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**NEW ISSUES IN PUBLIC DEBT MANAGEMENT: GOVERNMENT
SURPLUSES IN SEVERAL OECD COUNTRIES, THE COMMON
CURRENCY IN EUROPE AND RAPIDLY RISING DEBT IN JAPAN**

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by

Paul Mylonas, Sebastian Schich, Thorsteinn Thorgeirsson and Gert Wehinger

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ABSTRACT/RÉSUMÉ

This paper reviews some of the difficult challenges facing debt managers in the years to come. In countries experiencing a rapidly diminishing gross debt, particularly the United States, this raises the issue of whether private-sector securities can serve as a substitute for the traditionally important government debt market. In the euro area, following the creation of the common currency, the issue is how to avoid that independent debt management strategies hamper the creation of a more efficient euro-area financial market. Turning to Japan, the level of debt is projected to rise rapidly and there is a need to improve the liquidity of the Japanese government bond market. To this end, a number of measures could be introduced to make debt management more efficient, yielding significant cost saving.

JEL classification: G1, G2, H6, H63

Keywords: Public debt, public debt management, financial markets, financial institutions and services.

Ce document passe en revue les difficiles défis que les gestionnaires de la dette publique devront relever dans les années à venir. Dans les pays où la dette brute diminue à un rythme rapide, en particulier les États-Unis, cela soulève la question de savoir si les titres du secteur privé pourront se substituer à l'important marché traditionnel des obligations d'État. Dans la zone euro, après la mise en place de la monnaie unique, le problème est celui d'éviter des stratégies indépendantes de gestion de la dette qui pourraient freiner la création d'un marché financier plus efficace au niveau de la zone. En ce qui concerne le Japon, on prévoit une augmentation rapide du niveau de la dette publique et il sera donc nécessaire d'améliorer la liquidité du marché des obligations d'État. Pour ce faire, il serait judicieux d'introduire un certain nombre de mesures pour rendre plus efficace la gestion de la dette, réduisant ainsi les coûts de façon substantielle.

Classification JEL : G1, G2, H6, H63.

Mots-Clés : Dette publique, gestion de la dette publique, marchés financiers, institutions et services financiers.

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TABLE OF CONTENTS

1.	Introduction	4
2.	Debt management as debt is dramatically lowered: the case of the United States.....	5
	<i>The role and uses of government debt in financial markets.....</i>	<i>5</i>
	<i>Policy options in an environment of declining net debt.....</i>	<i>7</i>
3.	Challenges in developing a unified bond market: the case of the euro area.....	8
	<i>Competition and co-ordination among debt managers in the European market</i>	<i>9</i>
4.	Debt management when the stock of debt is growing: the case of Japan.....	11
Box 1	Liquidity.....	6
Box 2	Debt management and monetary policies	11
	APPENDIX. The primary objectives of debt management: minimising cost while reducing risk ...	14
	Bibliography.....	16
	Tables and Figures.....	19

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Paul Mylonas, Sebastian Schich, Thorsteinn Thorgeirsson and Gert Wehinger¹

1. Introduction

1. Rising debt-to-GDP ratios until the 1990s made governments more aware of costs in managing their public debt. At the same time, the shift away from bank financing of budget deficits towards non-bank sources increased the focus on the risk of rolling over the debt at higher interest rates, not least in the context of financial markets that have become increasingly open internationally. The result has been the development of more market-oriented and more sophisticated debt management procedures and techniques (discussed in the Appendix). Partly to this end, the promotion of domestic financial markets became a supplementary role of debt management in a number of countries.

2. More recently, with the advent of low inflation and progress in reducing public deficits (the exception being Japan), debt management concerns have abated somewhat. By the late 1990s, longer-term, fixed rate instruments accounted for a large part of government debt (Tables 1 and 2), reducing rollover and interest rate risk. Moreover, with the deepening of secondary markets, the impact on market interest rates from government issuance activity in primary markets appears to have been considerably reduced and with it the potential conflict between debt management and the operation of monetary policy. In fact, the link between monetary policy considerations and debt management issues is largely through the signalling effects of debt levels and maturity structures on policy makers' credibility.

3. Looking forward, however, debt managers will face different challenges as the evolution of debt-to-GDP ratios is seen to diverge quite significantly across countries (Table 3).

- For the United States (and to a lesser extent the United Kingdom, Canada and Sweden),² in view of the projections of gross debt quickly falling to low levels, policy makers will have to confront the implications of lower liquidity in traditional government securities markets that play an important role for the overall functioning of financial markets.

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2. Some other smaller OECD countries have also signalled fiscal surpluses (the other Nordic countries, Australia, Ireland and New Zealand).

- For the euro area, despite recent improvements in primary balances, debt levels are unlikely to decrease rapidly. The introduction of the euro raises the question of the need for co-ordination among the eleven autonomous debt managers with a view to supporting the creation of a larger and more efficient euro-area financial market.
- In the case of Japan, estimates suggest a rapidly rising level of debt as a per cent of GDP. Thus, an emphasis on improving the efficiency of debt management techniques has the potential to produce budgetary savings.

The subsequent three sections of this paper deal with each of these issues in turn.

2. Debt management as debt is dramatically lowered: the case of the United States

4. Budget surpluses are currently projected by the US government to be sustained into the future and, on optimistic scenarios, the gross marketable debt of the Federal government of the United States (i.e. that held by the public) would even be eliminated by as early as 2013.³ These trends, if they materialise, will provide major benefits to the US and world economy, but, if outstanding government debt falls to low levels, policy makers will face a new set of challenges. The issues discussed here relate mainly to the level of gross government debt which is sufficient for the well-functioning of debt markets in general.⁴ In this respect, market participants are reportedly already noting the impact on US bond prices of the reduced flow of new supply (Figure 1).⁵

The role and uses of government debt in financial markets

5. Government securities have contributed to the development and functioning of financial markets, in part because of their liquidity (Box 1). In highly developed markets, in particular those of the United States, examples of their importance include:

- Governments, reflecting their taxation power, provide securities with no (or a negligible) credit risk. Markets use (central) government debt to calculate prices of other debt and derivative instruments. Such benchmarking is considered to be important for the development of a corporate bond market.
- Due to this characteristic, government debt also forms part of bank regulatory capital and, in many countries, guidelines and/or direct quantitative regulations of private pension funds specify minimum compulsory investment shares in government securities.
- For similar considerations, central banks use government debt securities from other countries, mostly US Treasury bonds, to invest their foreign exchange reserves.

3. These projections assume that policies required to meet the existing expenditure limits will be identified and implemented. In the event, the envisaged ageing of the population is expected to result in an increase in the debt from the middle of the next century.

4. This paper does not address the impact of (net) debt reduction on the level of interest rates: i.e. the degree of "crowding in".

5. A similar, if not even sharper, reduction has occurred for long-term gilts. In part, this reflects investment requirements of UK pension funds.

- Estimates of the yield curve and interest rate futures are mostly based on medium- to long-term government bonds. As well, options are often written on government bond futures, because their valuation requires a large, active and well-arbitrated market in the underlying security. In the swap market,⁶ government securities often serve as the basis for pricing such transactions.
- Government debt is often a critical component of strategies aimed at reducing overall portfolio risk. For example, short positions in government bonds can be used to hedge interest-rate risk from holding other fixed-income securities.

Box 1. Liquidity

Liquid markets are defined as ones where participants can rapidly execute large transactions without having a significant impact on price. This feature enhances market participants' confidence in the functioning of these markets both in normal and in stress situations (BIS, 1999).

Market liquidity has many dimensions, and depends *inter alia*, on the volume and design of the relevant asset. Government bond markets have advantages in this regard as, typically, government security issues are large compared with other bond issues, and there is some evidence that larger issue sizes tend to be accompanied by somewhat narrower bid-ask spreads (Figure 2). Furthermore, as a general rule, government securities are more homogenous because there is only one issuer (the government) and because other features, such as coupon payment dates and issuance frequency, are usually identical across issues. This implies a high substitutability among the issues. The desire to increase market liquidity was the rationale for the trend by managers of public debt towards a passive issuance policy -- that is, the regular issuance of bonds within a limited set of maturities and in relatively large sizes.

Due to these factors, major OECD countries' government bond markets can generally be classified as highly liquid, which is reflected in high turnover ratios and low bid-ask spreads (Table 4), compared with other bond markets. The recent Asian and Russian financial crises have illustrated the robustness of some major government bond markets which remained liquid, while spreads in many other bond markets increased very substantially, reflecting increasing illiquidity premia, or even completely shut down. Nevertheless, even these more mature markets can experience short periods of illiquidity (e.g. as occurred in the US market at the time of the near-collapse of Long-Term Capital Management).

6. For open market operations, the Federal Reserve, as well as other major central banks, use government securities and derivatives of those securities (repos) almost exclusively, largely because of the high liquidity of these markets. This practice also helps avoid the appearance of favouritism that might occur if transactions were carried out in private sector assets. More importantly, a liquid market for government bonds brings the added benefit of rendering monetary policy signals more transparent. The US government, as well as others, has also used issuance activity to develop domestic financial markets. This activity has played a key role (often leading the way) in issuing STRIPS,⁷ a procedure which allows the individual coupons and the principal to be traded separately, as well as to be combined again. These instruments have advantages for market participants, including the more flexible management of future

6. In this market, participants agree to exchange a sequence of interest payments, one based on a fixed rate of interest and the other based on a floating short-term interest rate. In effect this exchange is a "swap" of interest payments.

7. The acronym STRIPS stands for Separate Trading of Registered Interest and Principal of Securities.

cash flows compared with coupon-bearing bonds. In addition, some governments are now issuing index-linked securities. However, as a general rule, the market for index-linked bonds is less developed than that for conventional bonds, even in the United Kingdom which was the first of the large countries to introduce them (Drèze, 1993). This appears to result mainly from: i) the unfavourable tax treatment in many countries (tax is typically due upfront on the adjustment of the principal following its indexation); ii) the relatively low inflation rates in recent years; and iii) the relative novelty of these securities. Another drawback is their low liquidity, arising from the buy-and-hold strategy most investors have for these bonds.

Policy options in an environment of declining net debt

7. The key challenge for the United States, and a number of other governments in similar positions, will be to manage the projected decline in debt in such a way as to maintain the benefits from government bond markets. If it were decided to reduce gross debt commensurately with the reduction in net debt, the effective maturity of the portfolio of government securities would have to fall. This could occur through reducing issuance of long maturity bonds. At the same time, the issuance of other benchmark securities, like the one-year bill and the two-year note, might have to be discontinued, (3-year notes were discontinued in the United States in 1998), *inter alia*, so as to avoid a sharp reduction in the size and issuance frequency of the remaining issues. These actions could be supported by a strategy of buying back and re-issuing (re-opening) debt to boost liquidity.⁸ In fact, the US Treasury has announced its intention to buy back \$30 billion of existing debt in 2000 and to reduce the supply of long-dated paper.

8. As gross debt continues to decline, however, even the use of this strategy might not prevent the well-functioning of bond markets from being affected, unless private financial securities could either achieve the same risk status, or fulfil similar functions despite a different risk status. In this case, the need for government debt would be less compelling, including for the conduct of monetary policy. For example, either collateralisation of, or an implicit government guarantee for, other types of debt could make it a close substitute for central government debt with regard to risk characteristics. In this regard, debt issues of government sponsored enterprises (GSE), such as Fannie Mae and Freddie Mac in the United States,⁹ or European Pfandbriefe, are bonds backed (indirectly) by private mortgages or public sector loans, and may be seen as reasonably comparable to government debt.¹⁰ The US institutions enjoy a considerable funding advantage through a perceived government guarantee,¹¹ while the European ones seem to benefit mainly from the strict regulations regarding their collateralisation and their payment track record. Like government bonds, these issues have been characterised by a trend towards "regularisation", that is, the regular issuance of bonds with a limited set of maturities and in relatively large sizes in order to create liquid markets (i.e. market benchmarks). Both markets are relatively large compared with other bond markets (Table 5); however, a derivatives market, based on their issues, is underdeveloped at this stage. The future development of the GSE market as a substitute for government debt may depend, in part, on whether their present preferred-status is maintained; and the US administration has indicated that some such changes may soon be considered.¹² More generally, the development of securities markets, based on

8. Bennet *et al.* (2000) describe other options to increase the government bond market's liquidity, *inter alia*, though the increased fungibility of the STRIPS market.

9. Fannie Mae stands for Federal National Mortgage Association and Freddie Mac for Federal Home Loan Mortgage Corporation.

10. Fannie Mae and Freddie Mae also issue mortgage-backed securities, so as to shift mortgages off their balance sheets. These securities are riskier than their straight issues, as the holders face mortgage refinancing risk when interest rates decline.

11. While the GSEs are not backed by an explicit Federal guarantee, capital market participants regard them as holding an "implicit guarantee" and they are rated AAA.

12. There is a draft bill currently before Congress that would reduce the GSE's credit lines with the US Treasury.

collateralised debt will depend, in part, on the cost of (over) collateralisation compared with the gains in the security's liquidity and risk characteristics.

9. Even when the risk and liquidity characteristics of private debt securities differ from those of government debt, they may be able to fulfil some functions of the latter. Outstanding corporate debt is relatively large and growing in the United States (Table 6) and benchmark issues are being established. For example, recently a private US company (with a single A rating) has offered the first large issue in its "Global Landmark Securities program", a series of multi-billion-dollar securities sales designed to establish a benchmark for corporate issues. Corporate issues may permit a more efficient pricing of other corporate debt and in this respect they may offer some advantages as opposed to using Treasury paper. Specifically, as long as the (idiosyncratic) company-specific risk is sufficiently small, the risks of different corporate securities may be more correlated than the ones between corporate and central government issues.

10. On the other hand, if private debt cannot fulfil all the desirable functions of public debt, governments may consider maintaining a minimum level of gross debt despite the reduction in net debt. This could be done by investing government surpluses in private financial assets (domestic or foreign). The level of gross debt would have to be sufficient to maintain liquidity in the government bond market, permit issuing in selected (benchmark) segments and support the existence of the large derivative markets that is currently focused on government bond markets. Maintaining a minimum level of gross debt would also eliminate the costs of re-establishing the government bond market in the second half of the 21st century, when the needs of an ageing population are expected to result in an increase in net debt.

11. The decision to purchase assets, however, raises many different issues about their regulation and administration. Previous experience provides only limited guidance. The US Social Security Trust Fund and the Canadian Pension Plan Investment Board only invest in their respective countries' government securities.¹³ Sweden, in contrast, following the recent important pension reform, widened considerably the investment options of the large pension funds -- with asset holdings equivalent to about 25 per cent of GDP. The aim was to encourage investments in both equities and foreign assets subject to prudential limits, whereas, previously, assets were placed mostly in government securities. Upper limits exist on the funds': i) overall exposure to companies listed on the Stockholm exchange (8 per cent); ii) exposure to an individual company (10 per cent); and iii) share of assets subject to exchange rate risk (40 per cent). There is also a lower limit on the funds' share of investments to be placed in fixed-income securities (30 per cent). At this time, it is too early to judge the impact of the reform.

12. Another example of asset management by government is Norway's Petroleum Fund. Prior to 1997, the strategy adopted duplicated that for foreign reserves, investing only in relatively risk-free assets, but from 1997 the fund was allowed to invest 30 to 50 per cent of its funds in domestic and foreign equity markets. While these strategies may be feasible for smaller countries, it may be more delicate for larger ones to follow them. They may cause large shifts in capital flows (to the extent that investments are made abroad) and domestic assets would need to be purchased with care so as not to distort either relative prices or to influence corporate governance.

3. Challenges in developing a unified bond market: the case of the euro area

13. The emergence of a truly pan-euro-area government-bond market would provide benefits similar to those of the US government securities market. Its establishment will be a policy priority for the euro area and some initial steps have been taken already. Beyond the introduction of the common currency, an important development has been the recent convergence within the euro area of the composition of debt

13. However, US state pension plans, most notably that of California, invest in corporate bonds and equities.

(by type of instrument and maturity) (Table 7).¹⁴ This reflects parallel attempts by the authorities to promote liquid and efficient government-securities markets in individual countries. Further progress towards the complete integration of their bond markets, however, might be hampered by the absence of a single-area issuer of debt and by decentralised budget policies. Despite recent progress, and improvements in primary balances, differences with respect to liquidity and default risk remain.¹⁵ Whether these factors will limit the substitutability of securities issued by different euro-area governments and, in the process, possibly hinder market integration, is an open question.

Competition and co-ordination among debt managers in the European market

14. In the search for funds in the European market, competition among euro-area treasuries could increase, especially if governments attempt to establish their issues as benchmarks in the process of trying to gain liquidity premiums. Market makers have had a preference for German debt as the reference bonds in the euro area, especially for the longer maturities.¹⁶ However, this benchmark status could start to be shared with French and Italian government bonds at shorter and very long-term maturities. For example, while German bonds benefit from their greater absolute size and from an active market in Bund futures, French securities are more liquid in the very short term and in the 15-to-30 year maturity segment of the market. Indeed, market makers have stated a preference for French Treasury bonds since they feel that the authorities' secondary-market policy is less discretionary.¹⁷

15. Competition among debt managers has beneficial aspects to the extent that it improves the overall liquidity and efficiency of the area-wide markets. However, now that exchange-rate risk has been eliminated, questions have been raised as to whether increased co-ordination among issuers may hasten euro-zone financial market integration and thus support an increase in the market's overall size. For example:

- Is there a potential for co-ordination failures with respect to issuance strategies among eleven debt managers acting independently, which may turn out to be costly to the taxpayer, deter market integration and thus the development of the euro area as an important financial market?
- Is co-ordination required to achieve a sufficiently uniform distribution of maturities so as to support the establishment of a euro-area term structure of interest rates and facilitate efficient pricing?

14. These developments have occurred concurrently with an accelerated integration of European capital markets, a substantial convergence of debt duration across EMU member countries. Taken together, they may have contributed to a more symmetric transmission of monetary policy impulses across member countries.

15. Risk premiums are relatively small, though the credit risk premium should have increased as a result of the loss of the participating country's monetary sovereignty. Recent rate movements suggest that other, offsetting factors may be at play. For example, the narrowing of interest rate spreads and credit ratings has been interpreted as reflecting the perception that a bail-out of a sovereign debtor within the EMU area is a possibility.

16. The traditional preference for Bunds over other European government bonds, before the launch of the euro, was highlighted again during the financial crisis in autumn 1998, reflected in widening spreads.

17. The practice in Germany of leaving aside issue amounts for the market management operations of the Bundesbank is perceived as discretionary by market makers (Favero *et al.*, 1999)

16. To date, in recognition of some of these potential problems, progress has already been made in the form of an exchange of information among euro-area debt managers and this has helped transparency.¹⁸ Although no other co-ordination is foreseen, a suggestion has recently been made to create a single body responsible for issuing some part of euro-zone government bonds (de Silguy, 1999). Without such efforts, it is sometimes argued, there may be incentives for individual debt managers to abandon passive issuance strategies in order to pursue a more active one in the cash market, competing against other governments as well as the market, and resulting in an overall welfare loss.

17. Passive issuance policies in the cash market have been adopted by many countries because they are thought to be more beneficial (in the long run) compared with more active ones.¹⁹ It has become accepted that an efficient functioning of the financial market requires that the impact of government debt operations on prices be minimal. This is more likely to be achieved by publishing issuance schedules in advance, and focusing on a small set of maturities (i.e. benchmark issues) and a smooth redemption profile.

18. In contrast, a more active debt management strategy aims at lowering debt-service costs by taking advantage of market anomalies (traditionally by switching from the issuance of long- to short-term bonds when the yield curve is atypically steep). Such a strategy is now widely seen to be disruptive for markets and actually would be ineffective if market participants were able to identify the issuer's strategic behaviour. Markets would eventually build in a specific risk premium as they gained experience of issuers' behaviour.²⁰ Moreover, to the extent that the term structure of interest rates is determined by expectations of future short rates, cost savings from such a strategy would be limited over time. In the case of the euro area, co-ordination (including an exchange of information) would reduce incentives for individual debt managers to revise their debt issuance schedules after observing those of others.

19. In the absence of co-ordination and complete integration of government bond markets, the euro-area term structure of interest rates from government bonds may be less informative regarding market expectations of interest rates, and this could hamper various financial activities, such as pricing other assets. Here the swap curve may represent a reasonable substitute.²¹ The introduction of the euro has led to the development of a single swap market comprising several closely linked markets. Swap yields are not the lowest yields in the markets; however, risk premiums appear to be fairly standard across markets (McCauley, 1996). Moreover, liquidity is relatively even across the curve, as opposed to the term structures derived from government bonds, where time-varying spreads exist between on-the-run and off-

18. Among other things, debt management issues for the EU area are discussed in the European Economic and Financial Committee on EU Government Bonds and Bills.

19. Debt managers are becoming more active in the derivatives market, however. For example, interest rate swaps allow a borrower to manage the interest sensitivity of a portfolio by switching from fixed to floating interest rate payments or *vice versa*. Cost savings also arise as public borrowers with a high credit rating, operating in a developed market, usually have a comparative advantage issuing long-term, fixed rate bonds, and can then swap interest payments to floating rates (OECD, 1999b).

20. One aim of an active strategy was to use issuance activity to lower long-term rates (with the purported additional advantage of stimulating output) and raise short-term rates (with a view to reducing net capital outflows). A noted example is the so-called "operation twist" in the United States in 1962, though similar operations were also briefly undertaken there in 1994 and contemplated in Japan in early 1999, in both cases when long-term rates increased rapidly above short-term ones.

21. Empirical research suggests that the choice of the specific yield curve may not affect the information content regarding future inflation (e.g. using swap or government bond yield curves or choice of functional approach for the curve-fitting. On the latter point, see Schich (1999).

the-run bonds (Figure 3) and between bonds underlying bond futures contracts and those that do not (i.e. deliverable and non-deliverable bonds).²²

4. Debt management when the stock of debt is growing: the case of Japan

20. The Japanese Government Bond (JGB) market is the second largest in the world after that of the United States. With the fiscal deficit relative to GDP projected to remain high -- the highest in the OECD area -- Japanese bond issues are expected to account for approximately 90 per cent of total net OECD government bond issuance in the next few years. Uncertainties related to this burgeoning supply, on the one hand, and micro-structure issues in the JGB market, on the other, may have already increased the volatility of the 10-year JGB yields, prompting investors to move into the AAA euro-yen market to reduce price risks. Looking forward, the envisaged rapid build-up in net debt -- albeit from relatively low levels -- is likely to make debt management a more important issue in Japan than in most other OECD countries, both as regards the more standard fiscal (cost savings) perspective as well as the signal it provides to markets about the future stance of monetary policy (Box 2).

Box 2. Debt management and monetary policies

While monetary policy considerations and actions are now relatively isolated from debt management ones, it is recognised that the monetary transmission mechanism may be affected through the impact of the structure of debt on market expectations. Equally, a high level of debt may create expectations of time inconsistent policies (Sargent and Wallace, 1981).

In the recent history of industrial countries, however, high debt levels have rarely resulted in a rise in inflation that reduced the government's debt burden at the expense of private creditors -- "unpleasant monetarist arithmetic". This can be partly explained by the existence of liberalised capital flows, which are a disciplining force on the authorities. Any sign of opportunistic behaviour would quickly lead to capital flight and an exchange rate crisis. Moreover, if the central bank has a clear mandate to keep inflation low, high levels of debt may be seen more likely to result in "unpleasant fiscal arithmetic" (King, 1998). If inflationary pressures arise, the independent central bank will keep interest rates high, and in such circumstances, fiscal policy would have to bear the brunt of adjustment.*

In fact, several countries in Europe may have been made more susceptible in the past to a crisis of confidence as the average term-to-maturity was reduced in response to concerns about time inconsistency arising from high levels of debt (Alesina *et al.*, 1990 and Giavazzi and Pagano, 1990). In effect, the economy was pushed into a situation which left it vulnerable to an adverse shock that forced up interest rates.

In the case of Japan, after the recovery is firmly established, the levels of debt are likely to be high enough that the government may need to signal to markets that it does not intend to create inflation or depreciation surprises. To this end, the credibility of policies (both macro and structural) could be enhanced through its debt management decisions. The latter could comprise the issuance of more foreign-currency-denominated or index-linked debt.

* In the euro area, partly due to these considerations, the Stability and Growth Pact includes limits on individual country deficit and debt levels.

22. On-the-run bonds are newly issued and are more liquid than existing comparable maturity bonds, a share of which are not being traded. The latter are called off-the-run bonds. Deliverable bonds are those which fulfil the requirement of a futures contract. This feature can, at times, result in a premium for these bonds.

21. Significant cost savings could be achieved if debt management were to be made more efficient. Various reforms concerning institutional aspects of debt issuance (the introduction of auctions and more liquid brokers) and other steps towards market liberalisation have already been undertaken including, *inter alia*, the abolition in 1999 of the withholding tax for non-residents²³ and the transaction tax on JGBs.²⁴ Nevertheless, various features point to inefficiencies that still persist:

- Most medium- to long-term issuance has until recently been concentrated in the 10-year market segment, with the 10-year bond still comprising the only benchmark issue (Table 8). As a result, approximately three-quarters of outstanding issues have an original maturity of 10 years, leaving the government bond markets with a lack of sizeable issues along the yield curve and undermining overall market liquidity (BIS, 1999; and Ohashi and Milligan, 1998).
- For a bond market the size of Japan's, bid-ask spreads are high in the JGB market (7 basis points for 10-year bonds, compared with 3 in the United States), which may signal a relative lack of liquidity even for this key benchmark bond (BIS, 1999).
- Margins of AAA euro-yen issues over JGBs are narrow compared with similar US issues (+/- 5 basis points for JGBs versus 15-30 basis points for yields on euro-dollar AAA bonds over US government securities), possibly suggesting the existence of significant liquidity spreads on government debt.
- Non-resident holdings of JGBs are small compared with those of other large OECD countries (10 per cent in the case of Japan compared with 37 per cent for the United States) (Table 9). This reflects, in part, the existence until recently of the transaction tax and the withholding tax, but may also reflect liquidity considerations.
- The cash-to-futures-transactions ratio has been low compared with that in other large OECD countries (1:2 in the JGB market versus 3:1 in the US government securities market). This fact may also reflect illiquidity premiums and tax considerations in the cash market.
- A large share of government debt is held to maturity by quasi-public institutions, such as the Trust Fund Bureau, thereby reducing the amount of market-priced debt. There are as well obstacles to short selling (e.g. the non-existence of rules/practices in the case of delivery failures).

22. A number of reforms could produce cost savings. Larger, standardised issues at more evenly distributed maturities could help increase liquidity. In this regard, the government recently introduced a 1-year Treasury bill (April 1999) and a 30-year bond (September 1999) and, more recently (February 2000), a 5-year JGB (a maturity which has been so far the exclusive privilege of long-term credit

23. To qualify for the exemption from the withholding tax, custodians must hold their bonds in an account with the Bank of Japan. This is reportedly viewed unfavourably by foreign investors, as it requires them to do their own settlement work.

24. Beginning in the second half of the 1980s, the financial system in Japan was dramatically liberalised. These reforms were aimed, in particular, at making the JGB market more attractive to foreign investors. Reforms included the deregulation of interest rates, the development of futures and options trading and new procedures for the issuance of government debt. Until 1987, bank syndicates were used for the issuance of JGBs. Since then, the higher maturity debt has been issued in multiple-price auctions, and (since April this year) public auctions have been introduced for short-term government securities (Takeda and Turner, 1992; Kroszner 1998; and Nakamae, 1999). Finally, larger and more liquid brokers took over the business in 1996, which may support market liquidity (Ohashi and Milligan, 1998).

banks). These initiatives, in combination with the recent emphasis on existing issues, as well as the 10-year bond, should help fill in the yield curve's maturity structure and increase its currently poor level of liquidity. The introduction of STRIPS which has been announced would improve the liquidity of the JGB market by offering high duration instruments, hedging flexibility and a fuller yield curve (Ohashi and Milligan, 1998). In view of the heightened uncertainties typically attached to a rising debt-to-GDP ratio, the introduction of index-linked bonds may also attract investor interest, thus raising market liquidity. The elimination of legislative obstacles to short selling would serve to increase demand, especially foreign demand, in the cash market. Over the medium term, market liquidity could be enhanced if a larger share of the debt were traded, rather than remaining in the hands of quasi-public institutions. In the event, caution would be required during a transition period so as to minimise disruptions to the market, given current large official holdings, which may be keeping interest rates low. Here, there may be a role for primary dealers which, currently, do not exist in Japan.

APPENDIX
THE PRIMARY OBJECTIVES OF DEBT MANAGEMENT:
MINIMISING COST WHILE REDUCING RISK

1. Debt management decisions typically deal with the choice of instruments, issuing techniques and institutional arrangements that minimise debt-servicing costs, given a certain risk profile (Tables 10 and 11).

The trade-off between cost and refinancing risk

2. Debt management decisions typically deal with the choice of instruments, issuing techniques and institutional arrangements that minimise debt-servicing costs, given a certain risk profile. When choosing a debt instrument, there is usually a trade-off between reducing cost and reducing rollover risk (the former frequently implies issuing short-term debt and the latter long-term). The appropriate choice has often been based on an *ad hoc* target, usually for: i) the mix of floating, index-linked and fix-rated debt; and ii) the mix of long-term and short-term debt. For example, a longer maturity structure, built from fixed interest rate securities, would lessen the need for refinancing and would stabilise the nominal cost of borrowing, thus reducing refinancing risk. There may also be a market preference for certain, usually medium- to longer-term, maturities. If such “preferred habitats” can be identified, the borrower can profit by raising funds more cheaply. The establishment of such market segments, however, may initially entail an illiquidity risk premium, which would be applied to new instruments, as compared with an issuing strategy that is focused on the few existing standardised instruments. This could be easily overcome if there was high market demand for the new instruments, as was the case for STRIPS but perhaps less so for index-linked bonds.

3. Currently, duration, which indicates the interest exposure of a debt portfolio, is the most commonly used single measure for the trade-off between cost and rollover risk.²⁵ A more advanced risk evaluation system, used by the Danish authorities, is a “Cost-at-Risk”(CaR) measure, which is similar to the Value-at-Risk (VaR) concept (OECD, 1998a). The CaR measure focuses on the risk from increasing interest rates by calculating the cost of debt service within a certain probability range. The respective probability distribution is calculated from models and assumptions concerning the future development of interest rates.

4. The maturity structure of the debt may serve an important macroeconomic insurance role as a hedging mechanism for governments, once the stochastic properties of the economy are known (Lucas and Stokey, 1983; and Bohn, 1988). For example, if productivity (supply) shocks are prevalent in the economy, necessary tax adjustments to keep the budget close to balance will be more limited if the government issues more long-term (fixed-rate) nominal debt. In the case of a supply shock, output and inflation are negatively correlated. For a negative supply shock, a hedge will have been created since revenues will fall at the same time as interest servicing costs, in real terms, also decline. On the other hand, if (non-fiscal) demand shocks are more prevalent in the economy, issuing more short-term and index-linked debt creates the appropriate hedge. In the case of a positive demand shock, higher output and inflation result in simultaneous increases in revenues as well as interest service costs. The debt structures of countries have been found to fit these patterns (Missale, 1997), which may reflect the fact that debt managers implicitly internalise the macroeconomic insurance aspects of the trade-off between rollover risk and cost saving. For

25. Duration is defined as the weighted average maturity profile, where the weights are the share of the total debt service payments (in present value terms).

example, in the United Kingdom there have been strong positive co-movements between inflation and output since the beginning of the 1990s, suggesting a role for price-indexed debt, while in Italy and the United States the co-movements have been negative, suggesting a role for longer-term nominal debt.

Selling techniques, debt instruments and innovations

5. To lower costs, debt managers have made several innovations with respect to the use of instruments and selling techniques. Generally, such innovations aim at increasing demand -- in many cases from foreign investors -- and raising liquidity. In most countries, auctions have replaced a system of syndication. Auctions are mainly of the "multiple-price" variety, with securities allotted to the bidders in the order of their bid price. As opposed to "uniform-price" auctions, the issuer can earn rents from price discrimination, and the successful bidders are subject to the "winner's curse" as the bid price is paid.²⁶ Auctions are sometimes combined with issuance through a set of primary dealers, who also act as underwriters. They are used to enhance the price discovery process through the requirement of continuous two-way quoting (market making), and by including foreign firms as primary dealers, to help stimulate foreign demand (Bröker, 1993). The combination of primary dealers and multiple-price auction systems has been linked to the opportunity for primary dealers to acquire a large fraction of new issues by aggressive bids, which then allows them some market power.²⁷ Other organisational improvements that have allowed cost savings are the introduction of electronic book entry systems, central depositories and delivery versus payment systems.

Institutional aspects: independent debt managers

6. Part of the trend towards transparency has been the appointment of independent debt managers. They operate outside the influence of both the central bank and the Ministry of Finance, with the sole objective of meeting the government's borrowing requirements. The argument for the creation of such an institution in many ways parallels that for independent central banks and basically refers to time-consistency and credibility, and the desire to prevent interaction of debt issuance with the conduct of monetary and fiscal policy (Kroszner, 1998). Independence raises the importance of an assessment of the management's cost-effectiveness. In general, their performance is measured in different ways. For example, assessment is made through comparisons with a benchmark or cost-risk relationship (Ferré Carracedo and Dattels, 1997).

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26. The fear of bidding too high under a multiple-price auction is said to lead to bid prices that are, on average, lower than in the case of a uniform-price auction. Though there is no clear-cut empirical evidence as to whether gains from price discrimination are outweighed by losses from under-pricing, for very liquid markets such as those for government bonds, multiple-price auctions are generally believed to yield net gains for the issuer. See Gray (1997) and Kroszner (1998).
27. They would make profits by squeezing the other primary dealers who acquired less, but have already sold "when issued" securities to their customers (Kroszner, 1998).

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Table 1. Features of the maturity profile for central government debt
(1997)

Country	Maturity distribution ^a (as a percentage of total volume outstanding) (In years)				Average term to maturity	Duration (Years)	Original maturities (m = months, y = years)	Number of original maturities	Number of benchmarks
	1 or less	1-5	5-10	Over 10					
United States	21	62		17	5.2	n.a.	3, 6 m; 1, 2, 5, 10, 30 y	7	7
Japan	5	8	78	9	n.a.	n.a.	3, 6 m; 2, 4, 5, 6, 10, 20 y	8	1
Germany	2	32	61	5	n.a.	n.a.	6 m; 2, 4, 5, 10, 30 y	6	4
France	10	27	53	10	6.2	n.a.	3, 6 m; 1, 2, 5, 10, 15, 30 y	8	7
Italy	17	32	48	3	4.7	2.4	3, 6 m; 1, 1.5, 2, 3, 5, 7, 10, 30 y	10	5
United Kingdom ^b	7	29	34	30	9.7	6.5	3 m; 5, 10, 20, 30 y	5	3
Canada	32	29	27	12	5.8	5.1	3, 6 m; 1, 2, 5, 10, 30 y	7	7
Belgium	19	6	43	32	4.4	3.4	3, 6 m; 1, 5, 10, 15, 30 y	7	2
Netherlands	4	10	74	12	5.9 ^c	4.1	3, 6 m; 1, 5, 10, 30 y	6	2
Sweden	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	12
Switzerland	27	23	13	37	n.a.	n.a.	3, 6 m; 5, 7, 9, 10, 11, 12, 13, 14, 15, 20 y	12	7

a) Distribution by original maturity, excluding older issues out of the regular issuance cycle and index-linked securities.

b) Maturity distribution by remaining maturity.

c) Excluding Dutch State Treasury Certificates.

Sources: BIS (1999).

Table 2. Central government securities by type of instrument
In per cent of total, end-1997^a

	Fixed	Floating	Indexed	Zero coupon ^b	Short term ^c
United States	77.9	-	1.0	-	20.7
Japan	94.2	-	-	0.5	5.2
Germany	95.8	1.9	-	-	2.0
France	78.2	5.6	-	6.2	9.9
Italy	39.4	29.1	-	8.2	15.5
United Kingdom	84.4	3.1	11.3	-	-
Canada	59.7	-	2.1	-	28.1
Belgium	74.2	5.8	-	0.6	19.5
Netherlands	96.1	-	-	-	3.6
Sweden	73.3	-	10.3	-	16.4
Switzerland	72.6	-	-	-	27.4

a) Any difference between 100 and the sum of displayed percentage shares comprise other, non-classified marketable issues.

b) Zero coupon issue with original maturity above one year.

c) Zero coupon issue with original maturity up to one year.

Source : BIS (1999).

Table 3. Debt dynamics

	Real interest rate ^a	Real GDP growth ^b	Primary balance ^c	Net debt ^d	Gross debt ^d	Debt dynamics ^e
	Per cent		As a percentage of GDP			Percentage points
United States	5.3	3.8	3.2	43.9	59.3	-2.6
Japan	2.8	1.3	-5.4	37.2	105.4	6.0
Germany	4.0	1.5	2.3	47.1	62.6	-1.1
France	4.3	2.1	1.1	43.2	65.2	-0.2
Italy	3.9	1.5	5.9	105.5	117.7	-3.4
United Kingdom	4.1	2.6	3.1	39.7	54.0	-2.5
Canada	5.5	3.0	6.4	57.9	86.9	-5.0
Belgium	4.1	2.3	6.7	110.7	114.1	-4.7
Netherlands	3.7	3.2	2.3	51.9	62.9	-1.9
Sweden	5.0	2.7	5.3	12.7	68.3	-5.0
Euro area	4.0	2.1	2.8	58.8	74.8	-1.7

a) Average long-term interest rates deflated by the GDP deflator from 1995 to 1999, estimate for 1999.

b) Average from 1995 to 1999, estimate for 1999.

c) Cyclically adjusted.

d) Estimate for 1999.

e) The implied annual change in the debt-to-GDP ratio. The estimate is based on the following formula:
 $\Delta d = d(r-y) - p$, where Δ denotes change and the variables are: d: general government net debt-to-GDP ratio;
 p: primary balance-to-GDP ratio; r: real interest rate; and y: real GDP growth.

Source: OECD Economic Outlook 66.

Table 4. Liquidity indicators for major OECD countries' government bond markets
(1997)

	United States	Japan	Germany	France	Italy	United Kingdom	Canada	Sweden
	Basis points							
Bid-ask spread:								
On-the-run issues ^a								
2 years	1.6	5	4	4	3	3	2	4
5 years ^b	1.6	9	4	5	5	4	5	9
10 years	3.1	7	4	10	6	4	5	15
30 years ^b	3.1	16	10	24	14	8	10	27 ^c
Off-the-run issues ^{a,d}								
5 years ^b	6.3	11	4	6	8	4	12.5	..
10 years	6.3	7	5	6	8	4	15.5	..
30 years ^b	12.5	19	10	10	14	12	18.5	..
	\$US billion							
Volume outstanding (a) ^e	3 457	1 919	63	551	1 100	458	285	35
Yearly trading volume (b) ^g	75 901	13 282	..	8 634 ^f	8 419	3 222	6 243	125 ^f
Turnover ratio (b)/(a)	22.0	6.9	..	33.8	7.7	7.0	21.9	3.6

- a) Bid-ask spreads in one-hundredth of a currency unit for the face value of 100 currency units.
b) For Japan, 6-year bonds are used in place of 5-year bonds and 20-year bonds are used in place of 30-year bonds.
c) For the 22-year bond.
d) Bid-ask spreads for off-the-run issues having similar remaining maturity as the on-the-run issues. Some of the spreads are indicative rather than definitive.
e) The figures are for end-1997, in billions of US dollars, converted at the exchange rates of end-1997.
f) Figures may include trading other than outright transactions; such as repos or buy/sell backs.
g) Figures are for 1997 calendar year.

Source: BIS (1999).

Table 5. A comparison of the size of some important bond markets
(\$US billion, end-1998)

US government ^a	3 355.5
Japanese government	2 590.4
US non-financial corporates	1 621.8
US government-sponsored enterprises ^b	1 273.6
German government	1 110.2
German Pfandbriefe ^c	1 073.2
US asset-backed securities issues	1 012.8
Italian government ^d	959.6
French government ^d	654.4

a) Total marketable interest-bearing Federal debt.

b) Securities issued by Federal Home Loan Banks, Fannie Mae, Federal Home Loan Mortgage Corporation (Freddie Mac), Farm Credit System, the Financing Corporation, the Resolution Funding Corporation, and the Student Loan Marketing Association (Sallie Mae), not including mortgage-backed securities (MBS).

c) Hypotheken Pfandbriefe and Öffentliche Pfandbriefe.

d) Excluding Treasury bills.

Sources: Board of Governors of the Federal Reserve System, *Flow of Funds Accounts of the United States*; Bank of Japan, *Financial and Economics Statistics Monthly*; Deutsche Bank (1999).

Table 6. **General government share of total bond debt^a**

	Government		Financial institutions		Non-financial enterprises		Government	
	As a share of total bond debt in per cent				As a share of total, excluding financial institutions			
	1985	1997 ^b	1985	1997 ^b	1985	1997 ^b	1985	1997 ^b
United States	54.3	44.2	26.9	40.9	18.8	14.9	74.2	74.9
Japan	66.6	59.0	24.8	26.0	8.6	15.0	88.5	79.7
Germany	26.8	38.8	68.4	58.5	4.7	2.7	84.9	93.5
France	35.9	46.0	49.5	41.7	14.5	12.3	71.2	78.9
Italy	81.1	83.5	15.0	15.3	3.9	1.2	95.4	98.6
Canada	66.5	69.6	7.2	8.9	26.3	21.5	71.7	76.4
Belgium	60.7	66.5	34.3	30.5	5.0	3.1	92.4	95.6
Sweden	57.9	51.5	35.7	46.2	6.4	2.3	90.1	95.7

a) Total bond debt here is defined as debt in short- and long-term securities by government, non-financial enterprises and financial institutions, where the government section includes central, state and local levels.

b) Latest values available in the OECD *Financial Statistics* are from 1996 for Belgium, Canada, Japan, Sweden and the United States, and from 1997 for France, Germany and Italy.

Source: OECD *Financial Statistics*, various issues.

Table 7. **Structure of euro-area government debt**(Per cent of total^a)

	Treasury bills	Variable rate bonds	Fixed rate bonds	Non marketable debt	Non marketable savings bonds and accounts	Foreign currency debt	Others
1990							
Austria	2	11	38	33	0	16	0
Belgium	23	0	58	0	1	16	2
Finland	0	0	42	14	0	43	0
France	8	7	60	4	19	0	1
Germany	0	1	73	15	9	0	2
Ireland	4	10	41	0	6	34	6
Italy	28	36	22	2	8	4	0
Netherlands	0	0	64	34	0	0	1
Portugal	20	37	7	0	14	8	14
Spain	63	0	29	1	0	4	2
Standard deviation ^b	19.9	14.5	20.6	13.4	6.8	15.1	4.3
1997							
Austria	1	8	50	21	0	20	0
Belgium	17	2	71	0	1	8	0
Finland	5	0	53	4	0	38	0
France	7	5	75	1	11	0	0
Germany	2	2	80	4	12	0	1
Ireland	3	5	49	0	12	26	4
Italy	14	26	45	1	8	6	0
Netherlands	3	0	82	12	0	0	3
Portugal	9	12	34	0	22	22	1
Spain	28	0	62	0	0	9	1
Standard deviation ^b	8.5	8.0	16.3	6.9	7.6	13.0	1.4
Change in standard deviation ^c	-11.4	-6.5	-4.2	-6.5	0.8	-2.1	-2.9

a) Rows add to 100.

b) Standard deviation across countries.

c) Standard deviation in 1990 minus standard deviation in 1997.

Source: OECD based on Favero *et al.* (1999).

**Table 8. Selected characteristics of bond markets in major OECD countries
(1997)**

	Bid-ask spread ^a	Cash-futures ratio ^b	Issues size ^c	Number of benchmarks	Rules/practices of short sales ^d	Primary dealers
United States	3	2.7	17.5	7	Yes	Yes
Japan	7	0.7	7.7	1	No	No
Germany	4	..	8.3	4	No	No
France	10	..	2.8	7	Yes	Yes
Italy	6	4.1	12.3	5	Yes	Yes
United Kingdom	4	1.0	18.2	3	Yes	Yes
Canada	5	33.7	6.7	7	Yes	Yes
Belgium	5	33.8	8.9	2	Yes	Yes
Netherlands	6.2	2	Yes	Yes
Sweden	15	3.2	3.8	12	Yes	Yes
Switzerland	10	1.4	2.5	7	Yes	No

a) Bid-ask spread for on-the-run ten-year fixed-coupon government securities.

b) Yearly trading volumes of all marketable securities divided by yearly trading volumes (notional values) in futures markets.

c) Average issue size in USD billion for on-the-run ten-year fixed-coupon government securities.

d) Existence of rules/practices for fails which enable dealers to postpone a delivery (with penalty payments) if they are in short position and cannot deliver the respective securities.

Sources: BIS (1999), Inoue (1999).

Table 9. Holders of government debt securities^a
(Per cent of total, end 1997)

	United States	Japan	Germany	France	Italy	United Kingdom	Canada	Belgium	Netherlands	Sweden
Residents	63.1	90.0	31.2	87.1	77.5	85.6	75.0	78.6	76.0	80.5
Government	0.0	35.8	} 3.3	..	0.1	} 3.6	4.5	4.3	0.0	21.4
Central bank	13.1	10.5		0.0	7.6		5.3	0.7	0.0	5.5
Domestic financial sector	} 50.0	26.8	12.3	} 87.1 ^b	} 69.8	67.8	52.5	57.0	} 76.0	33.4
Domestic non-financial sector		16.9	15.6			14.2	12.7	16.6		20.2
Non-residents	36.9	10.0 ^c	68.8	12.9	22.5	14.4	25.0	23.0	24.0	19.5

a) Figures are for marketable debt only, except for Belgium where non-marketable debt is included.

b) Includes government holdings.

c) Estimate.

Source: BIS (1999), and Deutsche Bundesbank, *Special Statistical Publication 9: Securities Deposits*, August 1998.

Table 10. Institutional aspects of public borrowing

Country	Institution authorised to borrow; debt management authority	Debt management agent	Main objective of debt management	Performance assessment	Monetary policy considerations	Central bank credit to the government
United States	Treasury	Federal Reserve System	Provide government funding, minimise cost, minimise market disruption, maintain balanced maturity structure	Yes	None	No
Japan	Ministry of Finance	Bank of Japan	Issue at low cost (foster creditworthiness and liquidity)	Yes; but no formal measurement	None	Purchase of newly issued government bonds prohibited (except in the case of maturing debt)
Germany	Government	Bundesbank	Provide government funding, minimise cost	No formal measurement	No institutional co-ordination arrangements; approval from the Bundesbank is required for issues of bonds of public authorities	No (Art. 104 of Maastricht Treaty)
France	Ministry of Finance, Treasury Directorate	Banque de France	Minimise costs of borrowing over a long-term horizon	No systematic performance measurement; control of general operations of the Treasury by the Cour des Comptes	None	No (Art. 104 of Maastricht Treaty)
United Kingdom	Treasury	Bank of England	Minimise cost, taking account of risk, minimise market disruption	Yes	Finance borrowing in a non-inflationary way	No (Art. 104 of Maastricht Treaty)
Italy	Treasury	Banca d'Italia	Provide government funding, minimise costs in medium term	Treasury submits semi-annual reports on public debt management to the <i>Corte dei Conti</i> (since 1996)	No institutional co-ordination arrangements	No (Art. 104 of Maastricht Treaty)
Canada	Government, Department of Finance	Bank of Canada	Provide stable, low cost government funding	Outside evaluators; ad hoc review of debt management process	Indirect; Finance Department consults with the Bank of Canada	Allowed
Sweden	Swedish National Debt Office (on behalf of the government)	Swedish National Debt Office	Provide government funding within the limits imposed by monetary policy; minimise costs (of borrowing and managing debt) in the long run (below benchmark portfolios)	Yes; benchmark portfolio	Yes (Debt Office must confer with the central bank; co-ordination committee with representatives of Central Banks and Finance Ministry)	No (Art. 104 of Maastricht Treaty)

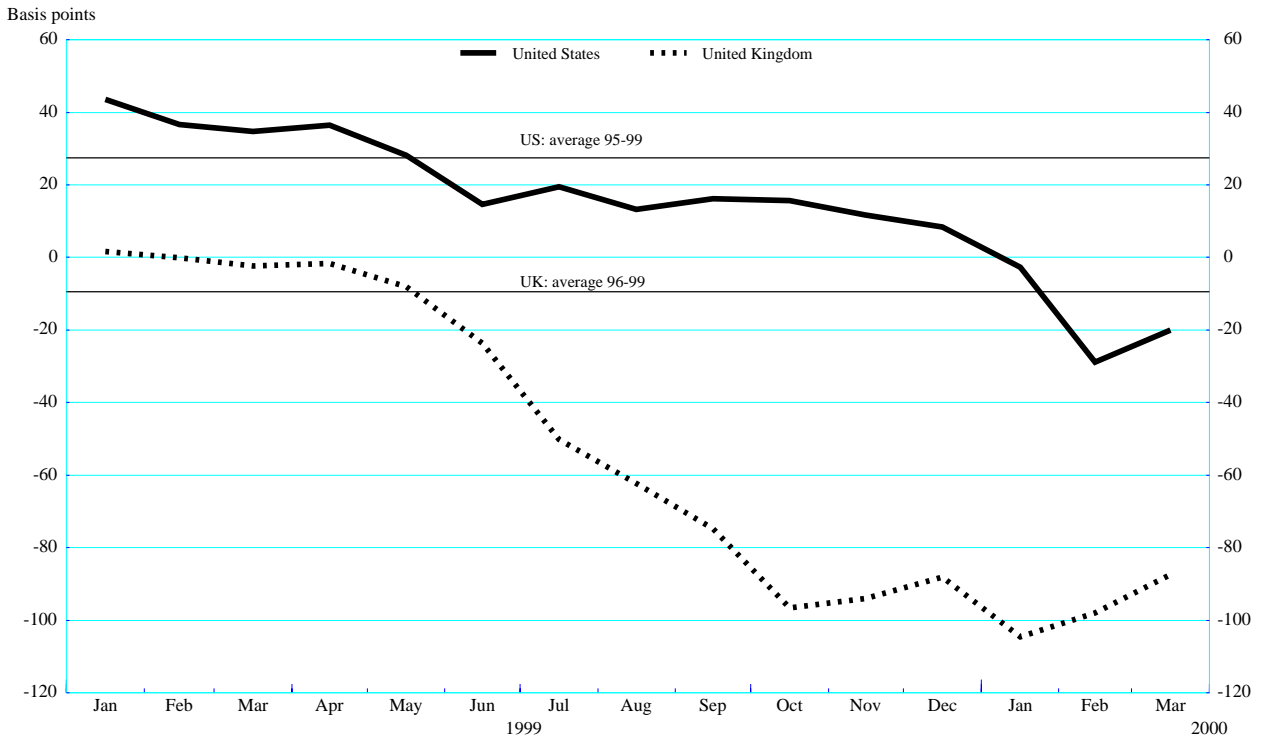
Sources: BIS (1999b), Blommestein/Thunholm (1997), Bröker (1993), Deutsche Bundesbank (1997), Ferré Carracedo/Dattels (1997), Kroszner (1998), and OECD.

Table 11. Instruments and selling techniques of government debt

Country	Standard instruments and maturities	Other instruments, derivatives	Currency	Selling techniques	Primary dealers
United States	Treasury bills; Treasury notes: 2,3,5,7,10 yrs; Treasury bonds: 30 yrs.	Strips (notes and bonds); inflation-indexed bonds (since 1997)	Domestic	Mostly auctions (multiple-price)	Yes
Japan	Treasury bills; medium-term interest-bearing government bonds: 2 yrs; medium-term discount government notes: 5 yrs. Long-term interest-bearing government bonds: 10 yrs; super long-term interest-bearing government bonds: 20 yrs.	None	Domestic	Auctions; syndicate system (for 10-year bonds)	No, underwriting syndicate
Germany	Treasury discount notes ("Unverzinsliche Schatzanweisungen"): 1-2 yrs; medium-term federal notes ("Bundesschatzanweisungen"): 4 yrs, 5-yr special federal notes ("Bundesobligationen")	Strips (allowed since 1997)	Domestic	Bank syndicate and multiple-price auction for long-term bonds (with a tranche reserved for the Bundesbank for later sale); tap technique for 5-yr special notes; private placements	No, Federal Bond Consortium
France	Treasury bills; Treasury notes (BTANs): 2.5 yrs; fungible government bonds (OATs): 10 yrs.	Floating rate OATs against long- or short-term benchmark rates; strips; inflation indexed (since 1998). Treasury is authorised to engage in interest-rate swaps	Domestic and foreign	Auctions; syndicate (occasionally for foreign borrowing)	Yes (SVT)
United Kingdom	Fixed-rate gilt-edged securities; treasury bills	Strips; inflation-indexed instruments	Domestic	Mostly multiple-price auctions; mixed techniques; tender, tap system	Yes (GEMMs)
Italy	Treasury bills; medium-term Treasury bonds (BTPs): 3,5, 10, 30 yrs; Zero Coupon Bonds (CTZ): 18, 24 months Treasury option certificates (CTOs): 6 yrs (3 yrs early redemption); Floating rate treasury certificates (CCT)	Strips; Medium term notes; commercial paper programmes; foreign-currency denominated bonds; nonmarketable: post office savings certificates; Swap operations allowed for domestic emissions	Domestic; since 1982 also in foreign currencies	Auctions; uniform-price auctions for long-term and multiple-price auctions for short-term instruments; automated auctions for short-, medium- and long-term instruments; tap system for Post Office Savings Certificates	Yes
Canada	Cash management bills; Treasury bills; government bonds: 2,3,5,10,30 yrs.	Strips; index-linked bonds (since Nov.1991); nonmarketable: Canada savings bonds: interest-swap programme	Funding only in domestic currency; borrowing in foreign currency only for the purpose of raising foreign exchange reserves	Auctions; tap system (for Canada Savings Bonds); syndicate (for index-linked bonds)	Yes
Sweden	Treasury bills; Treasury bonds: <15 yrs; lottery bond loans	Index-linked bonds; nonmarketable: national savings system; national debt account; swaps for foreign currency debt	Domestic and foreign	Auctions; tap system (for household instruments)	Yes

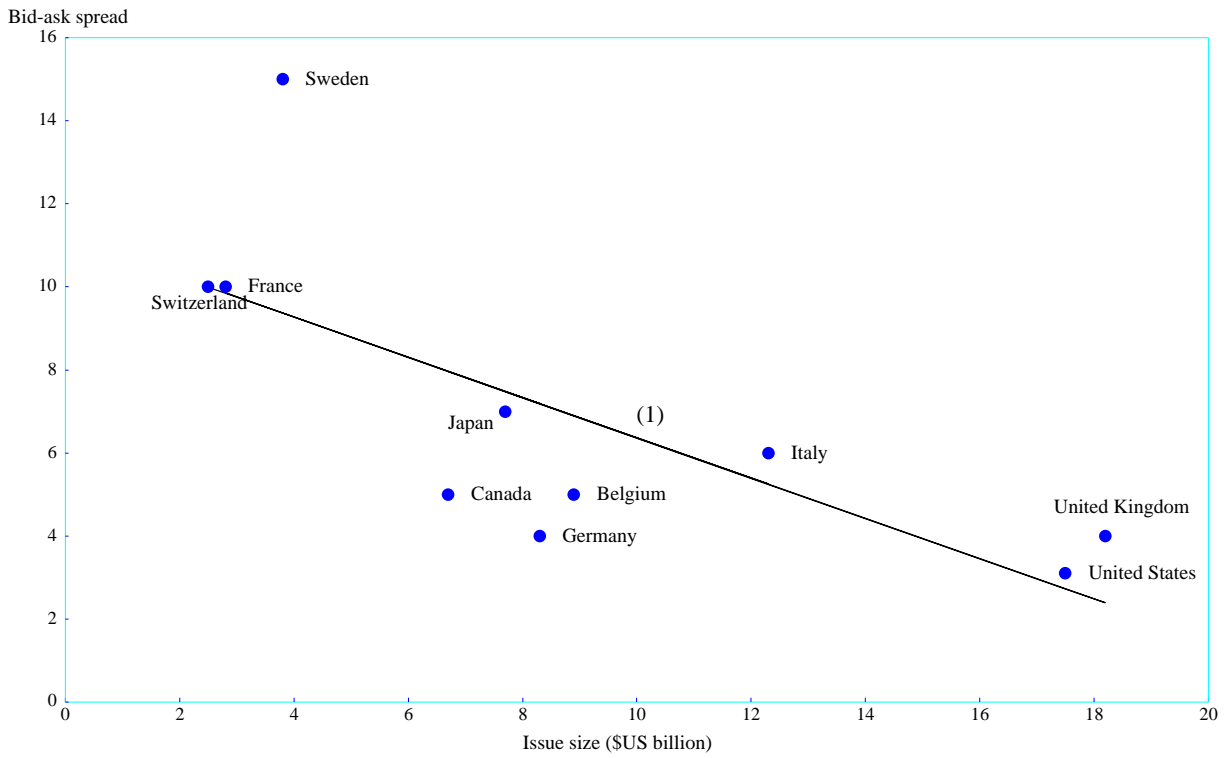
Sources: BIS (1999b), Blommestein/Thunholm (1997), Bröker (1993), Deutsche Bundesbank (1997), Ferré Carracedo/Dattels (1997), Inoue (1999), Kroszner (1998), and OECD.

Figure 1. US and UK differential between 30-year and 10-year securities
(monthly averages)

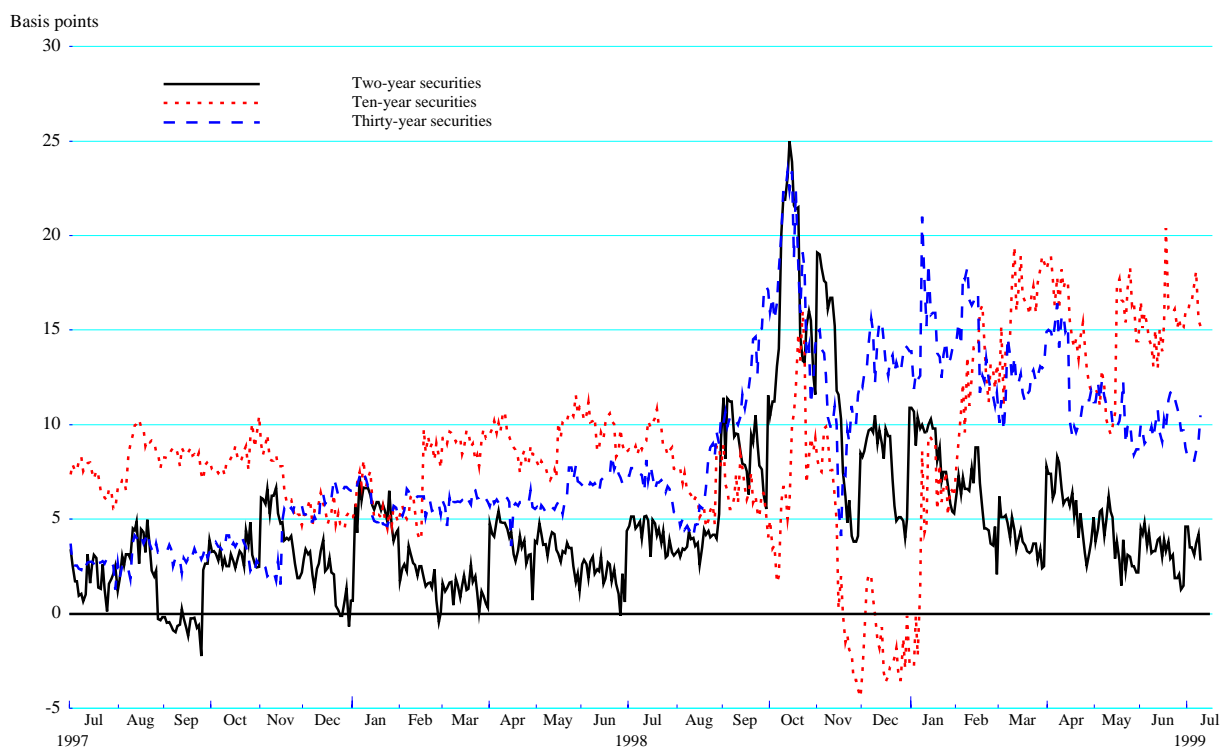


Source: OECD.

Figure 2. Issue size and bid-ask spread for on-the-run 10-year government bonds



1. Simple OLS regression yielding the following: Bid-ask spread = 11.2 - 0.5 * issue size.
Source: OECD based on BIS (1999).

Figure 3. Time-varying yield spreads between off-the-run and on-the-run Treasury securities

Source: Federal Reserve Bank of New York.

Note: The chart plots the fitted off-the-run yields less the comparable on-the-run.

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