Financial stability implications of local currency bond markets: an overview of the risks[1]

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1. Introduction

Latin American countries have made considerable progress in developing their local currency bond markets. With more sizeable local bond markets come improved efficiency of financial intermediation, diversification of intermediation, reduction in the concentration of risks in the banking sector and financing of fiscal deficits in a non-inflationary manner. In addition, the more developed local currency debt markets in these countries should help mitigate important risks and sources of vulnerabilities, eg by reducing systemic instability associated with currency and maturity mismatches. A growing body of evidence says that the development of local currency bond markets, which has gone further than many had expected a decade ago, has strengthened the stability of local financial systems in the emerging market economies as a whole.[2]

Notwithstanding the substantial benefits of local currency bonds, it is useful to consider potential risks that may arise from the rapid development of such instruments. Such risks may initially be hidden but should not be underestimated. An important issue to consider is whether the replacement of long-term foreign currency borrowing with shorter-term borrowing has not simply replaced currency risk with refinancing risk. A second concern is whether insufficient market liquidity may result in greater volatility during times of stress. A third issue is whether a narrow investor base may create systemic risks. Finally, we must ask whether the expansion of domestic issuance may have taken place without the existence of a proper infrastructure and/or regulations.

This chapter discusses the extent to which the development of local currency bond markets may affect financial stability. It starts by addressing a key question: whether the development of bond markets has reduced the vulnerability associated with currency and maturity mismatches. Next, it offers an analysis of the financial stability implications associated with the structure of local debt markets. Following this is a section drawing some implications for risk management, with a particular emphasis on liquidity and settlement risk. A final section concludes.

2. Currency and maturity mismatches

The development of domestic bond markets in Latin America has resulted from concerted efforts by the authorities to reduce their countries' vulnerabilities to external shocks. Such

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[1] The views expressed are those of the authors and do not necessarily reflect those of the BIS. We thank Philip Turner and Michela Scatigna for their comments, Rodrigo Mora for research assistance and Alejandra Gonzalez for editorial support.

[2] This topic has been examined by a Committee on the Global Financial System (CGFS) Working Group on "Financial stability and local currency bond markets" (see BIS (2007)). This paper draws partially on material prepared for the Working Group, but all opinions expressed are our own.

vulnerabilities were often related to the difficulty faced by sovereigns and corporates in issuing debt denominated in local currency, a phenomenon known in the literature as "original sin".[3] These difficulties, for instance, often resulted in a trade-off when they financed long-term projects. Agents borrowed at long maturities in foreign currency, which led them to incur a currency mismatch if their revenues were denominated in local currency or if they financed themselves with short-term loans.[4]

From a general perspective, currency and maturity mismatches matter because they have the potential to exacerbate the impact of exogenous shocks, increase the severity of crises, and slow the post-crisis adjustment process (Goldstein and Turner (2004)). They also complicate monetary policy as they limit the degree of exchange rate movements that central banks are willing to permit (ie the "fear of floating" hypothesis), thus forcing them to intervene to prevent such movements. Furthermore, fiscal deficits may become a major drag for the economy if currency depreciations increase the cost of foreign denominated debt. Finally, they can affect the level of sovereign ratings.

Given the implications that currency and maturity mismatches have for the overall financial stability of the economy, it is reasonable to ask to what extent the development of domestic bond markets has led to a reduction of the vulnerabilities associated with currency and maturity mismatches in the region. Using available data, this section reviews some of the issues and risks relating to such mismatches in Latin America.

2.1 The evidence on currency and maturity mismatches[5]

2.1.1 Currency mismatches

There are at least three dimensions to the measurement of currency mismatches: aggregate, sectoral and microeconomic.

(a) Aggregate currency mismatch

The notion of currency mismatch refers to the impact of a change in the exchange rate on the present discounted value of future income and expenditure flows (see Goldstein and Turner (2004)). Such a notion has two direct implications. The first is that all assets and liabilities must enter the calculation – not just cross-border assets and liabilities. The denomination of contracts between residents in foreign currencies matters because a sharp change in the exchange rate can disrupt such contracts, which can have real economic effects. Foreign currency debts between residents may "cancel out" in normal times but do not do so in a crisis. The second implication is that the currency denomination of income flows is as important as the currency denomination of balance sheet variables: foreign currency borrowing to finance the production of tradables is one thing, to finance non-tradables quite another.

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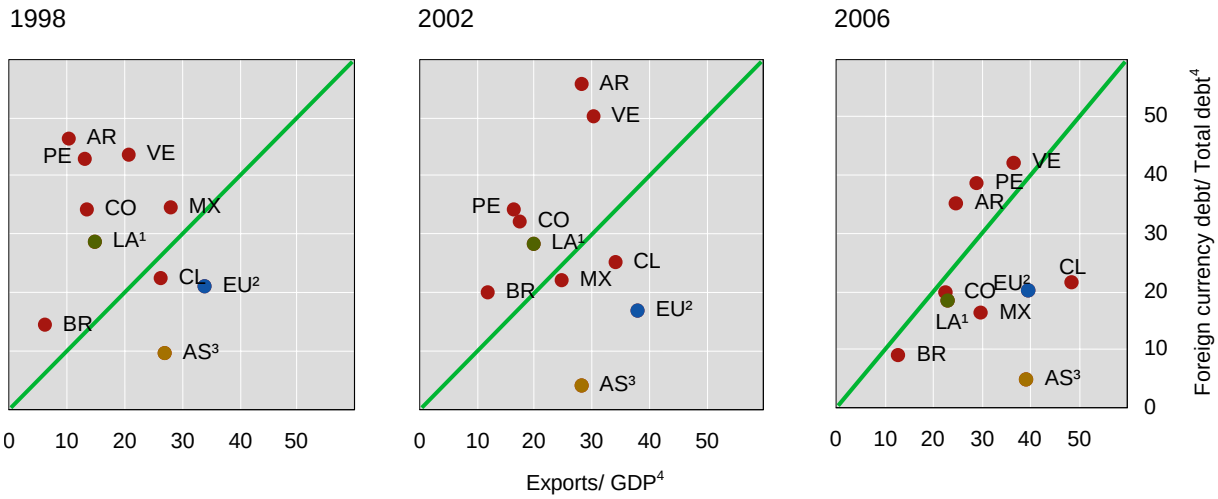
[3] For an overview of "original sin", see Eichengreen and Hausmann (2005) and Goldstein and Turner (2004).

[4] Due to the lack of appropriately developed bond markets, certain market segments, long-term credit in particular, simply will not exist in local currency. Of course, an alternative is to use inflation indexation for the development of such markets.

[5] It is worth noting that most simple stand-alone measures of balance sheet mismatches do not provide an accurate assessment of the associated risks (IMF (2005)). The reasons are that, first, such indicators might not take into account the interaction between interest rate and exchange rate risk. Second, none of the measures give an indication as to which balance sheet mismatches contribute to the deterioration or improvement of the financial health of the corporate sector. Finally, the use of pre-crisis levels for the relevant indicators as "critical levels" may not always be appropriate.

Figure 1

Currency mismatches



[1] Latin America; weighted average of Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela based on 2000 GDP and PPP exchange rates. [2] Emerging Europe; weighted average of Czech Republic, Hungary, Russia and Turkey based on 2000 GDP and PPP exchange rates. [3] Emerging Asia; weighted average of China, India, Indonesia, Korea, Malaysia, Philippines and Thailand based on 2000 GDP and PPP exchange rates. [4] In per cent.

Source: BIS calculations.

A key indicator of currency mismatch is the ratio between the currency denomination of debt and the share of traded goods in GDP. Simply stated, countries with high export/GDP ratios can sustain a higher share of foreign currency in total debt. If this ratio is greater than one – more foreign currency debt than foreign currency earnings to finance – then the country is experiencing a mismatch. How large a problem this is depends on a country's net foreign currency position; a large net liability position compounds the difficulty. Figure 1 plots the basic components behind the measure of currency mismatch just described. In 1997, the mismatch ratio was well over one in all the largest countries in the region except Chile. This is clearly captured by the average position for Latin American countries, which stands over the 45º line in Figure 1. By 2006, most countries in the region had clearly moved away from such a vulnerable situation, as reflected by their positions below the 45º line. In fact, Brazil, Chile, Colombia and Mexico (the countries with the most developed local currency bond markets) are now, according to this indicator, in a balanced currency position. At the same time, net liability positions in foreign currency have fallen as foreign exchange reserves have been built up, thus lowering aggregate mismatches.

(b) Sectoral currency mismatches

Assessing the extent of currency mismatches at the sectoral level is important because it may reveal vulnerabilities that are submerged within the country aggregates.[6] Data for the government sector are generally good.[7] These show that governments in the region have made much progress in reducing their exposure to external debt. For instance, the Mexican

[6] See Rosenberg et al (2005) and Goldstein and Turner (2004) for an analysis of currency mismatches at the sectoral level. In particular, the second study incorporates an estimate of foreign currency denomination of all debt. At the country level, Lima et al (2006) carry out a detailed analysis of sectoral balance sheet mismatches and vulnerabilities for the Colombian economy. Rosenberg et al (2005) also have applications for Argentina and Brazil.

[7] The IMF has assembled a new database for government debt. See Jeanne and Guscina (forthcoming).

government has made an explicit effort to reduce the country's external debt exposure by shifting the financing of its deficits to the domestic market. In fact, since 2001 the entire fiscal deficit has been financed domestically. The Mexican government has also conducted a number of buyback operations in the international market and repaid debt to the Inter-American Development Bank (IDB) and World Bank. As a result, the domestic component of its narrow public sector debt rose to 65% in 2004 compared with 30% at the end of 1995 (Jeanneau and Pérez Verdia (2005)). In Brazil, the government has endeavoured to phase out dollar-linked debt (see Amante et al (2007)).

Table 1

Currency denomination of bank balance sheets

Percentage denominated in foreign currency

	Assets			Liabilities			Dollarisation ratio[1]		
	1993	2000	2005	1993	2000	2005	1997–2001	2005	2006
Argentina		69.8	20.6		69.1	17.6	63.2	11.8	12.7
Chile	19.7	14.4	18.9	20.6	12.9	17.8	8.2	12.6	NA
Colombia[2]	13.0	8.1	6.5	11.1	10.0	5.4	0	0	0
Mexico	26.7	16.1	9.8	28.2	15.6	9.8	6.9	3.4	3.6
Peru		74.0	66.0		76.0[3]	66.0[3]	75.5	64.3	59.6
Venezuela	12.2	8.1	5.7	3.5	2.2	1.2	0.14	0.2	0.2

[1] As a percentage of total deposits in the domestic banking system. [2] With restricted exemptions, legislation prohibits foreign currency deposits. [3] Excludes capital.

Sources: National data (questionnaire); Moody's; IMF; BIS statistics.

Moreover, across the region such efforts are reflected by explicit actions: Argentina repaid its debt to the IMF, Brazil and Venezuela bought back their Brady bonds, Colombia bought back several external issues and Peru reduced its debt with the Paris Club and has issued domestic debt to replace external debt. As a result, the share of international debt in total government liabilities has declined across the region.

Data on the currency denomination of banking system assets and liabilities are also generally readily available – at least for the supervisory authorities. Table 1 presents the currency denomination of bank balance sheets as well as the ratio of dollarisation (ie the ratio of foreign deposits as a percentage of total deposits) in the domestic banking system. In general, the data show a significant improvement. In particular, it is noteworthy that dollarisation in Peru has declined, although it remains high.[8]

Data on the balance sheet structure of the non-financial corporate sector are sketchier. However, some authors have attempted to use partial indicators. One piece of evidence on corporate asset and liability dollarisation during the last decade is presented in Figure 2. As shown, liability dollarisation remains high in most Latin American countries, while asset dollarisation is low.[9] This asymmetry between asset and liability dollarisation indicates that

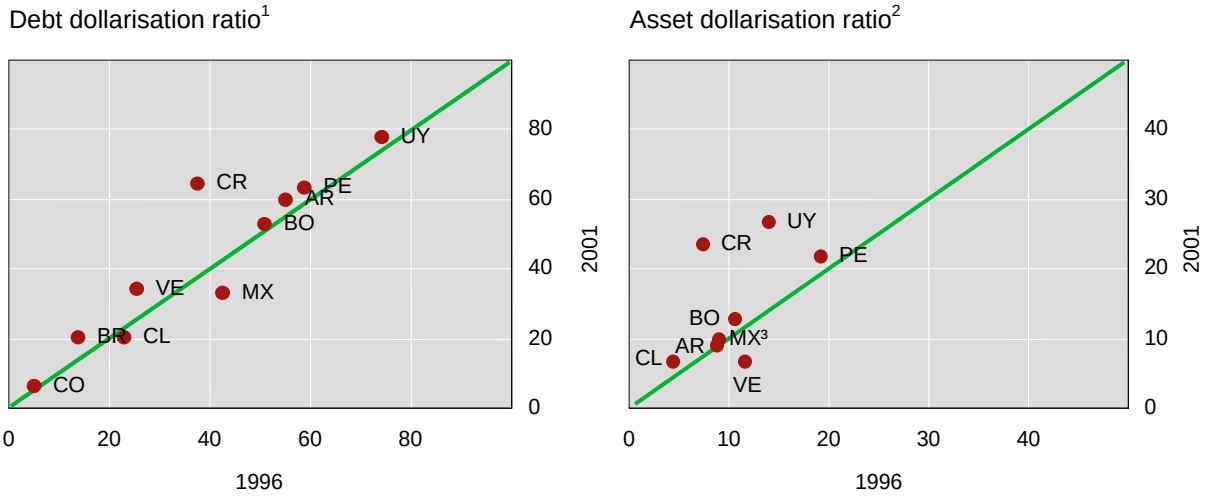
[8] In Brazil and Colombia foreign currency deposits are forbidden by law.

[9] However, this indicator is incomplete because it ignores the currency of denomination of income flows.

currency mismatches in the corporate sector may still be a source of vulnerability. The figures also reveal that debt dollarisation has experienced a very modest improvement over the period. Lima et al (2006) further support this finding. Their study finds that the Colombian corporate sector's net financial position did not change much between 1998 (just before a severe crisis in that country) and 2003. They show that although vulnerabilities have receded, large and medium-size companies still have short positions in dollars.

Figure 2

Corporate balance sheet dollarisation



[1] Dollar-linked debt as a percentage of total liabilities. [2] Dollar-linked assets as a percentage of total assets. [3] Data for 2000.

Source: Kamil (2004).

(c) Micro currency mismatches

It is also essential to look at the situation of individual firms. Are firms able to hedge their "natural" mismatches? Foreign borrowing can naturally be hedged by an exporting firm but not by a firm producing non-tradables. Several studies have tried different ways to answer this question. Table 2 (drawing on IMF (2005)) shows further evidence on currency mismatches at the corporate level. The information is disaggregated into two groups of firms. One is the group of firms that have issued foreign currency-denominated debt in international capital markets, ie what the study calls "participants". The other group has not issued foreign currency debt and is therefore simply termed "non-participants". The information reveals the following features.

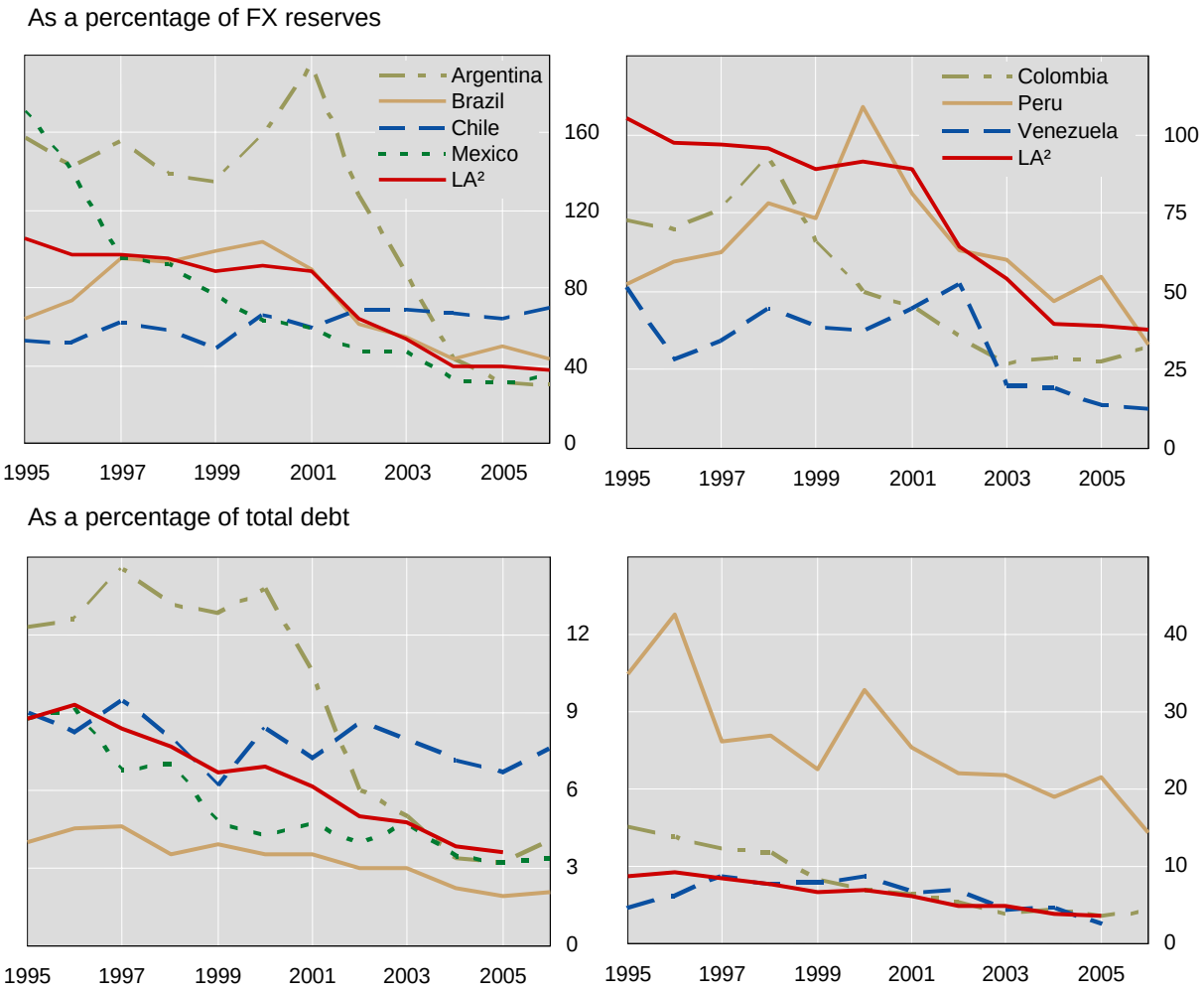
First, the ratio of foreign currency debt to total debt is higher in Latin America than in other regions of the globe. However, the reliance on short-term debt appears to be lower, both for market participants and for non-participants. Second, the ratio for foreign currency and short-term debt is far from homogeneous across the region. In particular, the corporate sectors of Argentina, Chile and Colombia appear to rely heavily on foreign currency debt. Third, non-participants are more dependent on short-term financing than market participants. This mainly reflects the fact that firms that do not borrow from international capital markets are more likely to rely on bank loans and local currency bonds of shorter maturities.

Several other studies attempt to relate reliance on foreign currency debt to the activities of the firm. For instance, Bleakey and Cowan (2005) examined 400 non-financial firms in five Latin American countries and found that firms producing tradables had a higher share of foreign currency debt – a natural hedge. Using a large sample of firms listed on the Mexican stock exchange, Martinez and Werner (2002a) report that firm size was the main determinant of dollar debt during the fixed rate period but that exports became the key explanatory

variable during the floating rate period, as the composition of foreign currency debt shifted toward borrowers better able to service that debt. This finding is echoed by Cowan et al (2005). They find that the net currency exposure of Chilean firms declined after the exchange rate was floated in 1999. They argue that a "flexible exchange rate increases the risk of dollar debt, inclining the balance in favour of peso debt".

Figure 3

Short-term external debt[1]



[1] Short-term liabilities (with maturity of less than one year) of BIS reporting banks. [2] Weighted average of Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela based on 2000 GDP and PPP exchange rates.

Sources: IMF; BIS.

2.1.2 Maturity mismatches

Another important source of vulnerability is that associated with maturity mismatches and rollover risks. One of the difficulties in assessing such vulnerability is that there is not much information on the maturity structure of domestic debt. The only information on maturity structure that is readily available relates to external debt.

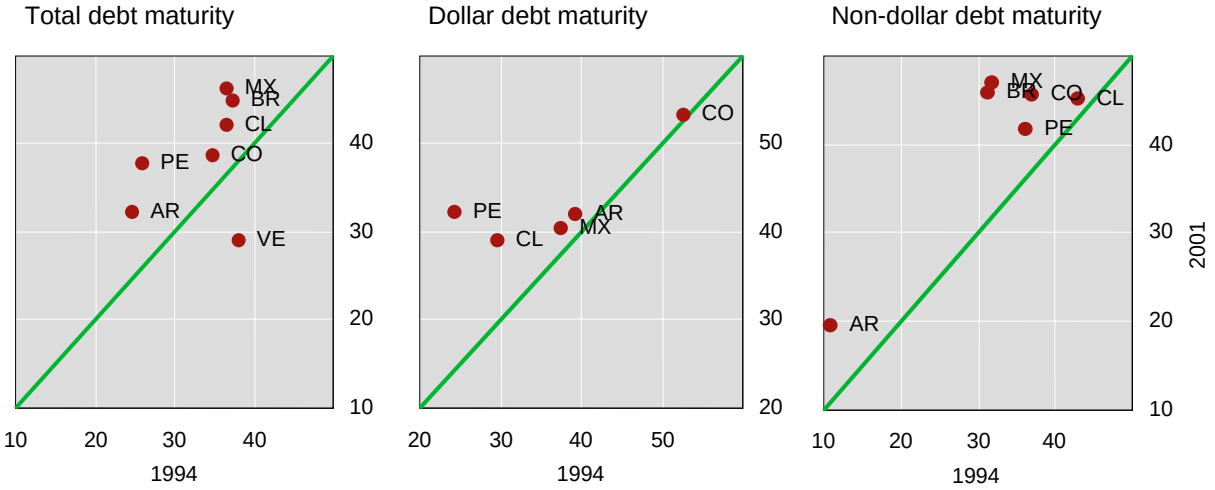
At the aggregate level, a crude way of assessing this is through the use of short-term external debt, in particular the ratio of short-term external debt to international reserves and the level of short term external debt to total debt. As is well known, such ratios are considered good predictors of financial crises. Figure 3 displays the evolution of these ratios since 1995. The ratio of short-term debt to international reserves shows a marked

improvement over the period, notwithstanding a deterioration in some cases between 1995 and early 2000s. Also, in most cases it is possible to see a consistent decline in the share of short-term debt as a percentage of total external debt. However, the ratio remains high for Peru.

Maturity mismatches also need to be assessed at the sectoral level. As is discussed in the accompanying article in this volume, "Latin America's local currency bond markets: an overview", governments in the region have made substantial efforts to reduce the extent of maturity mismatches by issuing debt at longer maturities. As an illustration, the Brazilian government's debt management policy has explicitly aimed to reduce refinancing risk by reducing the share of federal debt maturing within 12 months (Amante el al (2007)).

Figure 4

Corporate debt maturity composition[1]



[1] Calculated as the ratio between long-term liabilities (assets) and total liabilities (assets), in per cent.

Source: Kamil (2004).

Figure 4 gives an overview of maturity mismatches within the corporate sector between 1994 and 2002 as reported by Kamil (2004).[10] Each panel in the figure displays the share of long-term liabilities to total liabilities, the share of long-term dollar-denominated liabilities to total dollar liabilities and the share of long-term non-dollar liabilities to total non-dollar liabilities, respectively. The evidence suggests that there has been some progress in improving the maturity structure of corporate debt, independently of its currency composition.[11] As the first panel shows, only Venezuela appears to have seen a worsening in the maturity of its corporate debt.

[10] Unfortunately, the data are outdated. In particular, 2002 is not the best year to make an assessment given the impact of the financial turmoil in Brazil.

[11] Using 2002 as an end year may bias the diagnostic. Using more recent data would probably show an improvement in the corporate sector's maturity composition. However, more recent data at this level of disaggregation are unavailable. Martinez and Werner (2002b) report that in Mexico the number of firms issuing three-year or longer maturity debt with fixed rate in pesos or UDIs increased from eight firms before 1999 to 23 in 2002. It was not until 2000 (after 20 years) that a Mexican company was able to issue fixed-rate peso debt longer than three years.

Table 2

Corporate debt structures, 1990–2003[1, 2]

	Short-term debt as % of total debt		FX debt as % of total debt	Current ratio[3]		Quick ratio[4]	
	Market participant	Non-participant	Market participant	Market participant	Non-participant	Market participant	Non-participant
Argentina	43.1	60.7	51.4	0.8	1.6	0.6	1.1
Brazil	23.5	47.9	11.1	1.2	1.3	1.0	1.0
Chile	21.8	32.8	34.9	1.4	2.5	1.0	1.9
Colombia[2]	31.3	43.6	53.9	1.9	1.6	1.4	1.0
Mexico	27.4	35.1	16.5	1.4	2.2	1.0	1.5
Memo:							
Latin America	*29.4*	*44.0*	*33.6*	*1.3*	*1.9*	*1.0*	*1.3*
Asia	*39.1*	*51.3*	*23.0*	*1.2*	*1.5*	*0.8*	*1.1*
Emerging Europe	*38.5*	*59.9*	*20.4*	*1.3*	*2.1*	*0.9*	*1.4*
All emerging markets	*35.7*	*51.7*	*25.7*	*1.3*	*1.8*	*0.9*	*1.3*

[1] Individual country ratios are value weighted (by firm's total assets). Regional ratios are equal-weighted averages of country ratios. [2] "Participants" refers to firms that have issued foreign currency denominated debt in international capital markets. For Colombia the size of market participants is less than 10. [3] Ratio of current assets to current liabilities. [4] This is a more conservative measure of liquidity that differs from the current ratio only in that the numerator is reduced by the value of inventories.

Source: IMF (2005).

Table 2 presents additional evidence to gauge corporate liquidity: current and quick ratios. Low liquidity ratios suggest that a company may not be able to convert its current assets into cash in order to meet maturing obligations. This inability may force the company to roll over its debt to avoid insolvency, which could be problematic if lenders sense that the firm is facing difficulties and withdraw their support. The evidence reported indicates that the ratios for Latin America tend to be higher than in other regions of the world. Evidence also shows that "market participants" have lower ratios and, as a result, appear to be more exposed to maturity mismatches. Overall, the evidence suggests that currency and maturity mismatches have been reduced over the last decade. However, this process has been driven largely by the public sector. Little progress seems to have been made by the corporate sector.

3. Risk structure of local debt markets

The wider availability of financial structures and their different risk profiles is making the intermediation process more complex. This situation can potentially lead to new risks, both for financial market participants and the financial system as a whole. This section analyses the financial stability implications associated with the structure of local debt markets. In particular, it reviews the risks associated with the issuance and holding of different debt instruments and the manner in which agents operating in the market, either issuing entities or investors, can affect financial stability.

3.1 Risk characteristics of financial instruments

The differentiating characteristics of domestic debt instruments include the type of borrower and the borrower's default risk, the type of contractual return and the length of time to maturity. Finer distinctions can be drawn with respect to call and put provisions, tax status and clearing arrangements. An additional consideration is market liquidity, which depends as much on the inherent characteristics of issues as on the stock of securities outstanding. This sub-section reviews the characteristics of the most common securities.

3.1.1 Dollar-linked debt

Several countries in the region first attempted to develop their local bond markets by issuing dollar-indexed debt. This often appeared to be the only cost-effective or practical means of rolling over domestic debt given the high level of domestic short-term interest rates. However, the heavy reliance on such debt led in some cases to severe difficulties, as illustrated by the Mexican tequila crisis of late 1994 and the Brazilian crisis of 2001.

In Mexico the problem arose when, in 1994, investors became increasingly reluctant to roll over their short-term peso-denominated cetes and instead shifted their funds to short-term dollar-indexed tesobonos (Agénor and Montiel (1999)). This shift to dollar-indexed liabilities provided a temporary respite for the government but the short-term nature of outstanding securities also meant that the transformation in the structure of debt towards tesobonos was extremely rapid. The sudden withdrawal of foreign investment from the domestic market at the end of 1994 and the ensuing sharp drop in the Mexican peso resulted in an explosive growth in the peso value of dollar-indexed government liabilities, thereby adding a fiscal dimension to the external crisis.

A similar phenomenon occurred in Brazil, where local currency debt issuance became prohibitively expensive after the sharp depreciation of the real between the end of 2000 and September 2001. Concerns by investors that the currency could weaken further increased the demand for currency hedges, which led the government to resume large-scale sales of dollar-linked notes after earlier efforts had been made to reduce such indexed securities. Believing that the exchange rate was significantly undervalued, the authorities also saw the issuance of dollar-linked notes as a means of reducing the domestic cost of debt financing since any increase in the dollar value of the real would have led to valuation gains. In retrospect, with the recovery in the real, dollar-linked financing turned out to be cheaper than financing in reais, thus allowing the authorities to economise on financing. However, there would have been significant costs had the government's expectations proven wrong (Goldstein and Turner (2004)).

3.1.2 Short-term interest and Inflation-linked debt

The risks of dollar-linked borrowing have encouraged governments in the region to shift to securities indexed to domestic economic variables, such as short-term interest rates or inflation. Short-term or longer-term debt indexed to short-term rates protects investors' capital in the event that interest rates rise, but also leaves public accounts exposed to significant volatility in interest rate payments. This was the case in Colombia in 1998 and 2002. During the second half of 1998, the cost of government financing skyrocketed. The auction rate for government papers (Títulos de Tesorería, or TES) reached 35%, compared with 23.6% at the beginning of the year. A similar problem was experienced during 2002, leading to what was called the "mini" TES crisis. During this period the government was unable to tap the market for several months due to the high cost of financing.[12] Attempts to

[12] In fact, at the time, the government had to suspend several auctions due to the high cost of financing.

counter downward pressures on exchange rates have had a similar effect, which has been particularly true under fixed exchange rate regimes, with interest rates often having to respond sharply to maintain the currency peg.

Governments in the region have also sought greater recourse to inflation-linked debt.[13] Inflation-linked securities are widely available across the region, with Chile having a long-standing market for such securities (Herrera and Valdes (2004)). Such instruments have been viewed as a means of developing local financial markets, particularly in countries that have lacked fiscal and monetary credibility.[14] For governments, an advantage of such securities is that they allow for a sharing of the inflation risk with investors. However, the indexation of securities to inflation can have a negative impact on public accounts in the event of an upsurge in inflation (although less so than indexation to short-term rates, which tend to be more volatile). Under such a scenario, higher real adjustments in expenditure and revenue will be required in the longer-term (Holand and Mulder (2005)). Moreover, by providing a hedge against inflation, such securities can weaken economic agents' incentives to achieve price stability.[15] They can also create operational difficulties in the conduct of monetary policy. Despite their drawbacks, these securities are attractive to domestic investors requiring long-term inflation-protected securities, such as pension funds. For this reason, they are likely to remain in use for the structuring of well diversified portfolios.

3.1.3 Fixed rate debt

The progress made in controlling inflation has allowed governments in the region to gradually develop their markets for fixed-rate debt. The growing issuance of fixed-rate securities has reduced domestic refinancing risks, at least as far as the yield curve extends, and has helped in reducing currency mismatches. It has also provided countries with insurance against negative supply shocks that are combined with a rise in inflation (Holand and Mulder (2005)).[16] However, fixed rate debt is not free of problems. The obvious drawback is that the issuer foregoes the ability to benefit rapidly from lower market rates should they eventually decline. This is less of a problem nowadays because debt managers have a variety of means at their disposal to reverse their exposures, such as call options and interest rate swaps. One potential danger for the financial system is that the availability of longer-duration liabilities leaves market participants exposed to greater price risk in the event of a sharp change in interest rates.

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[13] Foreign currency denominated debt may be more cost effective than inflation-indexed debt under some circumstances. However, in general, inflation-indexed debt would have more favourable risk characteristics given that countries have better control of their inflation rates than their real exchange rates (Holand and Mulder (2005)).

[14] For instance, Mexico introduced Udibonos in 1996 as a way of extending the maturity of its debt, lowering its funding costs and diversifying its public financing instruments (Holand and Mulder (2005)). Walker (2002) shows that these instruments have fostered the development of deeper capital markets in Chile. He argues that the successful acceptance of these instruments is because the unidades de fomento (inflation indexing units) are produced by an independent entity, are legally accepted as a valid alternative currency and enjoy a tax treatment that is consistent with indexation in the economy. More recently, Argentina actively issued inflation-linked bonds.

[15] Although it could also be argued that for fiscal reasons indexation could increase the authorities' determination to ensure a climate of low inflation.

[16] These are shocks that force a joint decline in output and government revenues. It should be noted that fixed rate debt would be superior to inflation-indexed debt in such a case since the government could inflate away the real cost of debt servicing.

3.1.4 Corporate debt

As noted in the accompanying chapter in this volume on the development of local currency bond markets, corporate debt markets have expanded in recent years. The market risks associated with the holding of corporate debt are identical to those for risk-free securities, but credit risk is an additional concern. Credit risk, which is reflected in a spread over risk-free securities, can be highly volatile, particularly when unexpected corporate events occur. The development of corporate debt markets requires adequate infrastructure to deal with asymmetric information problems and other capital market imperfections. The lack of appropriate corporate governance, transparency and economy-wide credit assessment capabilities may hide balance sheet weaknesses, potentially leaving investors exposed to corporate distress with systemic implications.

3.1.5 Asset-backed securities

In addition to these more "traditional instruments", the region is now starting to rely on new structures, such as asset-backed securities (ABSs).[17] The creation of such securities involves the packaging of a pool of illiquid assets into marketable securities that are more liquid and safer from a stability point of view. A key requirement for the development of securitisation is that, in the event of a default by the original lenders, the securitised assets are protected from the creditors of the defaulting parties. This scenario of course requires appropriate legal frameworks.

The development of ABSs has helped improve the efficiency and completeness of financial markets in some of the largest industrial countries, and is now rapidly expanding in Latin America. The diversified nature of underlying portfolios and the use of a variety of techniques to mitigate credit risk, such as over-collateralisation and third-party credit enhancements, have resulted in the creation of a new class of highly rated securities. Asset-backed securities can be particularly useful to banks, providing them with greater flexibility in the management of their balance sheets and capital resources. In particular, by allowing creditors to take assets off the balance sheet, they free up lending lines and enable banks to have access to lower funding. Therefore, structured financing may help reduce risk exposure and add value and liquidity to the loan book.

However, such securities create important challenges. For instance, the limited availability of good historical data for household finance products may lead to greater uncertainty about the credit risk that investors are really holding. In fact, the capacity of forecasting agents to pay may be particularly difficult in a rapidly evolving macroeconomic environment, which is often characteristic of the Latin American economies.

Another important concern is the reliance on domestic credit rating agencies in the structured finance markets. In the early stages of the development of these markets, the structuring of new issues is relatively easy, as they involve homogeneous assets such as residential mortgages for which default probabilities are easily calculated via the law of large numbers. As markets develop, less homogeneous assets are securitised. These are more sophisticated in terms of legal structure and in the type of assets used, which implies that rating agencies become more closely involved in structuring and issuing, and they therefore may create potential conflicts of interest that are different from those in the traditional business. In particular, rather than just giving opinions about companies and sovereigns, the ratings of structured finance products are to a large extent based on methodologies and, to a lesser extent, on expectations regarding legal aspects and government behaviour during

[17] See Scatigna and Tovar (2007) for an overview of securitisation in Latin America and Gyntelberg et al (2007) for a comparative analysis of securitisation in Asia and Latin America.

periods of financial distress. Equally important, reliance on rating agencies may delay the development of better accounting standards and disclosure rules.

In addition, prepayment risk on fixed rate mortgages may be a new concern. In some countries, mortgage borrowers can prepay their mortgages at any time. In an environment of declining mortgage rates, this can become a problem for holders of those securities because the resulting acceleration in prepayments forces the issuers to call their securities. As investors face a shortening in the duration of their portfolios, they attempt to return to their target duration by replacing the called securities with newly issued mortgages, standard fixed income securities or long positions in government bond futures. In turn, these actions create upward pressures on the price of fixed income securities and, consequently, further downward pressures on interest rates. Such a destabilising spiral of events can lead to increased market volatility, as occurred in the United States in the early 2000s and in Chile during 2004.

3.1.6 Derivatives

Derivatives markets are increasingly active in some of the larger countries in the region, such as in Brazil and Mexico. Derivatives are leveraged instruments and, as such, are a highly cost-effective means of adjusting risk exposures (see Euro-currency Standing Committee (1994)). They allow the unbundling of various kinds of price risks embodied in underlying assets, facilitate the transfer of risk to those more capable of bearing and managing them and permit the establishment of investment and arbitrage strategies that straddle various market segments. In the light of these considerations, they are likely to improve market efficiency. Under normal conditions, they seem likely to have a stabilising influence on underlying markets. During periods of stress, however, they may exacerbate short-run price volatility, which can result from the feedback effects of dynamic hedging, margin and collateral calls or a drying up of market liquidity. Regulators in some countries in the region have been concerned about the potential risks involved in the use of such instruments and their ability to supervise their usage, which may have retarded their development. Of course, the lack of hedging instruments or their development offshore can by itself be a source of risk.

3.1.7 Other indexed instruments

Lastly, some countries have issued bonds in the international market place with returns that vary directly with some index of economic performance, such as economic growth or export revenues. Such securities give foreign investors an opportunity to share in the economy's potential growth, while enabling the issuing country to ensure itself against a potential slowdown or debt servicing difficulties. A caveat with such structures is that their prices are likely to be more closely correlated with those of equity markets than with standard fixed income securities, and thus offer investors fewer diversification benefits. Some have also argued that the issuance of such securities would amount to taxing economic growth since any improvement in activity would have to be shared with foreign investors.

3.2 Risk associated with the type of issuer

An important question to address is the extent to which an issuing entity may affect financial stability. Governments in the region are the largest issuers of domestic debt. There are some advantages to a strong presence of governments in domestic debt markets. For instance, governments tend to play a key role in the development of liquid debt markets through the creation of risk-free yield curves, which are used as benchmarks for private sector issuance. However, excessive reliance on government issues in the domestic market has several disadvantages, which may have implications for financial stability. To what extent is this concentration of issuance a risk?

A well known problem with government issuance is the impact that it has on local interest rates and credit risk. Heavy government issuance can create upward pressure on the domestic yield curve, which forces the corporate sector to pay higher market rates for its financing, with possible negative implications for the financial situation of heavily indebted firms. Another implication is that strong government borrowing can crowd out the private sector and impede its development. It can also drive corporates to borrow abroad and therefore magnify any existing currency mismatches.[18]

A high degree of exposure of the financial system to government securities can also create problems. A good example of this is the exposure of the Colombian financial system to government securities (ie TESs). Vargas (2006) warns of the trade-off that such exposure creates between inflation, interest rate and foreign exchange risk. More precisely, a dilemma arises when there is a shock to the capital account that forces a depreciation of the currency and a decline of value of government securities. If the depreciation is sufficiently pronounced or if the pass-through is large, the central bank may be forced to increase interest rates to maintain its inflation target. This, in turn, would lead to a decline in the price of government securities. However, if the banking system's capital is too low to absorb those losses, the central bank may be constrained in raising interest rates due to financial stability considerations, and hence the risk of higher inflation may arise. Stress tests for Colombia show that a 100 bp parallel increase in the TES spot curve could result in a 17% profit decline by credit institutions in 2004, and a 2.5% fall in the value of their portfolios as of May 2005. This is a non-negligible effect given that the 2002 turmoil pushed sovereign spreads up by 400 bp.

In some economies, such as Mexico and Brazil, corporates have slowly become major issuers in local markets. This development has benefits as it allows investors to diversify their investments away from government securities. However, some concerns arise as the market develops. One is the high concentration of issuance among a few large groups of companies. An example of this is Mexico, where the corporate bond market is dominated by a small number of issuers, some of which happen to be interrelated.[19] Concentration may thus result in an effective lack of diversification for investors purchasing such securities. Another problem is the lack of secondary market liquidity of such corporate securities. In particular, investors may find themselves locked in with these securities in bear markets.

Finally, a concern for stability may arise if foreign subsidiaries issue in domestic markets without the guarantee of the parent company. In 2006 in Colombia, for example, a US$200 million fixed rate bond denominated in local currency by Comcel, a subsidiary of the Mexican América Móvil, was the first one launched without its parent organisation's guarantee.

3.3 Risk associated with the type of investor

In addition to commercial banks, institutional investors, such as pension funds, insurance companies and mutual funds, have become key players in the bond markets of the region. Moreover, the presence of foreign investors has increased.

A broad investor base is fundamental for the development of bond markets as it allows for diversification of risks and deeper markets. On the other hand, a narrow investor base can

[18] Of course, the government could avoid the crowding-out effects by issuing external debt in foreign currency. However, doing so can generate a trade-off between the short-run benefits and the long-run cost associated with an increased fiscal drag (Turner (2003)).

[19] América Móvil, Cemex, Coca-Cola, Telmex, Bimbo, Ford, Grupo Carso and IMSA have a share of approximately half of the outstanding corporate bond market in Mexico. América Móvil, Telmex, and Grupo Carso all belong to Carlos Slim.

be a concern. Chilean private pension funds are often used as an example of this problem. Pension funds have been the main driver in the development of Chilean capital markets since their inception in 1981. They are considered to have contributed to financial stability during periods of stress, such as when other investors pulled out of the country in the late 1990s (Cifuentes et al (2002)). However, an important drawback is that pension funds have become a virtual monopsony. Given that they are also subject to rules limiting their investments in non-investment grade paper, they could potentially undermine stability as they magnify the impact of ratings downgrades. In particular, a process of adverse selection would arise if institutional investors were obliged to sell downgraded bonds and poorer credits were forced onto banks (Turner (2003)).

Some types of investors may be an important source of liquidity risk. Good examples are hedge funds and mutual funds. As is well known, hedge funds have been directly or indirectly associated with nearly every major episode of financial market turmoil during the late 1990s (IMF (1998)).[20] The systemic risk impact of hedge funds is difficult to assess owing to the lack of publicly available information about their balance sheet and trading activities. Furthermore, any further systemic risk assessment is complicated by the diversity and the multitude of factors that may affect individual and collective hedge fund behaviour under different market conditions. Under normal market conditions, hedge funds seem to play a positive role, particularly since they bring liquidity to markets. However, they may also contribute to a build-up of invisible vulnerabilities in the financial system (Papademos (2007)). Moreover, hedge funds are highly leveraged and pose two key risks for financial stability (Tsatsaronis (2000)). The first one arises when a hedge fund amasses sufficient long positions as to influence specific asset prices or tactically exploit its influence on other participants' behaviour to tilt the market in its favour. A second risk is associated with large and concentrated positions during liquidity or solvency crises. In this case, the functioning of the market in which the hedge fund was active is disrupted. The institutions that helped finance these positions may also experience serious losses. Depending on the nature of exposures and prevailing market conditions, these dynamics can have systemic implications. As a result, the possible simultaneous exit of hedge funds could have an adverse impact on market liquidity and volatility.

Whether domestic investors are a more stable source of financing than foreign investors is another aspect of concern. Owing to an assumed information disadvantage and their "footloose" nature, foreign investors have long been considered to have a destabilising influence on emerging markets. In contrast, Turner (2003) argues that foreign investors play a key role in spreading risk in local currency bond markets (in the same way that foreign debt did in the past).

In addition, foreign investors have recently been a source of long-term financing, clearly illustrated by the 20-year global sovereign Brazilian real-denominated bonds. Those securities were issued at a fixed rate with a maturity that exceeds the maximum for similar domestic bonds (which is 10 years). Also, about 70% percent of 20-year government bonds issued by Mexico in 2005 were held by foreigners.

The experience of Colombia also illustrates the important role of foreign investors. As mentioned earlier, the financial sector there is exposed to growing uncovered long positions

[20] Hedge funds are not easy to define. However, they are characterised by: (i) having none of the traditional restrictions on retail investments in terms of diversification and marketability of financial assets; (ii) making heavy use of derivative products or financial techniques that enable them to short-sell; (iii) making extensive use of leveraging; (iv) having substantial outperformance commissions (which increases the incentives for risk-taking) and; (v) having fund shares that are often not redeemable at any time by investors, although there are granted windows of opportunity to sell back their shares (see Prada (2007)). Nevertheless, 18 of the 20 largest financial markets for asset markets supervise the management or distribution of hedge funds.

in TESs resulting from the reduced foreign exchange exposure of the public sector. The risk associated with this exposure could be lessened by transferring some to non-residents (Vargas (2006)). Furthermore, the exposure to foreign exchange risk in the public sector could also be transferred to non-residents either by allowing foreign investors to access the market or, if regulatory frameworks are too rigid, as in the case of Colombia and (less so) Brazil, by issuing global bonds in local currency (Tovar (2005)).

In general, one can also argue that a narrow reliance on local investors limits liquidity. Recent episodes tend to confirm that local investors can bring about destabilising behaviour in certain cases. A good example of this occurred in Mexico in the spring of 2004, when the tightening of monetary conditions prompted Mexican funds to shift to shorter-duration assets. This shift would have made longer-term issuance much more difficult had it not been for increased holdings of longer-term bonds by foreign investors (see Jeanneau and Pérez Verdia (2005)).

The previous examples illustrate the advantages of expanding the investor base beyond domestic investors. Such a diversification has occurred in Latin America, particularly in countries where restrictions on foreign investment have gradually been removed (as in Brazil, Mexico and Peru).

4. Implications for risk management

The development of bond markets is inducing changes in risk management practices in Latin America, which, in turn, has implications for financial stability. Several issues emerge in this respect. First, effective risk management requires the existence of liquid and transparent financial markets. As such, a relevant question to ask is whether markets in the region meet such prerequisites. A second one is whether risk management tools and practices have evolved at a sufficiently rapid pace to follow developments in underlying financial markets. Finally, it remains an open question whether the existing infrastructure for clearing and settlement is sufficiently robust to ensure an efficient functioning of these markets.

4.1 Liquidity

Market liquidity is essential for the smooth functioning of modern financial systems. The existence of deeper and more liquid bond markets should make it easier for financial institutions to adjust their portfolios of cash market securities and related derivatives in a cost-effective way. The low level of secondary market trading in the region is a concern since active markets are an essential prerequisite for the cost-effective taking or unwinding of positions. Poor liquidity or a liquidity breakdown under stress can induce large changes in market prices and volatility.[21] In extreme situations, it can temporarily convert tradable assets into non-marketable loans, which can lead to substantial losses for market participants who rely on their ability to turn over positions quickly and at favourable prices. Liquid financial markets are also necessary for the functioning of modern risk management systems, which rely on the derivation of accurate benchmark rates for the pricing of portfolios and the smooth functioning of markets for the frequent rebalancing of positions. Until there is genuine progress on that front, financial market participants will find it difficult to hedge their positions at an acceptable price and will therefore be exposed to a fair degree of price risk.

[21] In fact, several countries in the region have already shown some vulnerability during periods of stress. Good examples are Brazil in 2001 and 2002 and Colombia in 2002, when financial turmoil led to a drying-up of market liquidity in government paper.

Market liquidity can be related to a number of factors. The size of a bond market and its individual issues is usually seen as a determinant of its depth, liquidity and resilience.[22] In the region, only Brazil and Mexico can be considered to have large enough markets. However, as shown by the bid-offer spreads (see Table 2 in accompanying article in this volume, "Latin America's local currency bond markets: an overview"), smaller countries should also be able to develop liquid markets. For instance, Colombia has managed to develop a relatively liquid market despite the relatively small size of its government bond market.

What is more, the type of securities traded in a market can have a bearing on market liquidity. In general, indexed securities tend to be held until maturity and are therefore less actively traded and liquid than money market instruments or straight fixed rate bonds. This is illustrated by the wider bid-ask spread for inflation-linked securities. The availability of a wide array of instruments can also prevent the build-up of a sufficiently large stock of homogeneous securities for active trading. In Brazil, for example, there have been various types of inflation-indexed securities (see Amante et al (2007)), while in Mexico fixed rate securities used to be issued by a number of public sector borrowers. A consolidation in the offering of government securities, in terms of either the instruments themselves or their issuing entities, would probably do much to improve liquidity.[23] In particular, a policy of consolidation by the government or the central bank – ie buying back illiquid issues and selling popular ones – could make the yield curve much smoother and thus provide a better benchmark.

Equally important is the breadth of the investor base. The shift to privately funded pension systems in the region has boosted institutional demand for local securities, but the investor base remains narrow. For instance, except in Brazil, the mutual fund industry is underdeveloped, insurance companies tend to be small, and the local hedge fund industry is practically non-existent. In some countries, such as Chile, pension funds have created a virtual monopsony in securities markets.

Furthermore, foreign investors still have a limited presence in most domestic markets owing to the prevalence of capital controls, which remain in place in Argentina, Brazil, Colombia and Venezuela. Trading is also limited by various regulatory restrictions or taxes on interest rate payments, capital gains or transactions.[24] The strong international demand for global issues in local currencies launched by Brazil and Colombia clearly captured the preference of investors for securities that are not affected by such impediments (Tovar (2005)). In Mexico,

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[22] Borensztein et al (2006) analyse the determinants of local bond markets in a broad cross-section of countries, with a special emphasis on emerging markets. These authors find that country size is significantly correlated with the size of bond markets (scaled by GDP). In their regressions, they also control for non-linear effects of GDP, GDP per capita, the exchange rate regime in place, the level and volatility of interest rates, the amount of domestic credit provided by the banking sector, banking spreads, capital controls, the size of public debt, years since the beginning of privatisation processes, measures of institutions and corporate governance and regional dummies. They find that a limited number of observable policy and country characteristics explain 70% of the difference between bond market capitalisation between Latin America and Asia. The only policy variables that seem to play a significant role for macroeconomic stability (proxied by the volatility of the exchange rate) are openness, investor protection and the cost of enforcing a contract. However, these factors can account for only a quarter of the difference between Latin America and industrial countries.

[23] Turner (2003) also argues that defining issues in a common maturity date (eg 30 June 2008) is preferable than in terms of a common maturity period (eg five-year paper with the maturity defined as five years from the issuance date). Such a strategy allows paper with an identical date of maturity to be issued for prolonged periods, thus simplifying pricing enormously.

[24] In Brazil, foreign investors must register their purchases of securities with the Brazilian securities regulator and the central bank and nominate a legal representative who is required to monitor the fiscal status of their transactions. In addition, they are subject to at least two transaction taxes (an additional 15% withholding tax on capital gains was removed in February 2006). In Colombia, foreign investors can only purchase domestic securities through an investment trust, and a withholding tax varying with the maturity of the securities is levied.

the recent vibrancy of domestic markets has been partly related to the unfettered access by foreign investors to the domestic bond market.

Improvements in liquidity should help the markets become more resilient (ie better able to cope with shocks). However, assessing their resilience is a difficult task. One way to approach this issue is to track the volatility of local currency bond returns. According to Figure 5, there is no broad evidence of regional improvement, although there does appear to be some progress in Chile and Mexico. Moreover, recent episodes offer conflicting evidence. While the May–June 2006 and August–September 2007 adjustment reminds us that these economies are vulnerable to sudden shifts in market sentiment, the February 2007 episode had minor effects. In fact, during this episode trading volumes in Brazil and Mexico reached record highs without major changes in prices. Overall, this evidence needs to be taken with caution as it is difficult to disentangle in some cases whether the secular decline in the volatility of local currency returns is exclusively associated with an improvement in the underlying market liquidity or whether, on the contrary, it was more the result of the favourable global and local conditions.

Overall, improving the liquidity in domestic securities markets remains a major challenge for the region. In this respect, it appears that sensible policy measures should aim at consolidating public sector debt under the same obligor, creating a limited number of benchmarks, allowing short-selling,[25] developing repo markets, removing regulatory restrictions and tax provisions inhibiting active trading, standardising legal frameworks and settlement systems and, finally, broadening the investor base. In this last case, a different option would be to issue global bonds in local currency, to encourage entry of foreign investors or possibly to develop a regional bond fund.

4.2 Risk management

The shift to capital market financing means that financial intermediation is increasingly conducted at competitively determined rates, which is exposing intermediaries to greater market risk than in the past. This exposure is magnified by the rising share of securities holdings and derivatives positions in the portfolios of bank and non-bank intermediaries. Moreover, the greater variety of financial products is exposing financial market participants to new types of risks, such as credit risk in the case of corporate securities and refinancing risk in the case of mortgage-backed securities.

The need to deal with such new sources of risk has obliged financial institutions to upgrade their risk management systems.[26] It has also led supervisors to shift from static rules-based approaches to more quantitative and risk-sensitive approaches. Such risk-sensitive methods rely on integrated internal risk management systems for ensuring the safety and soundness of individual financial institutions. In that context, the state of risk management in Latin America appears to be heterogeneous and depends in part on the degree of development of local financial systems. Countries where foreign bank penetration has increased the most, such as Mexico and Chile, appear to have benefited from a transfer of advanced systems. However, even in those countries, weaknesses in the local financial infrastructure and markets may have prevented the wholesale implementation or functioning of those systems.

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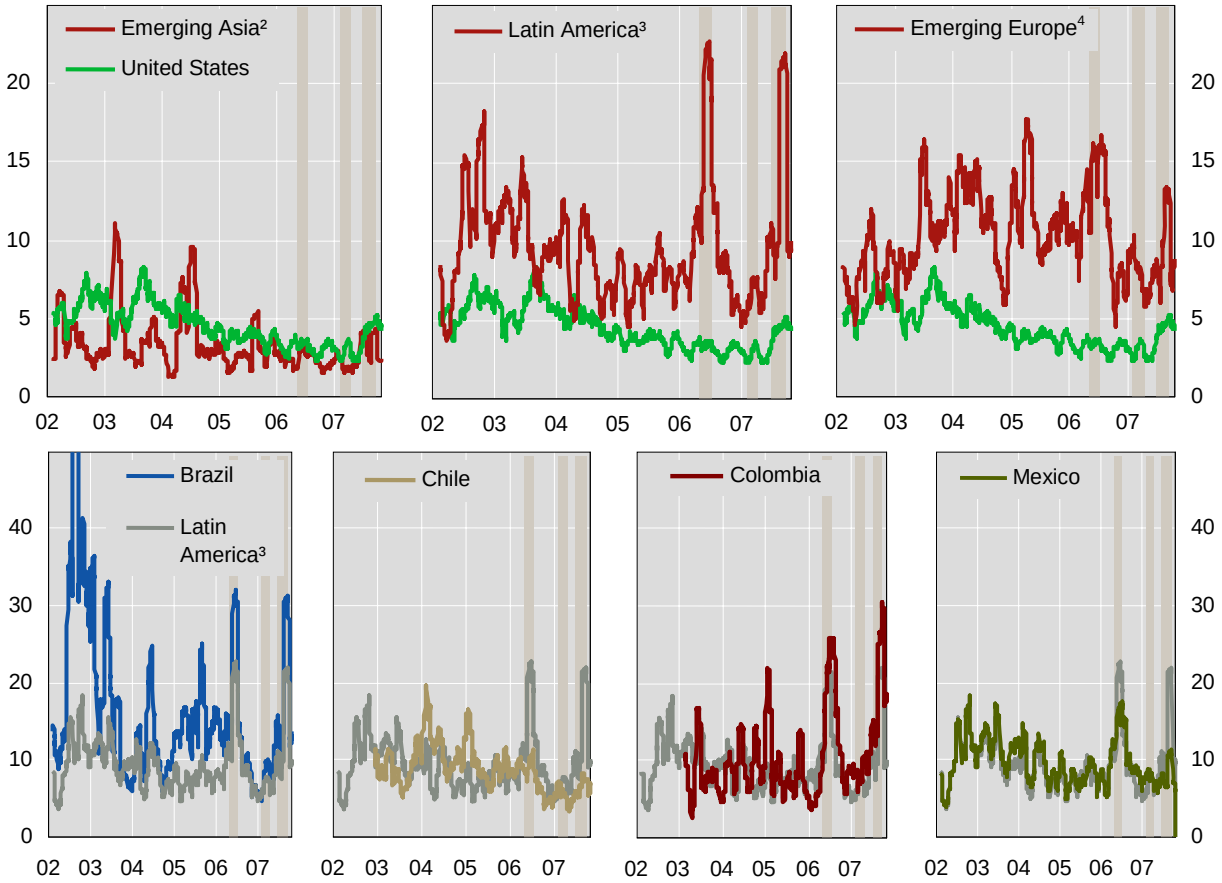
[25] The ability to short-sell and borrow a security promotes market liquidity. In this respect an important advantage is that it reduces settlement failures and increases arbitrage opportunities. The favourable impact on liquidity is what led many developed economies to relax its restrictions on securities lending during the 1990s. Nevertheless, it is common in emerging markets to argue that short-selling increases market volatility. See CGFS (2000).

[26] See Moreno (2006) for an overview of risk management practices in emerging markets in the banking sector and financial institutions. See Tovar (2007) for a complementary discussion more focused on Latin America and the Caribbean.

Figure 5

Volatility of local currency bond returns[1]



[1] Calculated as the standard deviation of daily percentage changes in the return index, with a 30-day moving window, annualised. Data refer to unhedged returns in US dollars of JPMorgan's traded index; last dated included 22 October 2007. [2] China, India, Indonesia, Malaysia and Thailand. [3] Brazil, Chile, Colombia, Mexico and Peru. [4] The Czech Republic, Hungary, Poland, Russia, Slovakia and Turkey.

Source: JPMorgan Chase.

Modern risk management systems rely heavily on statistical methodologies, such as value-at-risk (VaR) models.[27] In order to produce reasonably accurate measures of market risk, VaR models require, inter alia, liquid and smoothly functioning financial markets, time series of asset prices and some stability in the correlation of those prices. However, in emerging countries, markets tend to be less liquid than in industrialised countries, historical asset price data are inadequate and markets are at times subject to extreme conditions. Financial institutions have complemented their VaR methodologies with stress tests that enable them to gauge their potential vulnerability to such events. However, there are also a number of caveats associated with the use of such tests. First, they measure exposures to a specified event but not to the probability of such an event. Second, they rely heavily on the experience and judgement of risk managers for their specification, and there is no guarantee that the chosen stress test scenario will be the right one. Third, they impose a high computational burden.

[27] A detailed treatment of VaR is beyond the scope of this paper. In a nutshell, VaR is a statistical estimate of the losses or gains that a portfolio could experience due to changes in the prices of its components over a given confidence interval and holding period.

4.3 Pricing

A key issue for policymakers and market participants in Latin America is the extent to which the yield curve reflects all available market information. Although some governments in the region have managed to issue at longer maturities, it is not clear at this stage whether the resulting yield curves are sufficiently stable to generate accurate market rates. Movements in the yield curve may be difficult to interpret because the pricing of longer-term bonds is influenced by various types of risk premia. These include risks associated with a lack of depth in particular segments of the yield curve and high and variable inflation. The threat of large but low-probability adverse events (often referred as the "peso problem") can also add to the risk premium. Taxes and capital controls are additional distortions.

4.4 Clearing and settlement

Another challenge is that the growth in volume and complexity of securities and derivatives has most likely advanced ahead of improvements in the trade processing and settlement infrastructure. This means that although risks can now be more easily diversified and transferred, shortfalls in the infrastructure could lead to adverse dynamics in conditions of stress.

Securities settlement exposes participants to a number of risks. For instance, securities settlements involve a *credit risk* associated with the fact that a counterparty may not settle an obligation for full value (this involves replacement-cost risk and principal risk). Agents may also face *third-party risk*, the possibility that banks or intermediaries required for guaranteeing or providing settlement funds will fail to do so. In addition, settlement operations are also exposed to *liquidity risk*, the risk that the counterparty will fail to settle an obligation on time. *Operational risk* is also frequent in securities settlement due to possible failures in following or performing procedures. Finally, *legal risks* can stem from ambiguous rules governing the clearing and settlement process, which in turn can complicate the management of credit and liquidity risks.[28] The implications for financial stability of not having an appropriate settlement infrastructure can also have a bearing on central banks' operations given that they operate actively in securities markets.

Two questions arise in such context. What is the current state of the infrastructure for securities clearing and settlement in Latin America? And what are the implications for risk management?

Although it is beyond the scope of this paper to provide a detailed assessment of securities and settlement systems in the region, Cirasino et al (2007) provide an overview of the status (see also Table 3). According to this study, the legal and regulatory frameworks are still lagging behind the improvements already achieved in other areas, particularly in those areas of a technological nature. Furthermore, the study finds that improved clearing and settlement processes in securities and settlements systems are needed in most markets in the region. In particular, it recommends that efforts in this area should aim at achieving same-day trade confirmation, reducing market fragmentation, increasing the standardisation of settlement cycles, operating with shorter settlement cycles, improving market liquidity through automatic securities lending and introducing international communication standards. The report also argues that true delivery-versus-payment (DVP) has not yet been achieved in all the markets of the region. Progress in the infrastructure of securities settlement appears to be a priority.[29]

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[28] See Guadamillas and Keppler (2001) for a more detailed discussion of the risks associated with securities clearing and settlement systems.

[29] One area that appears to be particularly weak in the region is the infrastructure for cross-border settlements (Argentina, Brazil and Mexico are possibly exceptions).

In particular, the physical handling of securities continues to pose a risk in some countries and reduces the efficiency of these markets. Finally, measures are required to guarantee the protection of customers' assets in the event of bankruptcy of the depository holding its titles or the insolvency of the custodian.

Table 3

Clearing and settlement of government securities in secondary markets

	Trading mechanism	Settlement date
Argentina	Stock exchange,[1] OTC	T+3
Brazil	OTC and BM&F[2]	T+1
Chile	Stock exchanges, DVC[3]	T+1
Colombia	DVC[3]	T+0
Mexico	OTC/MexDer (futures)	T to T+4 T+3 to T+4 for foreigners
Peru	Cavali	T+1

[1] MAE, Euroclear, Cedel. [2] Brazil´s Future and Mercantile Exchange. [3] Centralised securities depositories.

Source: JPMorgan.

Despite some of these weaknesses, important progress has been made, in particular in the largest countries. For instance, of particular relevance is the infrastructure for the settlement of local securities. As a result of the progress, a number of risks will become less of a concern over time. For instance, *principal risk* (the risk that a seller of a security delivers it but does not receive the cash, or that the buyer of a security pays but does not receive the security) will diminish as DVP systems effectively start to operate. In addition, the risks associated with settlement lags have been reduced.[30, 31]

[30] Although settlement lags provide market participants with additional time to finance the trades, they also increase replacement cost risks (ie the risk that a counterparty may default prior to settlement, denying the non-defaulting party the gain on the transaction) (BIS (1992)). Settlement lags can also amplify over time any disruption in the settlement system. The mechanism operating in this case comes from the fact that participants can measure the direct effects of a possible disruption but cannot measure the impact of such disruption on their counterparties, thus limiting any further trades. See Devriese and Mitchell (2006).

[31] In general, there are a number of management initiatives, procedures and tools that can mitigate the impact of other risks associated with securities clearance and settlement systems (see Guadamillas and Keppler (2001)). For instance, credit risk can be handled with appropriate admission standards and monitoring mechanisms so as to ensure the creditworthiness of clearing agents. Bilateral credit limits can also be established, and clearing organisations can require collateral to cover certain exposures. In addition, loss-sharing procedures can be established, and same-day settlement and liquidity facilities can be set up. Finally, all unsettled securities or failed positions can be mark-to-market to reflect the fluctuations in market prices. Operational risk can also be mitigated with back-up facilities, automated recovery, authentication of procedures and access controls.

5. Concluding remarks

Latin American countries have made substantial progress in developing their domestic bond markets, which has important implications for financial stability. The shift away from dollar-denominated debt has reduced a key source of currency mismatch and the move toward longer maturities in domestic markets has helped reduce interest rate and refinancing risks. The evidence seems to suggest that much progress has been made at the government level but less so by the corporate sector.

However, even within the government sector, vulnerabilities remain. Short-term and indexed securities still represent an important share of the total stock of government debt. In some cases, debt levels remain a concern. Market liquidity also represents a constraint in most countries, both in primary and secondary markets, which complicates market participants' risk management operations.

The development of bond markets has created new risks and transformed the nature of others. This has been mainly the result of the introduction of new instruments and market participants, as well as of changes in market structure. This development has also resulted in a need to adjust risk management practices – a task that is not always easy in the region given the incomplete development of financial markets and the low level of market liquidity.

Overall, the development of domestic bond markets may have helped to ensure greater stability of domestic financial intermediation. However, a convincing test of whether this is indeed the case will depend on markets' behaviour under less favourable macroeconomic and financial conditions.

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