

# Improving liquidity in government bond markets: what can be done?

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## 1. Introduction

Domestic bond markets in emerging market economies (EMEs) have seen a significant growth in recent years. Nevertheless, as the experience of the countries reviewed in this paper shows, lack of liquidity remains a major obstacle to their development in practically all countries. The benefits of developing a liquid bond market go beyond financing government deficits at lower costs. First, a liquid government bond market will facilitate pricing of other and riskier financial assets. Second, it has a direct impact on the degree to which other segments of financial markets (forward and futures markets, including foreign exchange hedging) can be developed to support risk management functions. Third, the depth of money and bond markets has a decisive influence on the effectiveness of central banks' monetary policy. Finally, the yield curve in a liquid bond market carries important information for the conduct of monetary policy.

This paper looks at what governments and central banks can do to promote liquidity in government bond markets. Section 1 discusses dimensions of market liquidity and examines whether the size of a country influences its choice. Section 2 deals with some of the macro policy issues that have implications for liquidity in the government bond market. Section 3 turns to issues in developing primary markets, while Section 4 addresses some of the challenges facing countries in enhancing liquidity in secondary markets.

### 1.1 Dimensions of market liquidity

Market liquidity has several dimensions and there is no one satisfactory definition that captures all the features of a liquid market.<sup>2</sup> Nevertheless, some of the important characteristics by which a market could be judged liquid are its relative tightness, depth and resilience. Tightness, measured by the bid-ask spread, provides an idea about the costs incurred by market participants in executing transactions; the lower the spread, the higher is the market liquidity. While the depth of the market determines the extent to which it can handle large transactions without causing sharp changes in prices, resilience determines the speed with which price fluctuations finally dissipate. Another factor could be the size of the market, as markets with large outstanding stocks generally see high turnover in cash and futures trading.<sup>3</sup>

The following trends are discernible from Table 1:

- First, spreads for “on-the-run” bonds vary from a low of 1-2 basis points in India, Korea and Brazil to 25-50 basis points in the Philippines. Spreads in the range of 5-10 basis points in Hong Kong and Singapore appear to be comparable to those of 4-7 basis points in some of

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<sup>1</sup> The paper is based on the statistical inputs provided by the relevant central banks and has benefited immensely from their comments. It also draws on discussions with private sector market participants about the functioning of the debt markets in emerging market economies. Special thanks go to Palle Andersen, Renato Filosa, John Hawkins, Eli Remolona, Setsuya Sato and Philip Turner for extensive comments on the draft, to Marc Klau and Michela Scatigna for very useful statistical assistance and to Patricia Mosquera for secretarial help. Thanks are also due to Jochen Metzger and Agustin Villar for helpful comments. Views expressed in this paper are the author's own and do not necessarily reflect those of the Bank for International Settlements.

<sup>2</sup> See CGFS (1999, 2001) and Borio (2000) for a review of concepts of market liquidity and the factors determining it.

<sup>3</sup> See McCauley and Remolona (2000).

the mature bond markets.<sup>4</sup> Very low spreads in some countries may not provide an accurate picture of liquidity if the volume traded is also low. In a majority of economies, however, spreads seem to be much higher than those observed in mature markets.

- Second, except for a few economies (notably Hong Kong, Israel, Malaysia and Poland), the depth of the secondary market, as measured by the ratio of turnover to average outstanding stocks appears to be low. The typical ratio in EMEs is between 1 and 5% compared to about 7% seen in Japan and the United Kingdom and over 20% in Canada and the United States.
- Third, liquidity also appears to be concentrated in only a few benchmark issues. For example, in about half the economies for which information is available, only one or two maturities are highly traded while in mature markets liquidity is usually high for a wide range of benchmark issues.

Lack of liquidity in government bond markets raises a number of issues. One question is to what extent the size of an economy may operate as a constraint in developing a liquid bond market. In other words, should size determine the choice? Second, to what extent could policy be helpful in improving the functioning of the primary and secondary markets? Third, in particular, what role could central banks play in enhancing liquidity?

## 1.2 Should the size of a country influence its choice?

Some have argued that the potential benefits of a domestic bond market may not be realisable for small countries. One reason may be that the smallness of the market could limit the feasible range of marketable instruments and their effective tradability; see Turner and Van't dack (1996). A small investor base and few market players imply that central banks may have to play a market-making role that is not conducive to the objective of maintaining price stability. Moreover, it is argued that secondary market liquidity develops only when the bond market is relatively large. This is because much of the infrastructure needed to develop a liquid bond market (for example, a well developed stock market and an automated payment and settlement system) requires a minimum turnover in order to function smoothly and cost-effectively. European experience suggests that bond markets became deeper after the adoption of a common market and currency.

A second argument could be that the small number of market players and the dominance of a few players may reduce competition in the bond market and distort yields. Instances of major institutional investors acting in concert to seek higher yields on government bonds have been common in small countries. For example, two to three banks account for a market share of over 70% in Iceland, Malta and Sri Lanka; see Turner and Van't dack (1996). One of the reasons why a money market did not develop in Sri Lanka was the oligopolistic behaviour of two state-owned banks, which exerted undue pressure on the call money rate. This problem, however, is not unique to small countries. For example, the share of the top five banks in the total assets of the banking system exceeded 80% in Israel, Russia, South Africa and Thailand in 1999 and the median ratio for the EMEs was about 60%; see Hawkins and Mihajek (2001). Concentration ratios in the non-bank financial sector are even higher, as a few public financial institutions dominate activity in the pension and insurance sector.

Yet a number of innovative ways have been suggested to develop local bond markets in small countries. One way to increase competition has been to allow entry of foreign banks and securities firms into the financial sector and create the necessary level playing field. An important example is Taiwan, which developed its capital market by allowing entry of foreign banks and securities firms into the local financial sector; see Shih (1996).

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<sup>4</sup> Within mature markets, spreads are much lower in the United States (1½-3 basis points) and much higher in Japan (7-9 basis points).

Table 1

## Indicators of liquidity in government bond markets

	Typical bid-ask spread <sup>1</sup>		Most important maturity	Ratio of turnover to average outstanding stock in 2000 <sup>2</sup>	Daily average volume of OMO by the central bank in 2000 <sup>3</sup>
	“On the run” bonds	“Off the run” bonds			
India	1		10 years	3	105
Hong Kong	5-10		...	22	...
Singapore	5	10-15	3 months, 1,2,5,7,10,15 years	4.7	...
Indonesia		...	3 years	0.5	1,097
Korea	1	1	3 years	9.1	5,290
Malaysia	3-5	5-10	3,5,10 years	24	2,375
Philippines		25-50	2,5,7,10 years		1,010
Thailand		2-3	5-7 years	1.1	1,250
Brazil	2	50	Fixed rate bill <sup>4</sup>	...	...
Chile		...	8 years	3.5	289
Colombia	40		5 years	0.2	248
Mexico	10-15	10-25	3 years	2.5	790
Peru		...	5 years	...	23
Czech Republic		20	10 years	1	485
Hungary			3,5,10,15 years		
Poland		5-25	2,5 years	31	4,290
Israel		...	5-10 years	46	0.3
Saudi Arabia		20	2-5 years	0.5	702
<i>Memo</i>					
United States	3	6	1,2,5,10,30 years	22	
Japan	7	7	2,4,5,6,10,20 years	6.9	
Germany	4	5	2,4,5,10,30 years		
United Kingdom	4	4	5,10,20,30 years	7	

<sup>1</sup> In basis points. <sup>2</sup> In percentages. <sup>3</sup> In millions of US dollars. <sup>4</sup> Currently matures in May 2002.

Source: Central banks.

Another possibility could be internationalisation of the capital market; for example, by allowing offshore entities to hold and issue local currency bonds. This requires a strong economic base and a relatively stable currency. The entry of foreign investors into government bond markets is likely to enhance liquidity by increasing the total investor base and adding to market sophistication. If offshore entities

are also permitted to issue local currency bonds, they could increase supply of high-quality paper, providing an alternative diversification opportunity to domestic investors and adding liquidity to the market. An important example is Singapore, where the local bond market deepened significantly after the government allowed highly rated offshore banks, multinationals and domestic companies to issue bonds in local currency. Recently, the government has permitted even unrated companies to issue local currency bonds provided they sell them to sophisticated investors.<sup>5</sup> To prevent speculative trading in the Singapore dollar, the offshore issuers are, however, required to either swap out the proceeds into foreign currency or use the funds raised to support economic activity in Singapore. A third possibility, which might look appealing in the context of small market size and incomplete market infrastructure, is to develop regional bond markets<sup>6</sup> (see Box 1).

#### Box 1

##### **Regional bond markets**

Building the infrastructure required for a well developed bond market is subject to significant time and resource costs. Consequently, many, particularly small, EMEs are caught in a vicious circle of low liquidity and underdeveloped markets. This situation provides a rationale for coordinated attempts to pull issuers and investors together and develop bond markets on a region-wide basis. Additional arguments in favour of such attempts are that name familiarity reduces information asymmetries and the same time zone eliminates settlement (Herstatt) risks. On the other hand, a major disadvantage of regional bond markets is that they do not provide instruments that would strengthen monetary policy operations in individual countries.

Cooperation in developing a regional bond market might take several forms. One arrangement could be to encourage countries to use regional financial centres to issue bonds in regional or international currencies along the lines of the euro-dollar and euro-yen markets. For the host country, development of offshore markets could mean further deepening of local bond and foreign exchange markets and more diversification opportunities for domestic investors. In Asia, the Japanese government has offered to provide funds and guarantees for the acquisition of sovereign or semi-sovereign bonds issued by other Asian countries ("new Miyazawa initiative"). The proposal was meant to pool the large amounts of excess savings in the region and reinvest the funds in local debt instruments. This would eliminate currency and maturity mismatches, both of which were primary causes of the Asian crisis. For several reasons, progress to date has been disappointing. There are no credit rating agencies or clearing and settlement systems at the regional level. Cross-border transactions in securities as well as trading mechanisms are absent and listing rules and tax treatments have not been harmonised. Finally, regional credit enhancement and guarantee agencies are missing and there is no common currency for the denomination of sovereign bonds.

Regional cooperation could also be strengthened by encouraging domestic financial institutions to invest in bonds issued by other countries within the same region. Although no formal cooperation schemes exist in practice, banks and institutional investors in EMEs have increasingly sought to diversify into bonds of neighbouring countries. Hong Kong expressed its willingness to invest in high-quality Asian debt papers if they were rated properly and priced at market clearing rates; see Tsang (1998). Hong Kong also offered to function as a clearing and settlement centre for the Asian bond market. However, as pointed out in the paper by Choy in this volume, the scope for regional diversification may be limited by the high degree of co-movements among markets. In Latin America, this has meant that institutional investors look towards developed markets for asset diversification and stay away from bonds issued by neighbouring countries.

Other ways of promoting regional bond markets and attracting local and international investors include the creation of a regional bond index or even a synthetic regional bond based on a basket of major regional currencies. However, these forms of cooperation are difficult to realise, as they may ultimately require a regional currency unit.

<sup>5</sup> See the paper by Lian in this volume.

<sup>6</sup> See a recent proposal by Sakakibara (2000) in the context of developing a regional bond market in Asia.

## 2. What can policies do to develop a liquid bond market?

This section discusses the broader policy framework to improve liquidity in the government bond market, leaving the specific role of central banks and governments in boosting primary and secondary market liquidity to later sections.

The role of policy could be critical in several directions such as the extent to which the bond market is allowed to function according to market-clearing principles and the nature of policy coordination between the government and the central bank. The overall financial sector policy affecting the investor base and the conduct of monetary policy also has significant implications for the depth and maturity of the bond market.

### 2.1 Market-determined interest rate

Many have emphasised the role of incentives in improving liquidity in bond markets, particularly allowing the interest rate to be determined by market forces. Accordingly, in most countries, interest rate liberalisation typically preceded the effort to develop a domestic bond market accompanied by a shift away from administrative determination of bond rates to auction-based sales. However, some argue that conditions in EMEs may prevent interest rates from being fully determined by market forces. One factor is that, in countries with high public debt, allowing interest rates to rise may threaten the sustainability of fiscal policy.

Another reason why interest rates may not be fully market-determined is the notion that the market-clearing rate is not always the “appropriate rate”. Some have pointed out that the tendency of authorities to believe that markets may, at times, not generate a competitive price could significantly weaken investors’ confidence and hinder the development of bond markets; see Fry (1997). This may be true if the rules of the game are not strictly according to market principles. For example, auctions may be cancelled because rates are not deemed appropriate,<sup>7</sup> or the debt manager fixes a minimum reserve price for the auction, or keeps the right to allocate less than the amount announced if price dispersions are too high.<sup>8</sup> In Korea, prior to the 1998 crisis, the government set a maximum rate for the auction, which was generally below the market interest rate. While this resulted in a frequent underallocation of the announced amount, the shortage was filled by the government bond underwriting agency at an interest rate lower than the average rate in the auction; see Kim, Y (2001).

It is difficult to judge how far intervention may be desirable. For instance, if the bond market is dominated by a few big players this may bring collusive pressure on prices, providing the rationale for intervention by the debt manager. As pointed out in the paper by Al-Jasser and Banafe in this volume, an important reason why the government prefers preset, fixed price bonds to auctions is the concern that a small group of banks could manipulate the market. Second, it has been argued that in the absence of a liquid secondary market, restricting the scope of indirect instruments of monetary policy, central banks may use primary auction rates to signal interest rate changes. In this case, auction rates are more likely to be influenced by central banks’ objective assessment of demand conditions and not purely by demand and supply conditions in the bond market. Third, central banks’ intervention may also be prompted by particular market conditions that, for example, lead to a sudden rise in the risk premium. For example, in India, the central bank accepted large amounts of private placement of bonds from the central government to avoid the impact of increased market uncertainty on interest rates. With the easing of uncertainty, the central bank sold these securities in the open market.<sup>9</sup> Fourth, some have argued that, in a thin market, the day-to-day movements of interest rates could be high and cause interest rates to deviate from their equilibrium level for a long time. Under this circumstance, by reserving the right to fix a minimum price, the government may give a clear indication

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<sup>7</sup> For example, in Mexico, auction bids were rejected in the wake of the 1995 financial crisis and in September 1998 at the peak of the Russian crisis. Argentina cancelled auctions in the wake of the Mexican crisis in 1995 and in 2001 when investors demanded high interest rates.

<sup>8</sup> For example, in Brazil, the debt manager can withhold full allocation or cancel the auction if the price dispersion among bidders is too high; see Credit Suisse (2000).

<sup>9</sup> See the paper by Reddy in this volume for the approach followed to reduce sharp volatility in yields.

to markets that low bids are not acceptable; see Gray (1997). Such a situation may not arise in countries where markets are deep enough to throw up a price that would normally be expected.

This also raises a related question: should stabilising bond rates be an important concern of the central bank, in order to promote the bond market? One view is that if the capacity of banks and other investors to manage interest rate risks is weak and there is limited opportunity for hedging such risks, excessive volatility in interest rates could discourage investors from bond markets. The counterview is that too much concern on the part of the central bank to contain rate volatility could dampen the development of futures markets, discourage risk-taking activity and reduce liquidity in the bond market.

Moreover, interest rate flexibility could be constrained by investment restrictions and the health of the banking system. The banking system in developing economies is typically subject to a higher statutory liquidity ratio than in industrial countries and many require insurance and pension funds to hold a large part of their investment in government bonds. In the initial stage, a high liquidity ratio could be desirable for developing a domestic bond market as it helps finance government deficits from market sources and ensures success of the auction programme. Maintaining a high liquidity ratio could also be defended on prudential considerations.<sup>10</sup> On the other hand, investment restrictions tend to blunt competition in the bond market, leading to lower than market-clearing rates, and reduce incentives for active trading by banks and other institutions. They also tend to be associated with slow progress in moving towards mark to market practices in the financial system, with major implications for risk management practices and liquidity in bond markets. Another factor for rigid bond market rates could be a weak banking system. This may lead a government to resist an interest rate increase in the bond market because of its adverse consequences for profitability and solvency of the banking system.

There are, in short, several convincing reasons for intervening in the market. Nevertheless, these interventions lead to underdeveloped markets. The adverse implications of deviating from market principles for the economy have been well demonstrated by country experiences. Many, therefore, argue that central banks could be better able to influence interest rates by putting in place an active liquidity management strategy and committing credibly to price stability. Industrial countries' experience shows that when commitment to market-determined rates is strong and interest rates are allowed to move in both directions, volatility in interest rates is significantly reduced through more diverse expectation formation and trading positions taken by the market participants.

Echoing these views, there was a broad consensus among the participants in the meeting that central bank intervention in the price-setting process is undesirable. It was felt that when markets were small, central bank intervention in such circumstances ran the risk of sending a wrong signal to the market. Moreover, central banks' action might lead to "habit formation" among market players. However, it was also argued that intervention might be desirable when market volatility stemmed from exogenous shocks.

## **2.2 Coordinating debt management and monetary policy**

Policy coordination is an important requirement when the central bank is directly involved in developing a bond market. Because of potentially conflicting objectives of debt management and monetary policy – the former focused on the cost/risk trade-off to minimise the borrowing costs to the government and the latter on price stability – close coordination between these two policies is desirable. One reason could be to ensure that price stability remains the main concern of the central bank. A second reason could be that the move to a market-determined interest rate does not threaten fiscal sustainability and prove counterproductive to the objective of promoting financial markets. A third reason could be that the confidence of the market in the authorities' commitment to market principles is not weakened by the overlapping responsibilities of the central bank. For instance, debt management operations are not influenced by inside information on interest rates within the central bank; see World Bank and IMF (2001).

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<sup>10</sup> For example, this is an important reason for the relatively high liquidity requirement in Hong Kong and Singapore.

In most industrial countries, debt management operations are separated from the central bank's monetary policy operations, with the government using the primary market to issue bonds while the central bank uses the secondary market for liquidity operations. Minimising borrowing costs to the government is achieved through product innovation and improvement of the price discovery process. While direct credit from the central bank to the government has been eliminated in major industrial countries, sale and purchase operations of government bonds by the central bank are primarily driven by monetary policy considerations. Typically, in this model, explicit coordination between the two policies is restricted to the tactical level, ie information sharing between the central bank and the treasury regarding the liquidity situation in the market. Implicit coordination is achieved through the use of financial markets, such as the central bank giving signals about interest rate conditions to the treasury and, at the same time, extracting information from the yield curve for monetary policy operations; see Blommestein and Thunholm (1997). In a situation of conflicting objectives, it is normally monetary policy that dominates over debt management policy.<sup>11</sup>

In most EMEs, the responsibility of managing government debt lies with the treasury (Table 2). Central banks play the role of debt managers in Hong Kong, India, Malaysia, Saudi Arabia and, to some extent, Singapore. Many countries have abolished or sharply restricted direct financing of government deficits by the central bank. In countries where the fiscal situation is strong and inflation has been low, central banks may have a greater degree of flexibility in promoting bond markets. In countries where fiscal deficits remain high, the need for coordination may have increased with the move to market-determined interest rates. While a high fiscal deficit leads to a steep yield curve, a tight monetary policy could further worsen the situation by raising interest rates. At the same time, the central bank's support to government may be constrained by excess demand in the economy.

Resolving this conflict requires a significant degree of policy coordination. Some argue that keeping the responsibility of debt management with the central bank might facilitate coordination. One important example is India, where the central bank has had to address the twin responsibility of funding a large fiscal deficit and restricting monetary growth. The Reserve Bank of India adopted a number of ways to resolve the two conflicting objectives. While the central bank directly absorbed a part of the central government bond issues in its portfolio, it later mopped up excess liquidity through open market sales. The reduction of reserve requirements and interest rate cut by the central bank also helped relieve pressure on interest rates.<sup>12</sup>

The need for coordination may also arise in countries with persistent fiscal surpluses, particularly when the central bank issues its own paper for monetary policy operations. Here the challenge might arise from coordinating maturity, issue size and auction schedule of both types of instruments. This also raises the issue as to whether the central bank should continue to issue its own paper after the treasury bill market has reasonably developed. One disadvantage of having identical instruments is that they fragment the market. Bills issued by the central bank have implications for its balance sheet.

Country practices differ significantly in dealing with this issue. In Hong Kong, for example, the public sector bond market consists predominantly of central bank issued papers, ie Exchange Fund Bills and Notes. In Chile, because of the history of fiscal surplus, the government has rarely issued bonds. The central bank primarily uses its own paper for monetary policy operations. In Mexico, the central bank issued its own securities for the first time in 2000 for sterilised intervention in the foreign exchange market. This decision was guided by the consideration that issuing large amounts of government bonds for sterilising liquidity would affect the yield curve; see the paper by Sidaoui in this volume.

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<sup>11</sup> A typical example of this hierarchical distinction of objectives is given by the experience of the United Kingdom. Prior to 1995, one of the objectives of the country's debt management policy was to "support and complement monetary policy". After the 1995 review this was changed to "ensuring that debt management policy is consistent with monetary policy". See Bank of England and HM Treasury (1995).

<sup>12</sup> As a medium-term goal, the Reserve Bank of India has proposed separation of debt management from monetary policy operations. This objective would be facilitated by the development of financial markets, better control of fiscal deficit and the introduction of the required legislative framework (see the paper by Reddy in this volume).

Table 2

**Institutional arrangements for debt and reserves management**

	<b>Central government: domestic currency debt</b>	<b>Central government: foreign currency debt</b>	<b>State/local government: foreign currency debt</b>	<b>SOEs: foreign debt</b>	<b>Reserves</b>
China	MoF	MoF	not allowed	SOEs	SAFE
India	CB	MoF	not allowed	SOEs	CB
Hong Kong	CB	...	...	SOEs	CB
Indonesia	MoF	MoF	not allowed		CB
Korea	MoF	MoF	own responsibility <sup>1</sup>	SOEs <sup>2</sup>	CB
Malaysia	CB	CB/MoF	own responsibility <sup>1</sup>	own responsibility	CB
Singapore	MoF & CB	none			CB
Thailand	DMO under MoF	DMO under MoF	none	MoF	CB
Argentina	MoF	MoF	own responsibility		CB
Brazil	MoF	MoF and CB <sup>3</sup>	not allowed	SOEs	CB
Chile	MoF	MoF	not allowed	MoF	CB
Colombia	MoF	MoF	state govts/MoF	SOEs, MoF	CB
Mexico	MoF	MoF	not allowed	SOEs, MoF	CB
Peru	DMO under MoF	DMO under MoF	DMO under MoF	MoF	CB
Czech Republic	MoF	none	MoF <sup>4</sup>	SOEs	CB
Hungary	DMO under MoF	DMO under MoF			CB
Poland	MoF	MoF	own responsibility		CB
Israel	MoF	MoF	own responsibility	SOEs	CB
Saudi Arabia	CB	CB			CB
World Bank survey	MoF (55%) CB (11%) MoF & CB (30%) other (4%)	MoF (51%) CB (11%) MoF & CB (30%) other (8%)			

Note: CB = central bank; DMO = debt management office; MoF = ministry of finance; SAFE = State Administration of Foreign Exchange; SOEs = state-owned enterprises.

<sup>1</sup> Require approval of Ministry of Government Administration and Home Affairs. <sup>2</sup> Require approval of Ministry of Planning and Budget. <sup>3</sup> CB for domestically issued dollar-linked debt. <sup>4</sup> MoF has only weak restrictive powers; large municipalities are largely autonomous.

Sources: Jensen (1999); central banks.

The discussion in the meeting revealed a number of practical approaches followed by countries in enhancing cooperation between the debt management and monetary authority. For example, in some countries the government issued shorter maturity bonds (for example, monetary stabilisation bonds in Korea) for monetary operations by the central bank while bonds for longer maturities were issued for market development. In countries where central banks acted as fiscal agents, the policy conflicts were usually resolved through constant dialogue with the government regarding the details of debt



management operations. Some countries also converted a large part of the non-marketable government debt to marketable debt to reduce the problem of shortage of securities with the central bank for open market operations.

### **2.3 Broadening the investor base**

A key challenge facing many countries is how to broaden the investor base so as to reduce the heavy reliance on a captive market. A broader investor base improves bond market liquidity not only because of the size effect but also because having a large number of investors with diverse risk profiles enables smooth dissipation of market shocks. Moreover, a large investor base generates incentives for financial innovation, leading to greater market dynamism and lower transaction costs. Broadening the investor base poses challenges. One view is that relaxation of investment regulations will reduce banks' holding of government bonds. The counterview is that while this may be a short-term consequence, banks' demand for government bonds is likely to increase over the medium to long term as investing in these bonds becomes part of their normal portfolio decision-making.

Increasing the number of investors implies promoting institutional investors and attracting foreign investors to the government bond market. It has been well recognised that institutional investors, such as pension and insurance funds, play a critical role in boosting liquidity in government bond markets. They promote a wholesale market for government bonds, increase arbitrage activities through their diversified portfolio and boost liquidity particularly in long-term securities. By providing a countervailing force in financial systems dominated by banks, they intensify competition and promote market transparency; see Vittas (1998). However, it has been pointed out that some of the beneficial effects on market liquidity would be restricted if the institutional investors adopt a "buy-and-hold" policy.

Pension and insurance reforms have played a particularly important role in developing bond markets in Latin America. In Asia and Central Europe, the role of pension funds in government bond markets has, so far, been limited because there are insufficient funded schemes in the public and private sectors. Significant progress has, nevertheless, been made in recent years to increase the participation of domestic institutional investors. For example, in Singapore, the share of fixed income investments in total investment of insurance companies has shown a sharp increase from 30% in 1999 to 49% by September 2001. A larger involvement of institutional investors in the bond market may also require a certain minimum financial infrastructure and an adequately developed bond market in the first place before a dynamic interaction is set off between investors and market liquidity.

Foreign investors can also play an important role in broadening the investor base and enhancing liquidity in secondary markets. Nevertheless, in many countries (with some notable exceptions such as Mexico and Hungary) foreign investors play a marginal role in government securities market. Some believe that increased participation of foreign investors could make emerging markets more susceptible to market volatility, especially because such investments may accentuate financial market responses to existing macroeconomic imbalances. It is also argued that foreign investors with their enormous resources could dominate activity in the local bond market. On the other hand, the risks of investing in EMEs' local bond markets (eg foreign exchange risks, liquidity and settlement risks) could be high. Like domestic institutional investors, foreign investors may also require a reasonably liquid market before increasing their stake. The paper by Sidaoui in this volume points out that relaxation of restrictions on foreign investors at the end of the 1980s led to a substantial increase in secondary market liquidity in Mexico, but the impact has declined since 1994. Most foreign participants now hold long positions on peso interest rates through foreign exchange forwards rather than directly investing in government papers.

Some argue that individual investors have only a limited role in promoting liquidity. Individual investors play a much greater role in the local bond markets through mutual funds, which diversify risks on their behalf. Many countries have, therefore, promoted mutual funds and some have set up specialised gilt funds for promoting a small investor base. For instance, in Mexico, regulations that restricted mutual funds' investment in short-term instruments have been relaxed recently to allow these funds to play a more active role in the government securities market. Others have argued for a more direct participation of individual investors in developing bond markets on the grounds that this would reduce

the reliance of governments on captive investors, promote a fixed income investment culture among households and increase competition in the deposit market.<sup>13</sup>

## 2.4 Developing money markets

A well developed money market reduces liquidity risks for bondholders by providing access to the immediate cash market. It also facilitates the emergence of a sovereign yield curve, as money market benchmarks lead to the development of long-term yield curves. When the money market is not well developed and the overnight rate is volatile, investors face heightened liquidity risks that limit their ability to undertake maturity transformation. A simple indicator of the development of money markets is given by the volatility of the daily interbank rate, since illiquid markets often witness high volatility of interest rates. As Table 3 shows, the standard deviation of overnight rates in EMEs declined substantially in 2000 compared to the levels in the mid-1990s. In many countries, however, the volatility of short-term rates is still high.

Table 3  
Volatility of short-term interest rates<sup>1</sup>

	Mean		Standard deviation	
	1995	2000	1995	2000
Asia <sup>2</sup>	9.5	6.1	0.9	0.3
Latin America <sup>3</sup>	27.1	11.6	5.6	1.0
Central Europe <sup>4</sup>	27.7	14.8	1.9	0.9
<i>Memo</i>				
G3 <sup>5</sup>	3.8	3.6	0.4	0.4

<sup>1</sup> Based on daily interbank or call money rates. <sup>2</sup> Unweighted average of China, Hong Kong, India, Indonesia, Korea, Malaysia, the Philippines, Singapore and Thailand. <sup>3</sup> Unweighted average of Argentina, Brazil, Chile, Colombia, Mexico and Peru. <sup>4</sup> Unweighted average of the Czech Republic, Hungary and Poland. <sup>5</sup> Unweighted average of Germany, Japan and the United States.

Sources: Bloomberg; Datastream.

Chief among the reasons for lack of depth of money markets are the high reserve requirements. While only a few countries exempt their banking systems from reserve requirements (eg Hong Kong and Mexico), the typical requirement in EMEs exceeds 5% and in some cases 10% compared to the usual 0-3% seen in most industrial economies (Table 4). It is well recognised that when reserve requirements are low, averaging provisions can stabilise the overnight rate by making banks' reserve demand sensitive to interest rates; see Borio (1997) and Van 't dack (1999). But, when the reserve requirement is high, this "buffer function" is limited. For instance, one important reason cited by India for high volatility in call money rates was the high reserve requirement. It made banks focus on overnight funding and encouraged a few lenders to stay in this market to earn arbitrage profits. While many EMEs exclude interbank borrowing from the reserve requirement, eliminating the distortion that this would create for interbank transactions, the reserve compliance period in many cases tends to be shorter than the usual one-month period seen in major industrial countries. Most countries, nevertheless, allow averaging and some allow a minimum daily ratio to reduce the probability of banks borrowing heavily towards the reserve compliance day.

<sup>13</sup> See, for example, Patil (2001) in the Indian context. Recently, Singapore took a major initiative to promote an individual investor base, where intermediaries have been involved in increasing public awareness of investing in bonds by organising retail bond fairs; see the paper by Lian in this volume.

Table 4  
**Reserve requirements in EMEs**  
December 2001

	Reserve requirement on banks	Reserve compliance period
China	6%	Quarterly
India	Cash Reserve Ratio 5.5% for commercial banks, urban scheduled cooperative banks <sup>1</sup> 3% for regional rural banks and other cooperative banks	Fortnightly
Hong Kong	None	...
Singapore	Minimum Cash Balance : 3% Minimum Liquid Assets : 18%	Fortnightly
Indonesia	5%	Fortnightly
Korea	2.9%	Fortnightly
Malaysia	4%	Fortnightly
Philippines	11% for commercial banks 0% for rural and cooperative banks	Weekly
Thailand	6%	Fortnightly
Brazil	45% on demand deposits <sup>2</sup> 10% on time deposits <sup>3</sup>	Fortnightly
Chile	Local currency     9% on demand deposit 3.6% on time deposit Foreign currency: 19% on demand deposit 13.6% on time deposit	Monthly
Colombia	Local currency 13% on current account deposit 6% on saving deposit 2.5% on CDs	Fortnightly
Mexico	None	...
Peru	Foreign currency Implicit required reserve ratio: 34% Marginal required reserve ratio: 20%	Monthly
Czech Republic	2% on primary liabilities vis-à-vis non-banking subjects	Monthly
Hungary	6% (5% from August 2002)	Monthly
Poland	5%	Monthly
Israel	6% on deposits up to 6 days' maturity 3% on deposits on 7 days up to 6 months 0% on longer-term deposits	Monthly
Saudi Arabia	7% on demand deposits 2% on time/saving deposits	Monthly

<sup>1</sup> Effective from 29 December 2001. <sup>2</sup> 45% of the average daily balance exceeding BRL 2 million. <sup>3</sup> 10% of the balance exceeding BRL 30 million.

Source: Central banks.

Central banks' accommodation policies also have an important influence on the development of the money market. While an easy accommodation policy may encourage banks to transact with the central bank and discourage active liquidity management by banks, a too restrictive policy may make interest rates more volatile. Second, the success of central banks' liquidity management operations in reducing rate volatility depends on how accurately they forecast daily movements of autonomous liquidity. This can pose difficulties when the government's cash management is weak and intervention in foreign exchange markets is frequent. In Mexico, the central bank has addressed these two concerns by allowing the exchange rate to be relatively flexible and requiring the treasury to provide one-day advance notice of movements of cash balances in the government account. Many countries have set up formal mechanisms for coordinating day-to-day treasury cash management. Third, the flexibility of operating procedures has implications for the central bank's role in stabilising rates. As the industrial country experience shows, increased reliance of central banks on discretionary market operations (rather than standing facilities) and signalling mechanisms strengthen their influence on short-term interest rates. Conversely, when central banks do not stabilise the overnight rate at some reference value by making available market-clearing reserves, interest rate uncertainty tends to be higher.

The development of money markets has also been hampered by country-specific market imperfections. For instance, the factors affecting money market development in India include the presence of non-bank participants in the interbank market, the prevalence of a system of cash credit to borrowers which places an undue burden of fund management on banks, and regulations preventing banks from paying interest on deposits of below 15 days' maturity. In South Africa, until recently money market liquidity was adversely affected by an oligopolistic market structure. A few banks with considerable market power dominated the repo market, resulting in relatively inflexible money market rates and uncertain liquidity flows to a large number of market participants; see Casteleijn (2001). The central bank changed its operating procedure to a fixed rate repo system and encouraged banks to square positions in the interbank market before coming to the repo window.

### **3. Issues in primary market development**

Boosting bond market liquidity requires developing a dynamic primary market. Because the government bond market is characterised by a special type of market imperfection, where a monopoly seller meets oligopoly buyers, the government should credibly precommit to a set of issuing policies that encourage investors to bid in a desirable way; see Das and Sundaram (1997). While pre-commitment would help establish transparency, given the informational asymmetries between the seller and the buyers, it is no guarantee that the government would obtain the most competitive sale price. Choosing an auction technique that improves the price discovery process is, therefore, important to maximising revenue for the government and improving market efficiency.

#### **3.1 Choice of auction technique**

The auction techniques generally followed in treasury markets are discriminatory and uniform price auctions. There is no clear-cut superiority of one technique over the other. Discriminatory price auctions enhance market competition as each bidder is under pressure to quote a successful price, and since securities are allotted at the bidding price, they also maximise revenue for the government at a given demand curve. However, a key disadvantage of the discriminatory price auction is that it penalises successful bidders who paid a higher price than the cutoff price and are likely to incur a mark to market loss through lower resale value of their securities in the secondary market (called the "winner's curse"). This encourages them to shade their bidding price downwards and lower their demand for bonds, with implications for revenue. Switching to a uniform price auction (allotment at the cutoff price to all successful bidders) could eliminate this bias and the related cost of gathering information for bidders, raise the potential demand for bonds and encourage bidders to bid a higher price. Empirical evidence supports the view that uniform price auctions increase revenue to the government compared to discriminatory price auctions; see Bartolini and Cottarelli (1997). But, an important disadvantage of the uniform price auction is that it is more vulnerable to market collusion, particularly in thin markets.

The choice between the two auction methods depends on specific market conditions. Some have argued that when markets are well developed, there would be little by way of difference in the market-clearing prices between the two auction methods, even though a uniform price auction saves the large cost of gathering information by the bidders.<sup>14</sup> In developing markets, the choice of uniform price auctions has been defended on the grounds that this lowers the “winner’s curse”, which could attract more investors to auctions. Others have argued that where markets are thin and uncertainty about prices is high, discriminatory price auctions could be a better option. Moreover, information gathered through discriminatory auctions could be used to further develop the market; see Feldman and Mehra (1993). To minimise the potential problems of both the auction techniques some have suggested a hybrid auction system, where a maximum price limit could be applied to a multiple price auction.

As Table A1 in the Annex shows, EMEs seem to be fairly divided between the auction types. Auctions are not in use in Indonesia, where a large part of bonds are recapitalisation bonds, or in Saudi Arabia, which issues preset coupon bonds to banks and other financial institutions. Korea has recently switched to a uniform price auction to reduce the problems of the “winner’s curse”. India has introduced a uniform price auction for 91-day treasury bills on an experimental basis though a complete migration is constrained by lack of empirical evidence on the possible cost difference to the government; see Thorat (2001). In Mexico, only fixed coupon bonds are sold through uniform price auctions. An important example of a uniform price auction is Columbia, where all allotments at the auction are done at the single cutoff rate. If the auction amount is lower than all the accumulated bidding at the cutoff rate, then all bids below the cutoff rate are accepted. Provisions also exist for additional placement at a second round, if demand at the first round exceeds the initial offer by a significantly high margin.

### 3.2 Participation in auctions

Should participation in auctions be restricted to only a few specialised dealers? Should there be an upper limit on individual bidding, and to what extent should non-competitive bidding be allowed? Should the central bank participate in auctions and, if so, in what form?

Broad participation is normally preferred to improve competition, but it could increase processing costs and time. An open-to-all policy could also pose problems for the payment and settlement system. An important example of unrestricted access is the United Kingdom, which allows written bids by anyone a day prior to the auction date. At the other extreme, some countries restrict auction participation to only a specialised group of dealers. However, a majority of countries seem to prefer broader participation that may include primary dealers, banks and institutional investors. Many countries also prefer to set both a maximum (to circumvent the potential problem of market cornering) and a minimum limit on individual bids (to discourage retail participation). The typical ceiling on individual bids varies between 20 and 30%. For example, in Singapore, a primary dealer can bid up to a maximum of 20% of the issue while others can go up to 15%.

The issue of whether and to what extent non-competitive bids should be allowed depends on specific objectives. Some countries allow non-competitive bids for a limited part of the auctioned amount, with the allotment done at the cutoff price or a weighted average price. The allotment is restricted to a select group of investors to encourage retail participation and protect them from the “winner’s curse”. Some allow primary dealers to have access to non-competitive bids as a special privilege for their market-making role. From the issuer’s point of view, non-competitive bids could increase the investor base by attracting those investors who would otherwise stay away from the auction, fearing that the price would be too high; it also increases the certainty about full subscription of the issue. Country experience suggests that a limit of 20% is generally preferred for non-competitive bids to ensure that a high limit does not reduce competition. Some countries also prefer to place a limit on the quantum of non-competitive bids by any individual bidder (for example, Singapore).

Another critical issue is the central bank’s participation. Many countries by law prohibit direct financing of the government deficit by the central bank through purchase of securities in the primary market. In

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<sup>14</sup> This explains why the experimental switching of auction technique from a discriminatory price to a uniform price auction in the United States in the early 1990s did not produce significant price differences.

some countries (eg Malaysia), while legal provisions do not restrict the central banks from directly purchasing from the primary market, they have chosen not to do so. In Singapore, the law permits the central bank to participate either as a competitive or non-competitive bidder to obtain securities for monetary policy operations. On the other hand, the Bank of Mexico can only purchase securities from auction when the government places the proceeds of the purchase as a term deposit with the central bank with the terms similar to those of the acquired security. It can also participate as a non-competitive bidder to replace its maturing stocks. In India, the central bank sometimes acquires central government bonds at the cutoff yield and accepts private placement of securities from the central government to transmit signals to markets, particularly during periods of high market uncertainty.

The varying practices followed by central banks simply illustrate the objectives behind central banks' interest in the primary market. To the extent that monetary policy operations are the main concern, central bank participation as a non-competitive bidder can achieve the objective without producing much market distortions. But, when central bank intervention is motivated by a price objective, market yields could be distorted.

### 3.3 Primary dealer system

Many countries have set up primary dealers (PDs) to promote bond markets (see Annex Table A2), while others (for example, Chile, Indonesia, Israel and Peru) do not have dedicated government securities dealers but typically rely upon banks and institutional investors for creating a market for government bonds. However, these agents do not have the rights or obligations of market-makers.<sup>15</sup> The advantages of having a dedicated group of market-makers are that they can guarantee success of the auction, promote liquidity in the secondary market by providing two-way quotes and eliminate the problems of conflicting objectives inherent in giving the responsibility of market-making to banks. As pointed out in the paper by Al-Jasser and Banafe in this volume, a major reason for the underdeveloped bond market in Saudi Arabia is the poor involvement of banks in creating a market for government securities. Both lack of monetary incentive and fears of losing deposits have reduced banks' involvement in the securities business. But, a system of PDs also involves providing them certain privileges, which might create an unequal field and restrict competition. For this reason, countries may prefer not to have them.

In most countries, PDs are obliged to take active part in the primary market by fulfilling a minimum bidding commitment, underwriting issues, and so forth. For example, in Mexico and Singapore each PD is required to bid an equal share of the auction amount. In others, they could be expected to bid a constant share of the primary issues (eg 10% in Malaysia). Many countries require PDs to provide two-way quotes in the secondary market, and in some they are obliged to maintain a minimum share in secondary market trade (eg 2.5% in Malaysia). In industrial countries, while PDs normally have an obligation to bid in the primary market and share information with the central bank, particularly relating to the "when issued" market, only a few countries (notably Belgium, France, Italy and the United Kingdom) impose an obligation to quote.

An important question is whether an obligation to quote might impair the financial health of PDs or, alternatively, lead to a high bid-ask spread, which could dampen trading and market liquidity. Some have argued that providing a relatively high spread is necessary for ensuring financial soundness of the PDs since markets tend to be volatile in their initial stages of development. This may provide a rationale for restricting competition among dealers and allowing them to reap monopoly rent in return for the externalities they create; see CGFS (1999). On the other hand, if a high spread discourages trading and reduces market liquidity, a fine balance between the market-making role of PDs and ensuring their financial viability may have to be struck.

In many countries, PDs have been granted certain privileges for their market-making role, including exclusive or restricted access to auction and central bank open market operation, access to non-competitive bidding, liquidity support from the central bank and the facility to borrow securities from the central bank. Some countries also provide PDs access to the interbank market (India), reduce their

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<sup>15</sup> The pattern is the same for industrial countries: Japan, Germany and Switzerland have a developed government bond market but without a system of primary dealers. In contrast, Canada and Italy have a two-tier PD system, where certain PDs have elevated rights and obligations; see Inoue (1999).

mandatory liquidity requirements (Malaysia) or guarantee that the central bank will act as a last resort supplier of bonds under certain conditions (Hong Kong).

Providing special privileges to PDs, nevertheless, raises a number of issues. One is whether giving a special credit line to PDs from the central bank compromises monetary policy objectives. If PDs enjoy a standing facility from the central bank, they can use it at their discretion and potentially affect monetary policy. Second, providing a short selling facility to the PDs, ie allowing them to sell a security not in their possession, might raise certain systemic risks (see the next section). In Mexico, the central bank has limited this risk by requiring PDs to submit collateral against securities lending and subjecting it to a “haircut” of 2% and a premium of 5% over the overnight rate. In Hong Kong, PDs can incur short positions within the margin limits imposed by the central bank, provided that the net aggregate position in all eligible securities held by a PD is not short. Borrowing the shorted security from the central bank is subject to collateral at a financing cost linked to the collateral. A third issue is whether privileges should be provided to PDs on an open-ended basis or only for a limited period. It has been argued that the monopoly position of PDs should not be treated as permanent since this can encourage inefficiency. As pointed out in the paper by Reddy in this volume, continued support from the central bank may also encourage PDs to take undue risks.

Another question is the criteria to be followed in selecting PDs. Given the nature of risks handled by PDs and the large capital base needed for their operation, banks and financial institutions are normally allowed to set up primary dealers. It is also argued that if banks have to take an active interest in setting up primary dealers, the regulatory costs need to be kept at a reasonable level, or they may not allocate sufficient capital for securities business; see IOSCO (1999a). More importantly, decisions need to be taken as to whether PDs should function both as brokers and as securities dealers, since the dual role could give rise to conflicts of interest, leading to problems of “front-running”. Nevertheless, keeping these functions completely separate (eg by having a separate capital requirement) might dampen trading and market liquidity. Finally, it has been argued that capital and regulatory requirements for setting up PDs should not be so strict as to block entry, creating an oligopolistic market structure.

## **4. Liquidity in secondary markets: policy and market microstructure**

Poor bond market liquidity can often be traced to lack of depth of the secondary markets. This raises the question of what central banks and treasuries could do to improve the depth of secondary markets and the role that market microstructures play in promoting bond market liquidity.

### **4.1 What could central banks and treasuries do?**

#### ***Repurchase transactions***

One important way in which central banks have been involved in enhancing liquidity in secondary markets is by using government securities as collateral for their lending operations. Repurchase transactions (“repos”) are said to be ideally suited to develop secondary markets since, unlike outright operations, they do not require a liquid bond market in the first place; they do not affect securities prices except indirectly; and they have temporary impacts on liquidity. Repos enhance bond market liquidity by allowing market participants to borrow against their securities portfolio, generally below the unsecured borrowing rate. As pointed out in the paper by Figueiredo et al in this volume, an important reason why the central bank in Brazil has preferred repos for conducting liquidity management operations is that outright operations can cause unintended volatility in bond prices and the yield curve. On the other hand, outright bond operations could be preferred when central banks intend to influence interest rates directly. Such operations also have a permanent impact on market liquidity. A recent example has been the intervention by central banks to address the liquidity impact of the 11 September attacks. Many central banks moved quickly to enhance liquidity and lower interest rate expectations in the securities market through outright bond operations. Collateralised lending operations backed by government bonds could also be an important way to improve liquidity, especially in countries relying on uncollateralised standing facilities for their monetary policy operations.

As Table 5 shows, central banks in most countries have introduced repos or collateralised lending facilities. While most central banks using repo operations typically lend/borrow against central government or their own securities, a few include other instruments as well. For example, Thailand uses state-guaranteed enterprise bonds for central bank repos along with government papers. Similarly in Malaysia, the central bank can conduct repos in any liquefiable security (with low counterparty credit risk and easily convertible into cash). In Mexico, bonds issued by some agencies and banking papers are also included for repo operations.

Table 5

**Repo and collateralised lending by central banks**

	<b>Government papers</b>	<b>Central bank own papers</b>	<b>Other securities</b>
China	√		
India	√		
Hong Kong	√		
Singapore	√		
Indonesia	√	√	
Korea	√	√	Government-guaranteed bonds
Malaysia	√	√	Liquefiable assets (with low counterparty credit risk; easily convertible in large sums into cash at short notice)
Philippines	√	√	
Thailand	√		Government-guaranteed state enterprise bonds
Brazil	√	√	
Chile		√	
Colombia	√	√	Bonds issued by two government agencies
Mexico	√	√	Some agencies and banking papers
Peru	√	√	
Czech Republic		√	
Hungary	√	√	
Poland	√		
Israel			Repo market under consideration
Saudi Arabia	√		

Source: Central banks.

Secondary market liquidity could also be improved by encouraging interbank repos in government bonds. In many countries, however, the interbank repo market is not well developed and the overnight market for funds is largely uncollateralised. One reason could be lack of a liquid term money market, which makes it difficult for market participants to borrow or lend beyond overnight using government securities. Second, if the interbank market is shallow, a proper benchmark interest rate may not develop, complicating the pricing of repos. Third, lack of sound collateral and inclusion of repo



transactions in the instruments eligible for reserve requirements have hampered development of the repo market in some countries. Fourth, the presence of a large number of weak financial institutions, absence of proper legal remedies in case one party fails to deliver its commitments and high settlement risks could heighten counterparty credit risks. Lastly, as pointed out by Kim, S (2001), an important reason for the underdevelopment of the interbank repo market in Korea has been that financial institutions are relatively insensitive to credit risk in their short-term lending operations and have preferred uncollateralised to collateralised lending.

### ***Securities lending/borrowing operations***

Many have pointed out the importance of securities lending/borrowing transactions in boosting market liquidity. This requires permitting market participants to short sell a security and, at the same time, enabling them to borrow the shorted security temporarily from its owner with a contractual obligation to redeliver at a later date. Securities lending operations promote liquidity by preventing settlement failures and increasing arbitrage opportunities. Another potential benefit of securities lending transactions is that they provide opportunities for fund managers and institutional investors to earn additional income from their idle security holdings. This, in turn, has implications for fund flows in the money market. Primarily because of their favourable impact on market liquidity, many industrial economies relaxed restrictions on domestic and cross-border securities lending transactions during the 1990s.

Only a few EMEs (notably Hong Kong, Mexico and Singapore) allow short selling. One reason could be poor risk management practices on the part of market participants and the heightened risks to the financial system. Securities lending transactions require market participants to manage actively all aspects of risks arising from such operations. This includes continuously assessing credit risks arising from the probability of failure of one party to deliver, managing market risks stemming from changes in collateral values and instituting an adequate internal control system for monitoring risk exposure limits; see IOSCO (1999b). Second, underdeveloped market infrastructure, particularly the payment and settlement system, could restrict the potential use of securities lending transactions as they involve complex settlement procedures, including a shorter settlement cycle and the need for settlement at both ends of the operation. Third, lack of an adequate legal system to ensure strict enforceability of financial contracts and bankruptcy laws could restrict the use of securities lending transactions to boost bond market liquidity.

Finally, systemic implications of securities lending transactions could be a concern. Since such transactions encourage high leveraging by market participants and provide additional channels by which shocks can be transmitted through the securities market, they pose systemic risks especially to weak and undersupervised financial systems. A major risk could also arise from the possibility of speculators using the securities lending facility to short the domestic currency.

Nevertheless, many have argued that these risks can be controlled through proper regulation of the financial system. In countries whose financial systems are well supervised and strong, allowing short selling by market participants could help develop a liquid bond market. However, it requires deciding on who should be allowed to short a security – whether only securities dealers or banks and others as well – and the securities that can be shorted. In the meeting, several countries saw developing a “when issued” market as a first step in introducing a short selling facility. There was a general consensus among the central banks that short selling can have an important stabilising influence on the bond market as market volatility was generally higher when market participants did not have recourse to short selling to alter their portfolio.

### ***Developing benchmarks***

Developing certain benchmark securities with high liquidity characteristics has been considered important in improving liquidity in bond markets. Benchmarks are important not only for developing a risk-free yield curve but also for reducing the servicing costs to government. Savings to government from selling benchmark issues are estimated to be in the order of 5-15 basis points in developed countries; see Goldstein and Folkerts-Landau (1994). Moreover, the availability of benchmark securities with different maturities (regarded as “on-the-run” issues) helps develop hedging markets and improve trading since the prices of these securities trade close to par and are thus better able to capture the market interest rate. Another important benefit of benchmark securities is that they are preferred by active traders and are less likely to be cornered by investors who hold to maturity; see

CGFS (1999). In addition, development of a benchmark yield curve could encourage mark to market practices and increase trading volumes.

However, developing benchmarks may also pose several challenges. First, debt managers may not be able to push forward the maturity structure when the degree of macroeconomic uncertainty is high and dampens demand for long-term instruments. Few countries have substantial bonds with maturity beyond 10 years. Bonds are also limited in the five to 10-year maturity range in many countries (see Table 11 on page 32). The average maturity of government stocks tends to be shorter in Latin America and central Europe than in Asia.<sup>16</sup> Despite recent progress in issuing longer-maturity papers, the average maturity has changed only a little (Table 6). Moreover, where most investors “buy and hold”, the scope for developing benchmark issues could be limited. The large stock of non-marketable debts, mainly saving bonds and special purpose government bonds, also reduces the availability of benchmark instruments.

Table 6  
Average remaining maturity of outstanding government bonds (years)

	1990	1995	1998	2000
India	...	...	6.5	7.1
Hong Kong	...	...	1.4	1.2
Singapore	3.1	3.4	3.8	4.1
Indonesia	...	...	...	6.0
Korea <sup>1</sup>	...	...	6.0	5.2
Malaysia	8.1	5.2	5.2	4.7
Philippines	15.0	17.3	13.5	14.7
Brazil	0.7	0.7	1.7	2.5
Colombia	...	2.0	4.4	3.5
Mexico	...	0.8	1.2	1.5
Peru	7.0	7.6	7.2	6.4
Czech Republic	...	1.4	1.0	1.7
Hungary	0.5	1.0	1.5	2.3
Poland	...	...	4.5	2.6
Israel	6.4 <sup>2</sup> /0 <sup>3</sup>	5.2 <sup>2</sup> /10.0 <sup>3</sup>	4.4 <sup>2</sup> /13.0 <sup>3</sup>	3.6 <sup>2</sup> /11.1 <sup>3</sup>
Saudi Arabia	2.0	6.5	6.5	6.0

<sup>1</sup> Distribution by original maturity. <sup>2</sup> Domestic. <sup>3</sup> International.

Source: Central banks.

A strategy followed by many countries in developing benchmarks has been to concentrate issuance on a few important maturities. This avoids the problem of market fragmentation arising from issuing a large number of maturities with small issue size. For example, major industrial countries have generally concentrated on issuance of four to seven maturities; see Inoue (1999). In EMEs, the benchmark status of securities varies widely across countries (column 3 of Table 1) and a particular problem is that only one or two maturities are heavily traded.

<sup>16</sup> Hong Kong is a major exception, as the average maturity is just above one year.

Nevertheless, many countries have taken specific initiatives to develop benchmark issues. Korea integrated the issuance of Grain Fund Bonds into treasury bonds, which increased the share of marketable bonds in new issuance. In addition, in order to increase the supply of a three-year benchmark issue, the average size of issuance was doubled between 1998 and 2001. Many countries have also followed the practice of reissuing an existing loan to consolidate maturities and develop benchmarks. For instance, India has followed a strategy of “passive consolidation” of securities by reopening the existing highly demanded loans; RBI (2001). Similarly, in Thailand, for the first time, in 2000, the debt manager replaced a large amount of maturing stocks by reissuing them with the existing terms and features; MOF, Thailand (2001). In Singapore, the policy has recently shifted towards replacing a maturing security with a new issue with similar tenor and fixing a minimum size for benchmark issues.

Countries with low fiscal deficits have tried to develop benchmarks by buying back the less liquid securities through bond conversion, outright repurchases (alternatively known as “coupon pass”) and reverse auctions and replacing them with new liquid instruments.<sup>17</sup> An important recent example is Canada, which uses quarterly reverse auctions to call back old loans before they mature so as to keep a constant supply of benchmark issues; see Gravelle (1998). Similarly, Singapore introduced reverse auctions to buy back small-sized, off-the-run securities. Other countries could also use buyback options to increase benchmark issues. One problem could arise if the original bond contract did not contain a buyback option. This would call for legal changes in the local security law. For instance, the new debt management law in Thailand includes a provision enabling the debt manager to buy back a government security. Second, if institutional investors hold most of the illiquid bonds, the success of buyback operations would critically depend on the extent to which these investors are willing to change their portfolio.

### ***Mark to market practice***

A key issue in improving secondary market liquidity is the extent to which bondholders are required to mark their portfolio to market. Absence of mark to market practices encourages investors not to book accrued gains and losses in their portfolio, reducing the incentive to trade. Even where mark to market practices are in force, it remains to be decided how frequently securities should be valued and whether valuation should be at a fixed point or at the time of sale. Needless to say, this decision affects the sale and purchase decisions. As can be seen from Table 7, few countries require their banks and other institutional investors to fully mark to market. Many have regulations that differentiate according to the type of instruments and their holders. In Israel, bonds designed to be “held to maturity” are not marked to market and institutional investors are exempt from mark to market requirements. In Chile, instruments that have a secondary market are marked to market. In the majority of countries, only trading portfolios are marked to market and those “held to maturity” are valued at cost price. Some countries (India) restrict the holdings that can be put under the “held to maturity” category. Not all countries require banks and institutional investors to mark to market on a daily or monthly basis.

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<sup>17</sup> In a typical bond conversion operation, the bondholders are given the option to convert their holding of less liquid bonds to more liquid benchmark issues, with the conversion rate being either decided at auction or predetermined by the government. In an outright repurchase operation, the government would ask the dealers to sell it securities of a particular maturity range at their offer price or directly ask the bondholders to sell in the “over-the-counter” market. A reverse auction is the opposite of the regular bond auction, where the bidders submit their offers to sell rather than buy securities.

Table 7

**Mark to market practices**

	<b>Institutions required to mark to market</b>	<b>Nature of mark to market (MMT) practices</b>
India	Banks, financial institutions, mutual funds	Bonds held by banks and financial institutions for trading purposes or available for sale must be MTM monthly and quarterly respectively Bonds held by mutual funds must be MTM daily
Hong Kong	Banks	Bonds held for trading purposes must be MTM
Singapore	Banks, IIs	Bonds held for trading purposes must be MTM (adoption of fair value standard for the accounting of financial instruments is under way)
Indonesia	Banks, IIs	Bonds held for trading purposes must be MTM
Korea	Trust accounts, banks and IIs	All investment grade bonds held in trust accounts in banks, investment trust companies and mutual funds must be MTM daily In addition, bonds held by other financial institutions (banks, merchant banks, securities companies and insurance companies) for trading purposes (available for sale) must be MTM quarterly
Malaysia	Banks	Bonds held for trading purposes must be MTM
Philippines	Banks	Bonds held for trading purposes must be MTM Bonds held indefinitely to meet liquidity must be MTM
Thailand	Banks, IIs	...
Brazil	Banks	...
Chile	Banks, pension funds, insurance companies	Instruments in the secondary market must be MTM
Colombia	Banks, IIs	Bonds held for trading purposes must be MTM
Mexico	Banks, pension and mutual funds	Bonds held by banks for trading purposes must be MTM Portfolios held by pension and mutual funds must be MTM daily
Czech Republic		Bonds to be sold must be MTM Trading portfolios must be MTM daily
Hungary	Banks, investment and pension funds, Insurers	Trading portfolios for banks and investment companies Unit-linked portfolios for insurers Whole portfolios (on a daily basis in case of public open-end funds) for investment funds Provision on daily MTM valuation will come into force on 1 July 2002
Poland	Banks, IIs	Bonds held by banks for trading purposes must be MTM Less liquid bonds are valued according to a fair value rule
Israel	Banks	Bonds held for trading purposes or available for sale must be MTM
Saudi Arabia	Banks	Bonds in the trading account must be MTM

Note: IIs: institutional investors.

Source: Central banks.

An important constraint in marking to market could be the lack of risk management practices among the large public sector pension and insurance companies. One view is that since these institutions have fixed future liabilities, they could better achieve their objectives by holding assets that provide them assured fixed cash flows. A strategy based on active trading of their holding of bonds would expose them to market risks. The counterview is that to the extent that these investors are sheltered from competition and hide x-inefficiencies, the return they provide to their investors is low. Therefore, regulations that require them to mark their portfolio to market would encourage them to pay a higher return to their clients. One example is Korea, where the introduction of mark to market practice for bonds held in the trust accounts of banks and investment trust companies has resulted in an increase

in trading volume, reflecting more aggressive trading behaviour by these bondholders. Ultimately, reforming the pension and insurance sector could fully mitigate this problem. An important question raised in the Singapore paper is whether the government and the central bank should take a proactive approach in educating corporate treasurers and fund managers about sophisticated risk management operations so as to improve their interest in government securities.

Another constraint could arise from the weakness in the banking sector, which might restrict the extent to which full mark to market practice could be introduced. On the other hand, the absence of proper mark to market practice for banks could have adverse implications for the financial system. As pointed out in the paper by Al-Jasser and Banafe in this volume, a large part of banks' holding of government securities in Saudi Arabia is marked at cost and this encourages them to run a large unhedged interest rate exposure.

A third practical problem that may arise is the lack of adequate pricing guides for marking to market. India has addressed this problem by entrusting the primary dealers with making available a reference curve to market participants (see Box 2). Korea has launched a similar initiative by establishing private pricing agents, which will provide accurate information on bond prices for mark to market valuation. Mexico has set up independent price vendors for this purpose. The central bank also publishes its own prices on a daily basis as a benchmark for evaluating the performance of price vendors; see the paper by Sidaoui in this volume.

#### Box 2

##### **Construction of a fair value curve – the Indian experience**

In the absence of a proper benchmark yield curve, prior to March 2000, the Reserve Bank of India (RBI) used to make available pricing guidelines to banks and other market participants at the end of the financial year for valuing their government securities portfolio. The RBI changed this system to a new arrangement under which the Fixed Income Money Market and Derivative Association of India (FIMMDA) and the Primary Dealers Association were given the responsibility of arriving at market prices that could be used for valuation purposes.

After consulting a group of experts, the FIMMDA has developed a system of constructing a fair value curve through the Bloomberg service provider. The methodology uses prices of 15 top benchmark securities from maturity ranges between one and 20 years polled from various active market participants at 4 pm on every working day. The data collection is automatic as Bloomberg provides a special page where the participating banks put their bid and offer prices at 4 pm for selected benchmarks which are then transferred to Bloomberg's valuation system. To ensure a system of checks and balances, a three-member group chosen on a rotating basis from participating institutions is required to vet the accuracy of the data at the end of each month. The group also reviews the benchmark securities to be included.

Bloomberg uses a three-step procedure to generate fair market curves for many bond sectors. First, a bond map is generated using the screen data. Then multiple term structures are iterated. Finally, the best-fit term structures are derived and applied to obtain fair values for unpriced bonds.

Source: FIMMDA, March 2001.

In countries where swap markets are well developed, a swap curve could provide an alternative for valuing fixed income securities. Swap markets are usually very liquid and swaps can be issued frequently without requiring a position in underlying assets. Swap rates also tend to be highly correlated with yields on fixed-income securities such as corporate bonds and mortgage-backed securities. However, unlike government bond yields, they embed the credit risk of the counterparty. Because of these features, swap curves have been used extensively as a close substitute for sovereign yield curves for marking to market. For example, the use of swap curves for pricing fixed income securities has seen a substantial growth in industrial countries, with the shrinking supply of new sovereign benchmark issues; see Ron (2000).

Among EMEs, currency and interest rate swap markets are fairly developed in Chile, Hong Kong, and Singapore. Recently, interest rate swaps have been introduced, for example in India, Peru, Poland

and Saudi Arabia. Swap markets have not, however, picked up substantially in many countries due to the lack of a deep interbank market. The key players in swap markets are usually foreign banks.

### ***Broadening the range of instruments***

Could broadening the range of instruments help deepen the secondary market? The choice of debt instruments typically depends on several considerations: market preference, cost to government and, in some cases, monetary policy objectives. In Latin America and some central European countries, the pattern has been to issue floating rate bonds and bonds indexed to inflation or the exchange rate. In Saudi Arabia, floating rate notes were introduced in 1996 to broaden the range of instruments and diversify price risk. Investors' preference for floating rate bonds is generally high when they are uncertain about the level of future interest rates; this could also be an easy means for governments to borrow. But floating rate bonds usually shorten the maturity profile of debt, transfer market risks to the government and might constrain monetary policy from raising interest rates. Country experience with floating rate bonds suggests that lack of a suitable benchmark rate has restricted development of FRN markets. To overcome this problem, central banks in Latin America have been publishing a key reference rate, which is used widely for benchmarking FRNs.

Indexed bonds are more attractive to long-term investors, who prefer a fixed real return on their assets. They could also reduce interest costs to the government by eliminating the inflation risk premium and serve a useful monetary policy function by providing a market indicator of inflation expectations; governments might also use them to enhance the credibility of their anti-inflation programmes. Exchange rate indexed bonds could also attract investors, although they pose the problem of exposing governments to external shocks. However, as discussed in the paper by Sidaoui in this volume, in Mexico liquidity in inflation-indexed bonds has been rather poor since most of these bonds are held by pension funds, which do not trade actively.

Many countries have issued market-friendly debt instruments such as zero coupon discount bonds. These instruments offer special cash flow advantages to investors and may temporarily reduce government borrowing costs. In Mexico, for instance, zero coupon bills (*cepes*) have the second largest annual turnover in the secondary market. Another method designed to deepen the secondary market is to allow "stripping" of securities, by which a conventional security could be allowed to trade as two separate bonds, one for the coupon payment and the other for the principal payment. Stripping can accommodate diverse cash flow needs of investors and thus broaden the investor base and improve secondary market liquidity. Chile's experience shows how bond stripping can help improve liquidity; see the paper in this volume by Cifuentes et al. While the central bank issued long-term bonds to establish benchmarks, the coupon payments from these bonds complicated the determination of a yield curve since coupons also included some amount of capital. Since the introduction of stripping in 1999, the benchmark status of these bonds has improved significantly.

Developing forward and futures markets in government bonds constitutes another strategy for enhancing liquidity in secondary markets. They increase hedging activity and promote risk management practices. Since cash and futures markets are closely linked by flow of information and expectation, the overall liquidity effects of futures markets in government bonds could be substantial. Many countries have started to see this impact. An important example is Korea. Since the government relaxed restrictions on futures trading in government bonds there has been a sharp rise in futures contracts; trading in the futures market has exceeded that in the spot market since the beginning of 2001. In Singapore, the recent narrowing of swap spreads is attributable to the liquid market for derivatives. The government has recently introduced five-year bond futures. In Chile, derivatives on central bank issued paper constitute an important segment of the futures market (banks can also make derivatives on corporate bonds and mortgage-backed securities), although banks have generally preferred derivatives based on foreign currencies to those based on sovereign bonds.

### ***Taxation issues***

Because taxes on transfers of financial instruments impose an explicit transaction cost, their removal can improve trading and liquidity in bond markets. On the other hand, it is argued that income from government securities should be subject to normal income tax in the same way as private debt instruments. A similar argument applies to providing special tax benefits to government bonds, because of their potential crowding-out effects. But, if income from government securities is withheld, it could add to operational costs when securities frequently change hands, requiring adjustment of the

tax component in the bond price. For these reasons, many industrial countries have abolished explicit transaction taxes on government securities and restricted withholding tax to individuals.

Taxation arrangements concerning government securities vary significantly across countries (Table 8). Many countries do not tax government bonds of any form. A few countries levy an explicit tax on financial transactions but most exempt government security transactions from stamp duty. Withholding tax appears to be a common feature in many countries; a few apply it at a reduced rate compared to the general income tax rate and differentiate between residents and non-residents. In Korea, the levy of withholding tax was changed recently from the point of transfer to the point of coupon payment to facilitate securities lending and repo operations.

Table 8  
Tax arrangements for government bonds

	Are stamp duties applied to trades on govt bonds?	Transaction tax	Are withholding taxes applied to interest on government bonds?
China	Yes	...	No
India	No	No	Only for foreign institutional investors
Hong Kong	No	No	No
Singapore	No	No	No
Indonesia	No <sup>1</sup>	No	Yes, 15%
Korea	No	No	15% for residents, different rates for others
Malaysia	No	No	20% for non-residents
Philippines	Yes, only on the primary market issues		Yes, at the point of interest payment (20%)
Thailand		Equivalent of US\$ 2.25 per transaction for institutions; \$0.50 for individuals	1% for domestic institutional investors 15% for individual investors 15% for non-resident investors
Brazil	...	0.38%	20% for residents 15% for non-residents
Chile	No	No	No
Colombia	...	...	Yes, 7%
Mexico	No	No	No
Peru	No	No	No
Czech Republic	No	No	15% on coupon payments for residents
Hungary	...	...	0% on income on government bonds (otherwise 20%), different rates for non-residents
Poland	No	No	Legal entities: interest and discount income as well as income from sale of treasury securities are subject to income tax. Private persons are exempt from taxes
Israel	Yes, on the secondary market	...	Yes
Saudi Arabia	No	No	No
<i>Memo</i>			
United States	–	No	No
Japan	–	No	Yes
Germany	–	No	Yes
United Kingdom	–	No	No

<sup>1</sup> Except a very small amount charged to the sellers.

Source: Central banks.

## 4.2 Issues in market microstructure

It has been well recognised that trading arrangements and the degree of market transparency have an important influence on the price discovery process and market liquidity. A trade execution process that leads to more competition among traders and improves the information flow to market participants is generally said to lower spreads and increase liquidity. There is an unresolved debate in the market microstructure literature about what constitutes an ideal market structure for boosting trading and liquidity in bond markets.

### *Trading arrangements*

An important advantage of a dealer-based or “quote-driven” market is that it provides greater immediacy to traders and guarantees them liquidity even under uncertain market conditions. A dealer-based market might also reduce the clearing and settlement burden by reducing the number of players among whom cash and securities transactions have to be squared. Some have also argued that since price discovery in government bond markets is relatively easy, given the fact that traders are guided by benchmark securities, an organised exchange may not seem all that important for reducing transaction costs. This explains why bond markets in many industrial economies tend to be quote-driven markets. On the other hand, organised exchanges are said to lead to more efficient price discovery since they enhance the information flow among traders and lead to more informed trading behaviour. In countries where the degree of competition in bond markets is low, dealers might extract monopoly rent by keeping their bid-ask spreads at a relatively high level. This would argue for centralised order processing through organised exchanges. Moreover, organised exchanges facilitate development of futures markets.

In most EMEs, trading in government bonds is through dealer-based OTC markets. There are, however, important exceptions. In Israel all trading in government bonds take place through stock exchanges, while in Chile pension funds are required to trade in stock exchanges. In Colombia, trading in electronic stock exchanges accounts for roughly half of the total trading in government bonds. Country experiences differ with respect to the success achieved in enhancing trading of government bonds in organised stock exchanges. For example, while the national stock exchange in India provides facilities for wholesale trading of government bonds under transparent market conditions, the volume traded is significantly lower than that in the OTC market. One of the reasons why electronic trading in Korean stock exchanges has not picked up is the prevalence of broking through personal networks between dealers and institutional investors. In many countries, trading has been relatively low although government bonds are listed on the stock exchange. Possible reasons include high transaction costs due to thinness of markets, a low degree of market transparency and high settlement risks.

### *Market transparency*

It is argued that a transparent market that disseminates pre-trade and post-trade information to traders lowers spreads, improves efficiency and attracts more participants by increasing their confidence in the pricing process. This is particularly so if the bond market is dominated by a few informed traders who can extract better prices from less informed traders. It is also argued that transparency and market efficiency are non-linearly related; high transparency beyond a point may increase price volatility, expose market-makers to undue risks and might even increase spreads by reducing dealers' need to compete for order flows. See Bloomfield and O'Hara (1999) and CGFS (1999).

Market transparency relates to the functioning of both primary and secondary markets. Many argue that the best possible course to improve primary market transparency is to preannounce an issue calendar and publish maximum information about post-auction results. Publishing an issue calendar would demonstrate governments' commitment to accept the price generated in auction; it would also help market participants to formulate their bidding strategy in advance. An issue calendar could also have significant informational value by promoting a “when issued” market. A major disadvantage, however, is that the government loses the flexibility to deal with market uncertainty if it precommits to an issue calendar. Publishing a wide range of information on post-auction results would enhance investors' confidence in the auction process and improve their bidding skills. For example, the usual practice followed in OECD countries is to publish post-auction information on the volumes of bids, allotments made, weighted average yields and the spread between the average and lowest accepted price immediately after the closing of auction.



Although most EMEs have regular auction schedules and typically announce the size of auction a few days in advance (generally not exceeding seven days), only some announce an issue calendar (Annex Table A1). Only a few prefer to announce one on an annual basis. India has an issue calendar for treasury bills, announced on a half-yearly basis. An important constraint faced by the Reserve Bank of India in announcing an issue calendar for bonds is the volatility in the government's borrowing requirement, which calls for flexibility of both issue size and timing to minimise its impact on interest rates; see Thorat (2001). While Mexico announces a quarterly calendar, it discloses the maximum amount on offer and the minimum possible amount for each security, which gives it flexibility to change the composition at the auction in response to changes in market conditions. In Israel, the size and timing of the auction are announced one month in advance. Singapore publishes an annual calendar but the exact size is made known a week prior to the auction date. An example of strict adherence to an issue calendar is Hong Kong, where the central bank announces an auction schedule every second month of each quarter for the subsequent quarter, followed up by confirmation of dates and issue size one week prior to the auction. "When issued" markets are non-existent in many countries. In Mexico the market is allowed to trade a security three days in advance of its actual issuance. In some countries, for example Korea, a "when issued" market has developed at the demands of the market participants rather than due to a strategy to develop a domestic bond market.

In recent years, many EMEs have introduced systems and practices for improving the degree of transparency in secondary markets. For example, Korea has introduced a system of inter-broker dealers in order to facilitate centralised dissemination of information about dealers' order flows. In India, a negotiated dealing system is being introduced that will facilitate electronic bidding and dissemination of information on trade flows on a real-time basis. Many countries have introduced legal changes empowering regulatory authorities to promote transparent market practices, impose prudential and supervisory standards over market intermediaries and improve surveillance of market transactions. One question is: who should regulate the government security market — the central bank or a security regulator? Another question concerns the extent to which the principle of self-regulation should apply to market intermediaries in government securities. In many countries, the trend has been to let the industry association of dealers develop a code of conduct for market intermediaries and to collect and disseminate information on volume and prices of trade flows.

### ***Clearing and settlement system***

In most countries, the clearing and settlement system in government bonds is centralised at the central bank (Table 9). Most economies seem to follow a book entry system of clearing and have introduced a delivery versus payment system (DvP). Some economies (for example, Colombia, Hong Kong, Israel and Singapore) have considerably reduced settlement risks by adopting electronic settlement systems with same- or next-day clearing of funds and securities. A settlement system based on gross principles requires market participants to be able to access intraday or overnight credit facilities from the central bank. This raises the issue whether central banks should be responsible for providing a credit facility to the participants for clearing and settlement in government securities and what consequences this might have for their liquidity management operations.

Another concern may arise from the transaction costs of the clearing and settlement system. Bond trading could be adversely affected when transaction costs are high. In Poland, high transaction costs for settlement have encouraged banks to avoid the national depository for securities settlement; instead, they have settled funds among themselves while giving lending advice to the settlement authority for effecting securities transfers.

Table 9

**Settlement system for government securities**

	<b>Nature of clearing and settlement system</b>
India	Settlement system centred at the CB (bonds transferred by DvP)
Hong Kong	Book entry system at the CB (settlement date T+0; DvP; RTGS)
Singapore	Book entry system at the CB (settlement date T+1; DvP; no physical transfer of bonds is necessary)
Indonesia	Book entry system at central registry at CB and a number of licensed sub-registries; (bonds transferred by DvP or "free of payment" method)
Korea	Book entry system for government bonds at the CB, for other bonds at the Korea Securities Depository (settlement date T+0)  DvP system was introduced in 1999 but it covers only 30% of bond trades (other 70% of trades are implemented by traditional "free of payment" method)
Malaysia	Settlement system centred at the CB (RTGS)
Philippines	Settlement system centred at the CB (RTGS under way)
Thailand	Book entry at the CB for government securities (settlement date T+2; electronic real-time DvP method under way)  Book entry at the Thailand and Securities Depository Co for corporate securities (settlement date T+2)
Brazil	Settlement system centred at the central bank and the national treasury (RTGS and settlement date T+0 planned for April 2002)
Chile	Settlement system centred at the central securities depository
Colombia	Settlement system centred at the central securities depository (settlement date T+0; RTGS)
Mexico	Book entry at the central securities depository (settlement at T+0, DvP)
Peru	Settlement system centred at the central securities depository
Czech Republic	Settlement and clearing centred at the Prague Stock Exchange (DvP under preparation)
Hungary	Settlement system centred at the Central Clearing House & Depository Ltd (security leg of the transactions and money leg of transactions made by investment companies) and at the central bank (money side of transactions made by banks)  For stock exchange transactions multilateral net settlement system is applied (T+2, DvP), for OTC transactions (RTGS, T+0, DvP)
Poland	Bonds: book entry system at the National Depository for Securities (settlement date T+2)  Bills: book entry system at the Central Registry of Treasury Bills at the NBP
Israel	Settlement and clearing centred at the Tel-Aviv Stock Exchange Clearing House, which acts as a central securities depository (settlement date T+1; DvP method)
Saudi Arabia	Book entry system at the CB (settlement date T+2; DvP, RTGS)

Note: RTGS = real-time gross settlement; DvP = delivery versus payment.

Source: central banks.

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Annex Table A1

## Structure of the primary market, issuing techniques

	Are bonds issued by periodic tenders?	Frequency of tenders		Is there a preannounced calendar?	Is the size of auction announced in advance?	Type of auction	Typical average issue size <sup>1</sup>	Is "when issued" trading allowed?
		Bills	Bonds					
China	Yes	Bonds are issued to institutional investors (10 times a year) or to individual residents over the counter at commercial banks (3 times a year)		Yes, quarterly basis	...	Multiple price sealed tender method for bearing securities Uniform price sealed tender for discount securities	2,400 – 9,600	...
India	Yes	W		Yes, but only for T-bills (half yearly)	Yes, with the calendar for T-bills (in the case of dated securities, the amount is announced three days in advance)	Multiple price sealed tender method for 364-day T-bills and bonds Uniform price sealed tender for 91-day T-bills	400 – 1,300	Non-existent, but successful bidders are allowed to sell on the same day before transfer of securities
Hong Kong	Yes	W, F, M	Q	Yes	Yes	Multiple price	60 – 500	Yes
Singapore	Yes	W		Yes, yearly basis	Yes, 7 days before	Uniform price	400 – 1,400	Yes
Indonesia	No	...	...	...	...	...	...	...
Korea	Yes		W	Yes	Yes, 3 days before	Uniform price	1,500	Yes, but the market is not well organised
Malaysia	Yes		Q	Yes, yearly basis	Yes, 7 days before	Multiple price	500 – 1,300	Yes
Philippines	Yes	W	M, Q	No	Yes, 2 days before	Uniform price	90	No
Thailand	Yes	W	W	Yes	Yes	Electronic bidding expected late 2001/early 2002	670	No

Annex Table A1 (cont)

	Are bonds issued by periodic tenders?	Frequency of tenders		Is there a preannounced calendar?	Is the size of auction announced in advance?	Type of auction	Typical average issue size <sup>1</sup>	Is “when-issued” trading allowed?
		Bills	Bonds					
Brazil	Yes	W, M	W, M	Yes	Yes	Multiple price Uniform price	No typical size	Yes, incipient stage
Chile	Yes	Twice a week	W	Yes	Yes		9 - 88	Non-existent
Colombia	Yes		W	No	Yes, 2 days before	Uniform price	200	Non-existent
Mexico	Yes	W	M	Yes, quarterly basis	Yes, but only total size	Multiple price Uniform price for fixed coupon notes	105 - 2,100	Yes 96 hours in advance
Peru	No			No	Yes	Uniform price	...	...
Czech Republic	Yes		M	Yes	Yes	Multiple price		Yes
Hungary	Yes	W, F	M, Q, H	Yes	Yes	Multiple price		
Poland	Yes	W	M	Yes, yearly basis	Yes, 7 days before	Multiple price	700 - 900	Non-existent
Israel	Yes		W	...	Yes, 30 days before	Multiple price	0.05 - 0.15	Non-existent
Saudi Arabia	No	W	M	Yes	Yes		1,300 -1,900	Non-existent

Note: W = weekly; F = fortnightly; M = monthly; Q = quarterly; H = half-yearly.

<sup>1</sup> In millions of US dollars.

Source: Central banks.

Annex Table A2  
Role of primary dealers

	Number of designated primary dealers	Obligations	Privileges from central bank
India	17	To take active part in primary and secondary market (broaden investor base and maintain a liquid secondary market) by providing two-way quotes To function as underwriters To fulfil bidding commitment	Allowed to keep securities with the central bank Access to interbank market Liquidity support from central bank
Hong Kong	26	To take active participation in primary and secondary markets (broaden investor base and maintain a liquid secondary market)	Exclusive right to deal with the CB in the secondary market CB acts as last resort supplier of Exchange Fund paper under certain conditions Allowed to incur short position in Exchange Fund paper
Singapore	12	To provide liquidity to Singapore Government Securities (SGS) market by quoting two-way prices To provide market feedback to central bank Assist in the development of SGS market	
Korea	30	To obtain at least 2.0% of annual primary issues To provide liquidity to market by quoting two-way prices and accept orders with face value equivalent of US\$ 400,000 at the quoted prices To provide market feedback to government	Exclusive rights to bid at government bond auctions Exclusive access to dealer financing with a maturity of one month or less from government at a low rate
Malaysia	12	To participate in money market auctions undertaken by the central bank To bid at least 10% in primary issue of selected securities To make market for securities by providing two-way price quotations, and selling/buying them at quoted price	Access to CB discount window facility Undertake repos and reserve repos of less than 1 month maturity from non-licensed financial institutions
Philippines	38	To take an active part in primary and secondary markets	
Thailand	9	To take an active part in primary and secondary markets To facilitate conduct of open market operations	Exclusive channel whereby central bank conducts outright open market operations

Annex Table A2 (cont)

Brazil	25	...	...
Colombia	...	To obtain 4% of total amount of TES B bonds auctioned	Exclusive access to primary market and second-round auctions of bonds
Mexico	5	To bid at primary auction for cetes and bonos To maintain constant prices for cetes and bonos on secondary market	Access to securities lending from central bank Right to bid for government securities in non-competitive auction
Czech Republic	...	To underwrite at least 3% of Government bonds offered in a quarter To allow access to other investors, including retail	Direct access to primary market Sole or preferential access to secondary market
Hungary	13	Quote prices for a determined group of government securities to ensure liquidity in secondary market	Exclusive right to support issue of bonds and T-bills
Poland <i>Memo</i>		In 2002 the Ministry of Finance will introduce a system of Treasury Securities Dealers	
United States	37	To bid in auctions To report	
France	12	To quote To bid in auctions	
United Kingdom	16	To report To quote To bid in auctions To report	