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## IV. Special feature: Size and liquidity of government bond markets

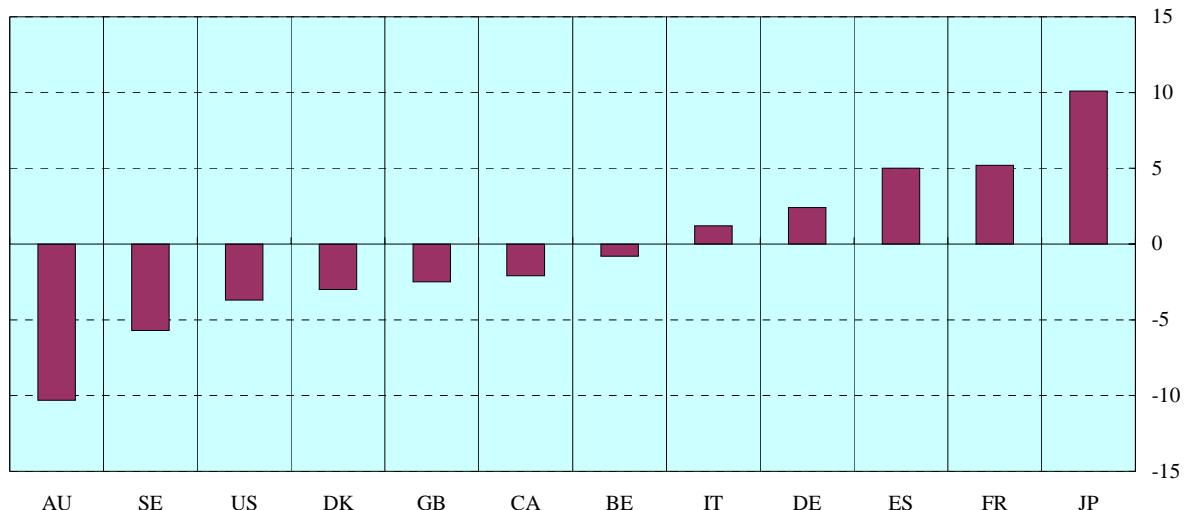
Feast and famine have hit government bond markets simultaneously. While the US Treasury market is shrinking the fastest in absolute terms, fiscal surpluses in such countries as Australia and Sweden would on present trends eliminate their central government debt ahead of those in the United States (Graph IV.1). At the other end of the spectrum, Japan's fiscal deficits are producing the world's biggest government bond market, while those of France and Spain are serving to maintain the size of the euro-denominated market. At the same time, some emerging market countries are having to increase their public sector debt to finance the recapitalisation of distressed banking systems.

As different as their fiscal circumstances may be, most governments have revealed a common interest in fostering market liquidity. In pursuing this goal, policymakers have regarded various dimensions of the size of the market as key considerations. In several industrial countries, where budget surpluses are shrinking debt, the authorities are trying to preserve liquidity by maintaining gross issuance in specific securities even as net issuance in all securities declines. The finance ministries in emerging market countries view growing debt as providing an opportunity to develop domestic bond markets – private as well as government – to reduce not only the cost of borrowing but also reliance on overseas financing in foreign currency.

After briefly describing the emergence of liquidity in some markets, this article takes up the question of the critical size for a liquid market. It then discusses one way of creating size: through lumping together different types of debt. Next it characterises the trade-off between size and crowding-out. Finally, it raises some issues concerning the transition in growing and shrinking markets.

Graph IV.1  
**Estimated net issuance in 2000 as a proportion of outstanding debt**

Net issuance of government bonds as a percentage of outstanding debt



Sources: Salomon Smith Barney; JP Morgan.

## The search for liquidity

Government bond markets in advanced economies arose as a by-product of the need to finance fiscal deficits. National treasuries learned that funds could be obtained more reliably and cheaply if issuance procedures, secondary market organisation and settlement mechanisms were adapted to the convenience of private investors and dealers. As market liquidity developed, government bonds became benchmarks for pricing other securities, provided means of hedging and positioning in both duration and volatility, and served as bases for futures market contracts and as collateral for secured borrowing. The benchmark role, however, does not appear to be a necessary one for all countries: the US corporate bond market, for example, was already fairly liquid before World War I, when there was little government debt. Nonetheless, a government bond market may currently be more necessary in emerging markets, since they have few well rated private firms to provide alternative benchmarks.

In emerging markets, large fiscal deficits have not always led directly to liquid bond markets.<sup>57</sup> In the past, governments typically borrowed abroad or placed paper with local banks rather than issue bonds in the local market. However, this has begun to change, as governments have recently been issuing more medium- and long-dated paper in their domestic markets, especially in Latin America, where the maturities of debt paper had been overwhelmingly short-term. In Asia, the development of government bond markets has been held back less by high and variable inflation than by the dearth of government paper, and the financial aftermath of the East Asian crisis has changed that. The Korean authorities, for example, had 93 trillion won (\$82 billion) in domestic public sector debt outstanding at end-June 2000, including a three-year benchmark issue that is now served by a futures contract. In June 1998, the Thai Financial Institutions Development Fund began an 800 billion baht (\$21 billion) programme to issue government-guaranteed bonds in maturities of up to 15 years. Even so, issuing the debt has been easier than achieving active secondary trading, which may require a minimum market size, as suggested below. As a result, in some emerging markets, the benchmark interest rate is derived merely from government auctions rather than from secondary markets.

If it matters for liquidity, size can be created through “overfunding”. The authorities in several jurisdictions have issued bonds in the absence of any financing need. Singapore’s government and the Hong Kong Monetary Authority had by mid-2000 built up outstandings of \$20 billion and \$14 billion of government and Exchange Fund paper, respectively, in part to serve as benchmarks. The proceeds of overfunding need to be invested in other assets. One issue concerns the choice of such assets: Hong Kong and Singapore choose foreign currency assets but other choices are possible. In some cases, the lack of a suitable investment may argue against overfunding.<sup>58</sup>

## Does size matter for liquidity?

The relationship between size and liquidity is complicated by the fact that size has several dimensions. In dealer markets, liquidity is often supplied by market-makers who not only provide quotes but also take positions. How far size matters for liquidity thus hinges on the various economies of scale in market-making. Those managing debt in the face of fiscal surpluses emphasise *gross* issuance in *specific* securities by concentrating issuance in fewer maturities, by holding auctions less frequently and by buying back illiquid issues. However, if important fixed costs are involved in the production of information about the future path of interest rates, the size of the whole market across maturities also matters. Similarly, if there are scale economies in extracting information from order flows, the scale of trading activity may matter.

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<sup>57</sup> See the special feature “Market liquidity and stress: selected issues and policy implications” on pages 38-48, for a working definition of liquidity in terms of tightness, depth, immediacy and resilience.

<sup>58</sup> To the extent that the proceeds of overfunding are invested in US Treasury securities, the shrinkage of the stock of these securities in private hands accelerates.

Table IV.1  
Measures of size and liquidity

	<b>Outstanding central government debt (end-1997)<sup>1</sup></b>	<b>Yearly cash and futures turnover (1997)<sup>2</sup></b>	<b>Turnover ratio<sup>3</sup></b>	<b>Bid-ask spreads for on-the-run issues<sup>4</sup></b>
United States	2,741	103,829	37.9	3
Japan	1,855	31,735	17.1	7
Italy	971	10,455	10.8	6
Germany	653	6,600 <sup>5</sup>	10.1	4
France	484	18,634	38.5	10
United Kingdom	459	6,516	14.2	4
Canada	210	6,428	30.6	5
Belgium	191	975	5.1	5
Netherlands	168	450	2.7	...
Sweden	102	4,763	46.8	15
Switzerland	27	215	8.1	10

<sup>1</sup> Nominal value outstanding; in billions of US dollars. <sup>2</sup> In billions of US dollars. <sup>3</sup> Defined as yearly trading volume divided by outstanding volume. <sup>4</sup> On-the-run issues of 10-year bonds. The spreads are in basis points and apply to inter-dealer transactions. <sup>5</sup> Only futures turnover of bund contracts (LIFFE).

Sources: Salomon Smith Barney; H Inoue, "The Structure of Government Securities Markets in G10 Countries: Summary of Questionnaire Results", in *Market Liquidity: Research Findings and Selected Policy Implications*, Committee on the Global Financial System, Basel, May 1999.

Size does seem to matter, although it is clearly not the only determinant of liquidity. The larger the outstanding stock of publicly issued central government debt, generally the higher the turnover in cash and futures trading (Table IV.1). And the higher the turnover, the better the liquidity, as measured by the bid-ask spread of benchmark 10-year issues (Graph IV.2).<sup>59</sup> The narrowing of this spread may reflect the ability of market-makers to reduce their inventory risks as trading activity rises. Nevertheless, other factors evidently also play a role, including: holdings by government accounts and other investors who do not trade actively; the amounts outstanding of benchmark issues; the trading microstructure; taxes; arrangements for repurchase; and clearing and settlement practices.<sup>60</sup>

Judging by the success of government bond futures markets as well as by bid-ask spreads in G10 markets, there may be a size threshold that lies around \$100-200 billion. Below this, sustaining a very liquid government bond market may not be easy. If so, the prospects for liquid government bond markets in Asia could be limited by the size of outstanding central government debt. Seoul's \$82 billion market, for example, may eventually cross the threshold, but such markets as Bangkok's and Manila's with under \$20 billion each may still have a way to go.

<sup>59</sup> The bid-ask spread measures only one dimension of transaction costs since it does not measure depth or resilience of the market with respect to absorbing large order flows. See *Market Liquidity*, Committee on the Global Financial System (Basel, March 2000), pages 13-15.

<sup>60</sup> See *How should we design deep and liquid markets? The case of government securities*, Committee on the Global Financial System (Basel, October 1999), and APEC Collaborative Initiative on the Development of Domestic Bond Markets, Compendium of Sound Practices: Guidelines to Facilitate the Development of Domestic Bond Markets in APEC Member Economies (September 1999).

### Creating size through lumping

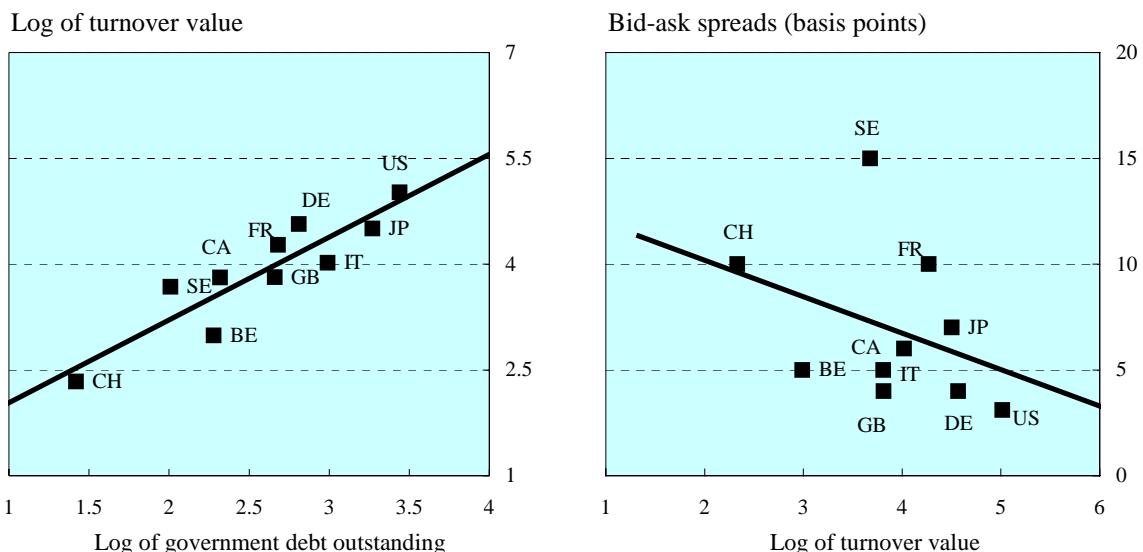
An important but often neglected policy choice is between splitting and lumping various forms of government debt. This choice has a number of dimensions: few versus many maturities, nominal versus inflation-indexed bonds, and one versus many public sector obligors.

In the case of industrial countries, there seem to be four maturities of choice: two, five, 10 and 30 years. France, Germany and the United States each conduct regular auctions of straight nominal bonds for only these maturities. Italy and Spain have both opted for five maturities (including 15 years for Spain), while the United Kingdom now issues conventional gilts in mostly 10-year and 30-year maturities. In addition to nominal bonds, the governments of Canada, France, the United Kingdom and the United States have committed themselves to issuing inflation-indexed bonds.

The choice between concentrating issuance for benchmarks, on the one hand, and supplying a continuous yield curve while lengthening maturities, on the other, seems initially to have been made without due regard to the benefits of big, liquid benchmarks. The reason is that corporations seeking pricing bases and institutional investors looking to match long-duration liabilities generally lobby for a variety of long-term issues. Confronted by fiscal surpluses, however, governments now find that achieving robust liquidity requires that issuance be limited to very few renewable maturities. Hence, the US Treasury has given up the three-year note, while the UK auction calendar now indicates an increased concentration of issuance in the 30-year gilt. Among emerging market countries, Mexico has treated long maturities with some caution, only recently issuing a three-year bond, while Thailand, with its better inflation record, has stretched out issuance to as long as 15 years.

The issuance of specific public sector bonds not carrying the full backing of the government may serve to divide the market into relatively less liquid segments. Besides the central government, other public sector obligors in Australia, Canada, France and the United States have issued substantial amounts of debt (Table IV.2). Recent examples include bonds to recapitalise banks, which may be backed by deposit insurance proceeds (eg the FICO bonds used to recapitalise US savings and loans) or the assets of an asset management company (either centralised as in Malaysia or one per bank as in China).

Graph IV.2  
Size and liquidity



Sources: Salomon Smith Barney; H Inoue, "The Structure of Government Securities Markets in G10 Countries: Summary of Questionnaire Results", in *Market Liquidity: Research Findings and Selected Policy Implications*, Committee on the Global Financial System, Basel, May 1999.

**Table IV.2**  
**Outstanding government securities (end-1997)**

	Total		Central government	Government agency and government- guaranteed	State and local government
	in billions of US dollars	as a % of GDP			
United States	6,652	80	41	43	16
Japan	2,135	51	87	9	4
Germany	765	36	85	6	9
Italy	987	85	98	2	.
France	668	46	72	27	1
United Kingdom	459	35	100	.	0
Canada	324	52	65	.	35
Netherlands	169	45	99	.	1
Belgium	203	84	94	6	.
Denmark	90	54	100	.	.
Spain	193	35	89	.	11
Sweden	103	44	99	.	1
Australia	82.2	20	71	29	.

Sources: Salomon Smith Barney; national data.

If such bonds are imperfect substitutes for straight government debt – which is true even of explicitly guaranteed bonds<sup>61</sup> – then the liquidity of the government bond market can suffer. In such circumstances, governments might wish, on the one hand, to lump the debt together. On the other hand, the debt might be split more cleanly by removing credit and liquidity support to agencies, as recently proposed by the US Treasury. Not resolving the ambiguity creates the risk of arriving at the worst of both worlds: uncertainty about the government guarantee *ex ante* leads to higher rates and reduces liquidity even though in sharply adverse circumstances such institutions might wind up being supported *ex post*.

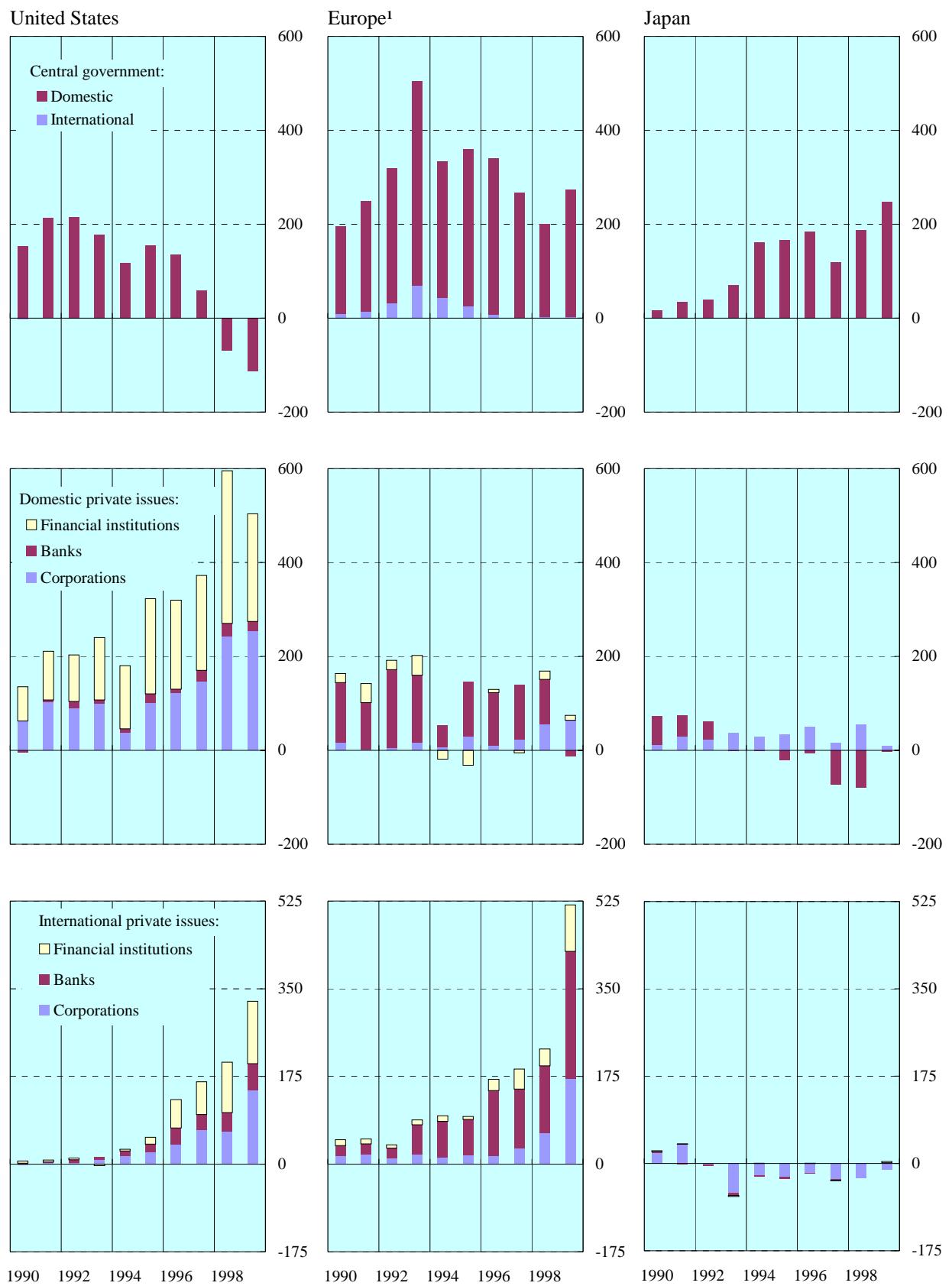
### The trade-off between size and crowding-out

It is important to realise that bigger is not always better. In the case where the supply of government debt is determined by deficits, any benefits from the government bond as a pricing benchmark and hedging instrument can be lost if the government crowds out private borrowing. Conversely, a reduction in government borrowing can create room for private borrowers: for instance, a remarkable surge in corporate issuance has accompanied the recent slowdown in government issuance in the United States and Europe (Graph IV.3). Nevertheless, heavy issuance of Japanese government bonds did not seem to prevent domestic corporate bond issuance from hitting a record high in 1998.

Moreover, private markets have shown a capacity to produce their own benchmarks and even to displace entrenched government instruments. The US experience in the early 1980s is a case in point.

<sup>61</sup> See the yield spread between the government-guaranteed bond issued by the German financial institution Kreditanstalt für Wiederaufbau and the German government bond (see the 1999-2000 BIS Annual Report, p 114, Graph VI.8).

**Graph IV.3**  
**Net issuance of domestic and international bonds and notes**  
In billions of US dollars, by country of residence



<sup>1</sup> EU 15 countries, Norway, Switzerland and Turkey.

Source: BIS.

At first, the US Treasury bill rate was the pre-eminent short-term money rate, with active markets in both cash and futures. In the course of the 1980s, however, the private bank rate known as dollar Libor in important ways displaced its public counterpart in the futures and options markets and as a benchmark for pricing private credit. The longer-term version of Libor is the fixed rate leg of interest rate swaps. There is no obvious reason why two-, five- and 10-year swaps could not do to US Treasury notes what three-month Libor did to the three-month Treasury bill, even without the retirement of Treasury debt.

To some degree, interest rate swaps already seem to be displacing Treasury securities as pricing benchmarks and hedging instruments in the US dollar market, although not without some difficulty. An extraordinary widening of spreads on these swaps during summer 1999 was in part the result of earlier shifts in liquidity that made on-the-run Treasury issues less useful as hedging instruments.<sup>62</sup> Hence, when corporate bond issuance surged, dealers turned to the swaps market in a one-sided effort to hedge unusual amounts of inventory. The swaps market, however, was new to such hedging activity and did not seem to possess the market-making capacity to accommodate these demands. Since then, market participants have turned to the swaps market for their hedging and benchmark pricing needs.

### Liquidity during the transition in shrinking and growing markets

How will liquidity adjust in the short run to the changing supplies of tradable government debt? In growing markets, increased supply should enhance liquidity and contribute to smooth market functioning as long as other structural conditions are present. In markets that are already well developed, it might be thought that arbitrage activity would ensure that yields are little affected by declining supply. In practice, however, liquidity requires market-making capital and this capital is allocated on the basis of a forward-looking calculation. Hence, liquidity may anticipate rather than follow the size of markets.

In the US Treasury market, recent developments suggest that forward-looking capital allocation has been important in the ebbing of market liquidity. In January, large budget surplus projections and the announcement of final rules for the Treasury's buyback programme seemed to cause investors to focus on the supply of securities. In early February, changes in the Treasury's auction calendar led to a sharp decline in yields, especially at the long end. In an indication of a deterioration of liquidity, so-called "specials", in which a specific security becomes unusually expensive to borrow, began to occur more frequently than before. While the US Treasury's selective buyback strategy seems to be substituting for the "relative value" arbitrage that investment funds and proprietary trading desks used to provide, thereby eliminating pricing anomalies, uncertainty about the market's future seems to have contributed to a withdrawal of market-making capital and a drying-up of liquidity.

In the markets of Japan and the euro area, liquidity remains highest in 10-year maturities, particularly in the benchmark Japanese government bond and the on-the-run German bund. Since 1999, the Japanese government has shifted issuance to the five-year maturity and away from the 10-year in an effort to create liquidity also in another part of the yield curve. It remains to be seen whether the anticipation of an enlarged market segment will be sufficient to attract the market-making capital needed for liquidity. In Europe, some liquidity can now be detected in the two-year and five-year issues of France, Germany and Italy. These countries have concentrated their recent issuance in these sectors to promote liquid benchmarks in these parts of the curve.

In emerging markets, there is a risk that the opportunity presented by costly financial sector recapitalisations will not be seized. The understandable reluctance of finance ministries to take on the costs explicitly – by including them directly in the fiscal deficit – may leave bond markets split and thus less liquid than they might be. Especially in medium-sized to small markets, national obligations best serve financial development if they take the most straightforward and homogeneous form.

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<sup>62</sup> See the discussion on credit premia and liquidity in the Overview of the February 2000 issue of the *BIS Quarterly Review*, pages 7-8.

## Composition of US dollar foreign exchange reserves by instrument

**Ben Fung and Robert N McCauley**

The uncertain but serious prospect of a shrinkage of the stock of outstanding US Treasury securities poses a challenge to managers of official foreign exchange reserves. More than three quarters of such reserves are held in US dollars, traditionally mostly in US Treasury securities. This box analyses the instruments in which central banks have invested their dollar reserves in recent years. The data assembled suggest that they have been shifting away from US Treasury securities for several years.

### Instrument composition of US dollar reserves in 1989 and 1999

In percentages

	End-1989 <sup>1</sup>			End-1999 <sup>2</sup>		
	Short-term	Long-term	Total	Short-term	Long-term	Total
Treasury securities	19	45	64	16	42	58
Other assets	27	9	36	28	14	42
Deposits in the US	3			3		
Money market paper	6			11		
Offshore deposits	18			14		
Agency securities		2			5	
Corporate bonds		0			1	
Equity		7			8	
<b>Total</b>	<b>46</b>	<b>54</b>	<b>100</b>	<b>44</b>	<b>56</b>	<b>100</b>
<i>Memorandum items:</i>						
<i>Share of Treasury securities in assets of the given maturity</i>	41	83		36	75	
<i>Total identified US dollar reserves (billions)</i>			403			993

<sup>1</sup> Figures for US Treasury securities, deposits and money market paper are from the US *Treasury Bulletin*, Tables CM-I-2 and IFS-2. Figures for offshore US dollar deposits are from the BIS international banking statistics. Figures for corporate bonds, agency securities and equity are from the US Treasury Department, *Report on Foreign Portfolio Investment in the United States as of December 1992*. <sup>2</sup> Figures for agency securities and corporate bonds were obtained by cumulating reported transactions to benchmark data. The figure for equity was estimated by also using data from R Scholl, "The International Investment Position of the United States at Yearend 1999", US Department of Commerce, *Survey of Current Business* (July 2000).

While the currency composition of official reserve holdings has received a good deal of attention over the years, little has been written regarding the composition of reserves by instrument. A breakdown of a central bank's portfolio by instrument can shed light on the extent of the bank's risk aversion and the portfolio's evolution over time. Our analysis, restricted to US dollar reserve holdings, is based not on a bottom-up aggregation of individual central bank portfolios but rather on a top-down approach using two reporting sources. It covers only identified investments in the United States, as captured in the US Treasury International Capital reporting system, and dollar deposits held outside the United States in banks in the BIS reporting area.<sup>①</sup> Not included are dollar securities held outside the United States, such as eurodollar bonds and notes of highly rated governments.<sup>②</sup> Overall, the identified official dollar holdings at end-1999 represent over 70% of estimated dollar reserves of about \$1.4 trillion and over half of total reserves of \$1.7 trillion.

<sup>①</sup> US Treasury data cover foreign official institutions, including international and regional organisations such as the BIS, and various investment funds such as the Abu Dhabi Investment Authority, the Government of Singapore Investment Corporation and the Fondo de Inversiones de Venezuela. This definition is quite similar to that for official monetary authorities used by the IMF but broader than the one used by the BIS. <sup>②</sup> Total eurodollar bonds and notes outstanding as of June 2000 amounted to \$2.6 trillion; see Annex Tables 13A and 13B. Almost a fifth of all international bonds are issued by the governments and state agencies favoured by central banks for investment; see Tables 12A and 12C.

The table shows the composition of US dollar reserves by instrument in 1989 and 1999.<sup>③</sup> The first row reports the holdings of US Treasury securities. The other rows report the holdings of other investments, including bank deposits, money market paper, other debt securities and equity. This table provides a snapshot of the aggregate US dollar reserve portfolio in 1989 and 1999. Over this 10-year period, total identified US dollar reserves more than doubled from \$404 billion to \$995 billion.

The share of dollar reserves invested in US Treasury securities has fallen from 64% in 1989 to 58% in 1999. This ratio remained between 62% and 65% until 1997 and has dropped only in the last two years. The decline was most marked among securities with an original maturity in excess of one year, where Treasury securities dropped from 83% to 75%. Holdings of debt securities of government-sponsored enterprises like Fannie Mae and Freddie Mac increased sevenfold between 1989 and 1999 in dollar terms, although their share only rose from the 2-3% range to over 5% during this period. Corporate bond holdings have risen sharply but remain below 1% of total holdings. At the short end of the yield curve, Treasury bills have long since lost out to bank deposits as the favoured habitat of reserve managers; among securities with a maturity of more than one year, the process of diversifying away from Treasury securities is less advanced.<sup>④</sup>

Perhaps surprisingly, equity holdings by official institutions remained the largest single class of assets among long-term non-US Treasury securities holdings. Notwithstanding net sales during most of the 1990s, estimated capital gains lifted overall holdings. In the past, such holdings have been confined to relatively few investors, but their numbers look set to grow.

The pace of asset diversification may be understated, owing to the limitation of the data used. As mentioned earlier, a significant portion of estimated dollar reserves at end-1999 was not included in the analysis. This is not the case in 1989, when only a negligible amount of dollar reserves was unidentified. If all the unidentified dollar reserves were held in non-US Treasury securities, the share of US Treasury securities would fall from 64% to just 43%.<sup>⑤</sup>

Looking at the reported transactions in the first six months of 2000, central banks appear to be diversifying away from US Treasury securities at an accelerating rate. Net foreign official purchases of all long-term securities, most notably agency securities, have increased. Central banks purchased over \$18 billion worth of agency securities, with considerably higher trading volume. Net purchases of US Treasury securities were substantially less, amounting to only \$12 billion. In fact, the US Treasury data show that central banks have been buying more agency securities than US Treasury securities since 1998. Net purchases of equity securities were over \$900 million, reversing the trend of net sales into a rising market since 1996.

In conclusion, within their US dollar portfolios, central banks are diversifying away from US Treasury securities. Recent evidence suggests that they are picking up the pace of this diversification. One can argue, on the basis of available scenarios of the evolution of outstanding US Treasury securities, that their supply may fall short of central banks' demand for them. But it should be borne in mind that changes in relative yields on US Treasury securities and changes in relative liquidity will tend to balance demand and supply.

<sup>③</sup> "Long-term securities" refer to securities which have an original term to maturity in excess of one year or which, as in the case of equities, have no stated maturity date. For example, a Treasury note with six months remaining to maturity is still considered as a long-term security. Y Amihud and H Mendelson show that a shift from a bill to such a long-term security offers an investor a yield pickup, assuming the coupon security is held to maturity. See Y Amihud and H Mendelson, "Liquidity, Maturity, and the Yields on U.S. Treasury Securities," *Journal of Finance*, Vol 46(4), September 1991, pp 1411-25. <sup>④</sup> In fact, holdings of short-term US Treasury securities decreased in dollar terms from the peak in 1996 to 1998, recovering only in 1999. This may reflect the fact that central banks also hold foreign exchange reserves for liquidity (intervention) purposes. Central banks may have used their US dollar reserves to cope with the crises in 1997 and 1998.

<sup>⑤</sup> This assumption allows an assessment of the maximum pace of asset diversification over this period by ignoring the possibility of unidentified central bank holdings of US Treasury securities, perhaps through external managers.