objectives, responsibility and main activities of the debt office. It also identifies the organizational structure, the lines of command, the staffing and the work program. The Procedures Manual focuses on the flow of debt information, and defines the relationship with the Treasury, Budget, and Accounting Departments.

Other countries, however, have remained less advanced (IMF, 1997, p. 41). Debt management objectives are often cast in general terms, and formal guidelines on the currency composition and the maturity structure of public debt have remained the exception. Fulfilling the operational function has proved particularly difficult. While portfolio management and risk control require substantial technical expertise and sophisticated information technology, many countries found it difficult to attract and retain qualified and experienced staff. Moreover, debt management has often been

hampered by the absence of clear benchmarks and internal management procedures to ensure that internal trading and exposure limits are strictly enforced.

The experience in individual countries suggests that the institutional framework plays a critical role. Indeed, as table 5 shows, many emerging markets suffer from serious institutional impediments. According to the Global Competitiveness Report (WEF, 1999) that ranks countries' relative competitiveness on the basis of their microeconomic and macroeconomic strengths (assets) and weaknesses (liabilities), several of them (namely Argentina, Malaysia, Philippines, South Africa, and Turkey) show a profound lack of competence in terms of public sector management. One might speculate that in these countries the authorities find it particularly challenging to recruit people with the necessary background from within the administration. An even more widespread problem is seen in an inefficient bureaucracy and a lack of independence of the civil service. Rather, in a number of countries the extent to which the authorities influence decisions is viewed as excessive, giving in many cases rise to government favoritism. Moreover, several countries suffer from institutional instability.

As long as risk managers remain subject to political interference, transparency and accountability can be seriously jeopardized, however. Moreover, hiring risk managers with the relevant background in sophisticated techniques could be hampered by either the management structure or pay scale of the public sector. Therefore, establishing separate debt agencies and granting them a separate structure and an autonomous status may have important advantages. Under certain circumstances, twinning arrangements with foreign institutions or the outsourcing of debt management might be perceived as an alternative route. As regards the latter, such a strategy would be similar to appointing a

foreign portfolio manager to manage the central bank's foreign exchange reserves, a strategy that has become increasingly popular especially in Central and Eastern Europe.

In establishing efficient institutions, the authorities in emerging market countries may find it useful to review the experience in individual industrialized countries that have recently implemented steps to reform their debt management (IMF, 1997). In Sweden, for example, the National Debt Office was moved from under the authority of the Parliament to that of the Ministry of Finance in 1989 to improve debt management practices. Aiming at minimizing the costs of borrowing within the limits imposed by monetary policy, separate benchmark portfolios for the domestic and foreign currency debt are established. Against these benchmarks, the National Debt Office manages the currency allocation, the maturity structure, and the market risk of the overall debt portfolio. In early 1998, Parliament decided to introduce new rules in the Act on State Borrowing and Debt Management. The new system for controlling the national debt places great emphasis on the evaluation of debt management at all levels, from day-to-day risk management decisions to the government's decisions on general guidelines.

Other examples include Ireland, where the borrowing and debt management functions and the domestic bond market operations were delegated to an autonomous debt agency, and New Zealand, whose Debt Management Office is charged with identifying "...a low risk portfolio of net liabilities consistent with the Government's 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." These examples could provide interesting insights for emerging market countries which aim at improving their debt management and market risk control mechanisms. Given that the outstanding stock

of sovereign debt issued or guaranteed by governments in these countries was about three times their foreign exchange reserves before the recent crises, it is difficult to overestimate the importance and urgency of far-reaching reforms in this field.

## **6. Conclusions**

This paper has proposed a reform agenda for the public sector's external liability management in emerging markets. Motivated by the high degree of vulnerability many countries have shown with respect to adverse movements in international asset prices, these reforms should be viewed as part of a broader agenda to join the "Good Housekeeping Club". A key measure was seen in the introduction of a market-based risk monitoring system based on existing VaR approaches developed for commercial banks. As the paper argued, VaRs could help the authorities identify excessive risk, and in alleviating the public sector's exposure, risk managers could take advantage of the increased availability of hedging instruments. In this context, the paper discussed the rising breath and depth and sophistication of the derivatives markets and ART products, financial innovations that have recently emerged in the insurance industry.

As the paper has cautioned, however, a more sophisticated, market-based risk strategy is unlikely to be implemented unless risk managers are shielded from political interference. This requires far-reaching institutional reforms. Establishing independent debt management agencies has been identified as a critical measure in order to limit the risk of financial turmoil in the future.

While the reforms discussed in the paper should help the authorities to keep their houses in order, it would be misleading to assume that they will eliminate the risk of financial crises altogether. If turmoil does occur, however, crises may be considered as

“honest”, a precondition for the use of insurance-based approaches and credit lines provided by commercial banks. To the extent that financial resources that become available under this first line of defense turn out to be insufficient, there needs to be a second line of defense in the form of generous support from the international community. By contrast, crises that occur because the authorities accept excessive market risk, knowingly or unknowingly, may be viewed as dishonest. Thus, the reforms proposed in this paper may play a considerable role with respect to dealing with moral hazard problems inevitably associated with IMF lending and other financial assistance.

This appears particularly relevant with regard to the Fund's Supplemental Reserve Facility (SRF) and the Contingent Credit Lines (CCL) whose guidelines specify that financing can be provided where a member country faces “exceptional payments difficulties due to a large short-term financing need,” as a result of “...circumstances that are largely beyond the control of the member and that stem primarily from adverse developments in international capital markets consequent upon developments in other countries.” In the view of the US administration, the SRF and the CCL – in addition to short-term standby arrangements – should become the IMF's two major weapons in the in the frontline of the international response to financial crises (The Economist, December 18, 1999). Many seem to agree. Thus, the reforms suggested in this paper could represent an important pillar of a new international financial architecture.

### **Appendix: The Value-at-Risk Approach**

Suppose all risks are normal and the portfolio is a linear function of these normal risks.<sup>1</sup> The VaR then is a multiple of the portfolio standard deviation, and the portfolio standard deviation is a linear function of individual volatilities and covariances. Consider first the case of a portfolio that consists of two assets, 1 and 2, with a relevant amount,  $w_1$ , held in asset 1, and the relative amount,  $w_2$ , held in asset 2 ( $w_1 + w_2 = 1$ ). If asset  $i$  has a return with variance  $\sigma_i^2$ , the variance of the portfolio,  $\sigma_p^2$ , is:

$$\sigma_p^2 = [w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\rho_{1,2}\sigma_1\sigma_2] \quad (A1)$$

where  $\rho_{1,2}$  denotes the correlation coefficient between the returns to the two assets. The VaR of the portfolio is thus given by

$$\text{VaR} = -\alpha\sigma_p W = -\alpha [w_1^2\sigma_1^2 + w_2^2\sigma_2^2 + 2w_1w_2\rho_{1,2}\sigma_1\sigma_2]^{1/2} W \quad (A2)$$

or

$$\text{VaR} = [\text{VaR}_1^2 + \text{VaR}_2^2 + 2\rho_{1,2}\text{VaR}_1\text{VaR}_2]^{1/2} \quad (A3)$$

$\text{VaR}_1$  is the undiversified value-at-risk associated with asset 1 (i.e.,  $-\alpha w_1 \sigma_1 W$ , with  $\alpha$  reflecting the level of confidence on which the VaR is predicated), while  $\text{VaR}_2$  is the undiversified value-at-risk associated with asset 2 (i.e.,  $-\alpha w_2 \sigma_2 W$ ). (A3) defines the VaR of the portfolio in terms of the individual variances, portfolio weights and the

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<sup>1</sup> This appendix follows Dowd (1998). Other good introductions to VaR analysis include Best (1998) or Jorion (1997). Chorafs (1998) focuses especially on the market risk amendment that made VaRs mandatory.

correlation coefficients as the underlying portfolio factors and in terms of the undiversified VaRs of the component assets.

If assets returns are perfectly correlated, i.e.,  $\rho_{1,2} = 1$ , the portfolio VaR is simply the sum of the individual undiversified VaRs and there is no diversification of risk. By contrast, if returns are perfectly negatively correlated, i.e.,  $\rho_{1,2} = -1$  the two individual VaRs offset each other in their impact on the aggregate VaR. If they are also of the same size, the portfolio VaR is zero. Finally, if the returns are independent, i.e.,  $\rho_{1,2} = 0$ , the portfolio VaR is given by  $[\text{VaR}_1^2 + \text{VaR}_2^2]^{1/2}$ .

In the general case of  $n$  assets, the VaR of the portfolio,  $\text{VaR}_p$ , can be calculated as follows:

$$\begin{aligned} \text{VaR}_p &= -\alpha \sigma_p W = -\alpha [\mathbf{w} \boldsymbol{\sigma} \mathbf{C} \boldsymbol{\sigma} \mathbf{w}^T]^{1/2} W = -\alpha [\mathbf{w} \boldsymbol{\Sigma} \mathbf{w}^T]^{1/2} W \\ &= [\mathbf{VaR} * \mathbf{C} * \mathbf{VaR}^T]^{1/2} \end{aligned} \quad (\text{A4}),$$

where  $\mathbf{w}$  represents the  $1 \times n$  weight vector  $[w_1, w_2, \dots, w_n]$ ,  $\boldsymbol{\sigma}$  the  $n \times n$  diagonal standard deviation matrix,  $\mathbf{C}$  the  $n \times n$  correlation matrix,  $\mathbf{w}^T$  the transpose of  $\mathbf{w}$ ,  $\mathbf{VaR}$  the  $n \times 1$  vector of individual VaRs  $[\text{VaR}_1, \text{VaR}_2, \dots, \text{VaR}_n]$ , and  $\mathbf{VaR}^T$  its transpose. Thus, if all returns are perfectly correlated, the  $\mathbf{C}$  matrix becomes a matrix of ones. If the returns are less than perfectly correlated, the portfolio VaR is less than the sum of the undiversified VaRs, implying benefits from portfolio diversification.

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