Recent changes in fixed income markets and their impact on reserve management by the Netherlands Bank

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1. Introduction

This paper describes some modifications that have taken place in the management of the foreign exchange reserves of the Netherlands Bank (DNB) in the last few years. These changes were made in response to several external developments. Firstly, there have been major changes in the American and European fixed income markets. In the United States, continuous budget surpluses and the prospect of a big reduction in the amount of outstanding government debt raised the question of the extent to which US government debt will be able to retain its benchmark status in the US fixed income markets. In Europe, too, the issuance of government debt has been showing a decreasing trend. At the same time, the advent of the euro has given rise to a substantial increase in euro-denominated debt by private market participants. Secondly, with the arrival of monetary union in the euro area, the character of the foreign exchange reserves of the Netherlands Bank has changed. For instance, the reserves formerly denominated in Deutsche marks have been transformed into domestic currency assets. In response to these developments the main focus of reserve investment gradually shifted from liquidity and absolute safety alone to a more return-oriented approach. This led to a decrease in the importance of government bonds in our portfolios and an increase of investments in less liquid, but higher-yielding spread products. Moreover, the investment and risk management framework of the portfolios has been changed in the sense that spread products have been included in the benchmark portfolios and that several limits have been established with regard to spread exposure.

2. Diminishing issuance of US Treasuries

For the last couple of years, the US government has been running budget surpluses. Recent forecasts by the Congressional Budget Office (CBO) continue to project surpluses in the foreseeable future, albeit a slower pace than expected. In its August 2001 estimates the CBO foresees for the period 2002-06 a total surplus of USD 1,082 billion, compared to USD 2,002 billion in May 2001.[2] It must be noted that almost all of the expected budget surpluses in the next few years are foreseen to be in the so-called off-budget surpluses, comprising surpluses in the Social Security trust funds and the net cash flow of the Postal Service (Graph 1). The reduction in the expected total surpluses compared to previous forecasts is to a large extent connected to the recent tax rebates by the Bush administration and a less favourable economic outlook. Nevertheless, the surpluses will lead to lower financing needs of the US government and a reduction in the level of outstanding government debt. The amount of outstanding debt with the public is projected to decline from USD 3,294 billion in 2001 to USD 876 billion in 2011 (ie from 32.1% to 5.2% of GDP; Graph 2). After the publication of the August CBO data many market participants still expect the Treasury to cease issuance of new Treasury debt in the not too distant future. For instance, investment bank Lehman Brothers expects the auction of the last 30-year bond to happen in August 2002 and it expects the complete elimination of Treasury note issuance in the fiscal year 2006.[3] The recent terrorist attacks in the United States may lead to some changes in the budgetary outlook: it is likely that government spending for, amongst others, defence, airline support and reconstruction may increase, whereas at the same time tax income may decrease because of the further deterioration in the short-term economic outlook.

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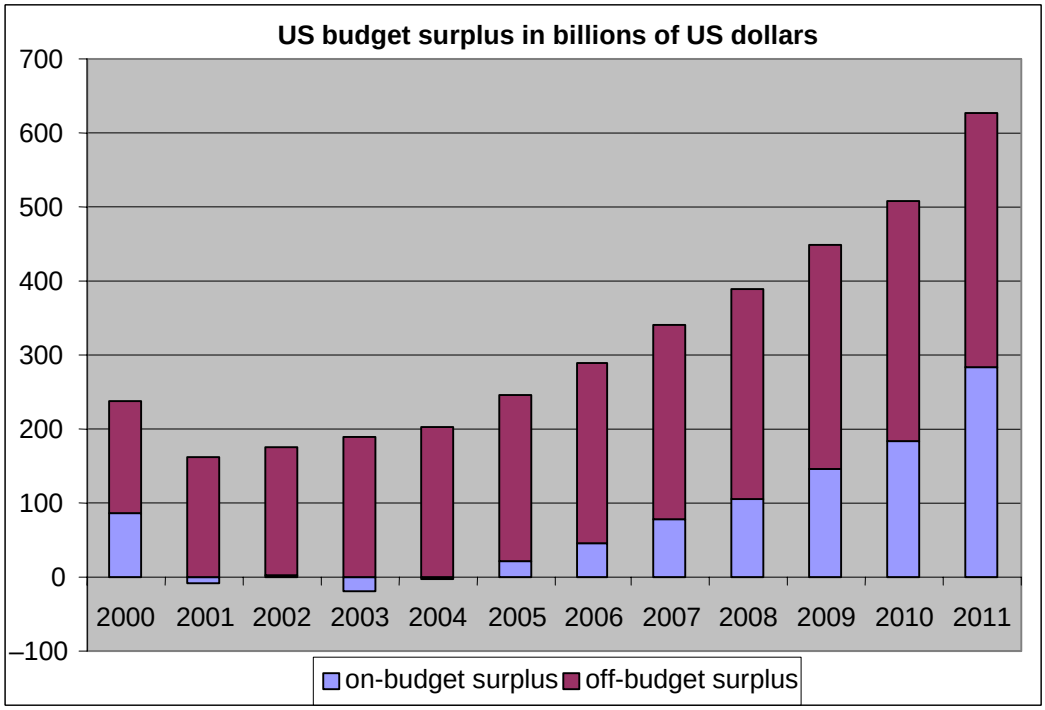
[1] De Nederlandsche Bank NV, Financial Markets Department. The views expressed do not necessarily reflect those of the Netherlands Bank. Comments by P Dijkstra, W T A van Veen and L M T van Velden are gratefully appreciated.

[2] *The Budget and Economic Outlook: an Update*, The Congress of the United States Congressional Budget Office, Washington DC, August 2001.

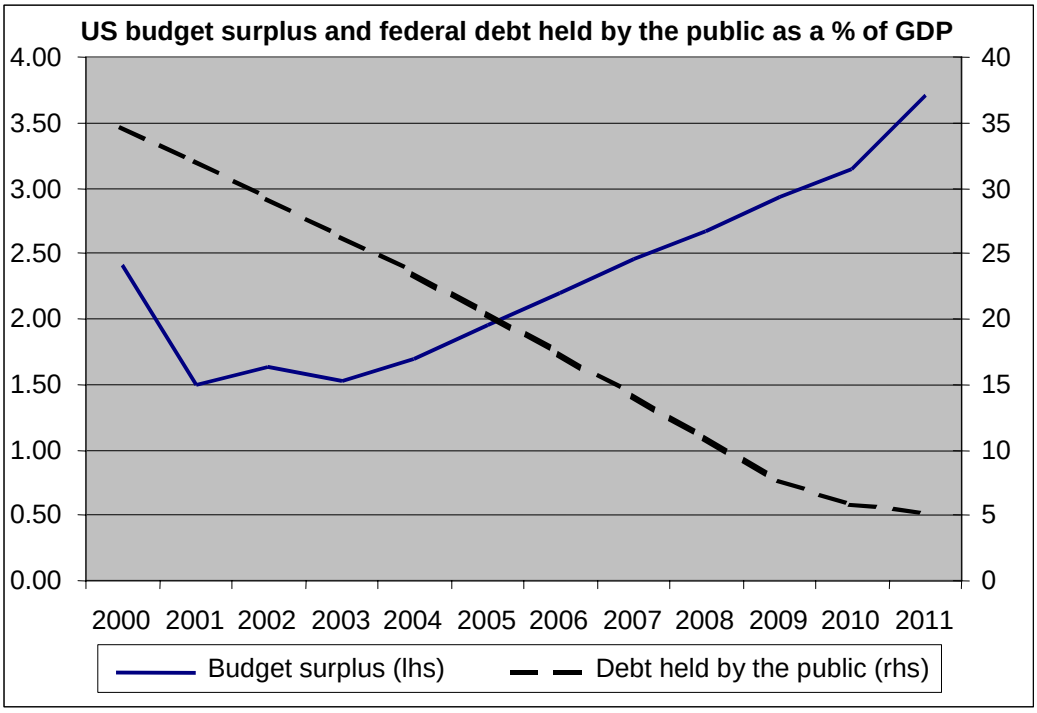
[3] Lehman Brothers Global Economics, 28 August 2001.

Graph 1



Source: Congressional Budget Office, August 2001.

Graph 2



Source: Congressional Budget Office, August 2001.

During the last few years, the decreased need for funds has already led to significant changes on the Treasury market and in the US Treasury's debt management policy. Firstly, the US Treasury has decreased the size of its new issues. Secondly, it has reduced the number of different issue maturities. For instance, the three-year note and the year bill were cancelled in 1998 and 2001 respectively. Thirdly, as from 1999 the US Treasury has decreased the number of auctions of new paper. At the same time it has increased the number of reopenings of older issues. For instance, five-year notes are issued on a quarterly basis instead of a monthly one. The May and November auctions concern new issues whereas the February and August auctions concern reopenings of the November and May issues respectively. In this way the Treasury tries to maintain reasonably large auction sizes and thereby the liquidity of on-the-run benchmark issues. Finally, in early 2000, the Treasury announced a programme of regular buybacks of old and less liquid debt issues. In practice, these buybacks concentrate on the longer end of the Treasury curve, ie issues maturing in 2015-30.

3. Role of Treasuries as benchmark securities

Traditionally, the market for US Treasuries has had several features that contributed to its benchmark status in the US fixed income market.[4] First of all, Treasuries are considered default risk-free as they carry the full faith and credit of the federal US government. Because of their default risk-free nature, Treasuries are heavily used as a pricing vehicle for credit products like corporate bonds. Prices of such bonds are quoted as a yield spread over a similar maturity benchmark Treasury bond. Furthermore, Treasury rates are often used for analytical purposes such as forecasting market movements. By looking at movements in Treasury rates as opposed to rates on spread products, one can clearly distinguish premia in credit and liquidity risk from fluctuations in the general level of interest rates. Secondly, Treasuries are widely used as a hedging vehicle by issuers of and traders in debt securities. By buying or selling Treasuries or derivative Treasury products such as bond futures, they can hedge for general movements in interest rates. In this regard it is important to note that the Treasury market is very liquid. This means that large blocks can be traded at relatively small bid-ask spreads and without causing price movements. In addition, well-developed bond and notes futures contracts on Treasury securities provide for even greater liquidity for the underlying Treasury products as well. Furthermore, there is a well-developed repo market for Treasuries, which facilitates short selling. The existence of repo markets in Treasuries makes it possible for market participants to either borrow funds by repoing out Treasuries (thus funding a position) or to manage liquidity safely by repoing in securities for cash, thereby using the Treasuries as collateral. For the latter reason repo rates are lower than unsecured interbank rates.

4. Diminishing role of Treasuries as US benchmark?

In the course of the year 2000, the debate heated up as to whether US Treasuries will be able to retain their benchmark status in the US fixed income markets. This happened especially after the announcement of the details of the treasury buyback programme in January 2000.[5] The details of the programme revealed that the Treasury would buy USD 30 billion of Treasuries with a maturity of longer than 10 years. This amount was larger than expected and it had not been foreseen that the Treasury would concentrate the buybacks in the longer maturities. Investors began to think that with the decreased financing needs and the possibility of a complete elimination of Treasury debt outstanding in the medium term, the Treasury might very well eliminate the issuance of new 30-year bonds: it was thought that it might be a little peculiar if the Treasury continued to issue such long-maturity debt, which would be bought back well before maturity.

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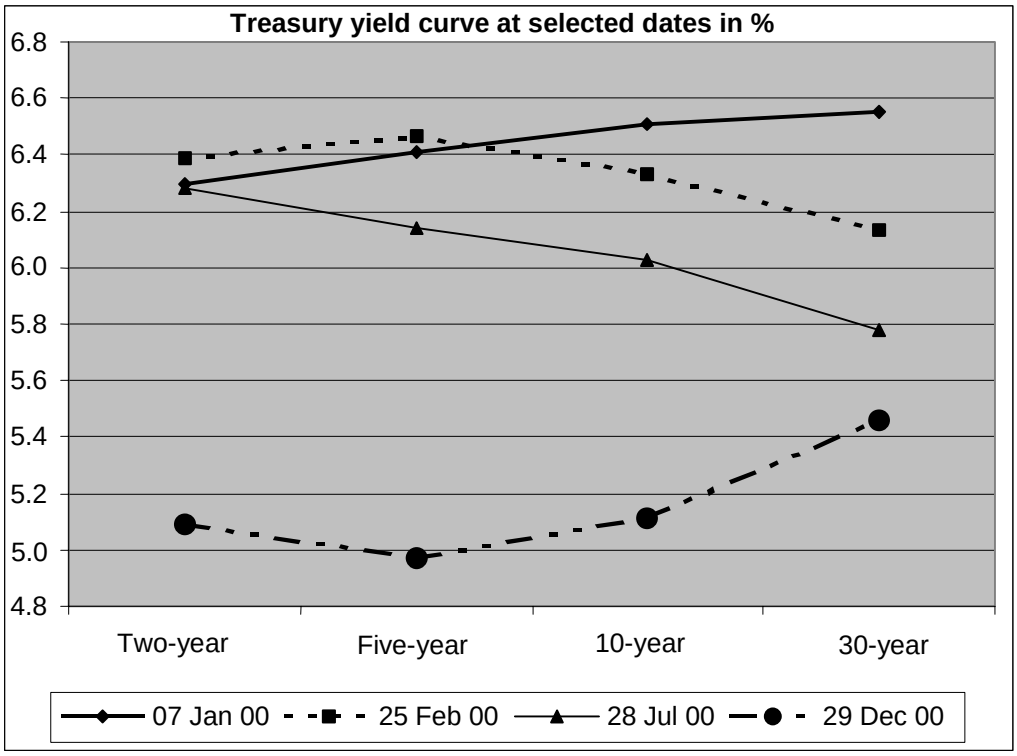
[4] For an extensive discussion of the role of US Treasuries as a benchmark and reserve asset, see Michael J Fleming (2000): "Financial Markets Implications of the Federal Debt Paydown", *Brookings Papers on Economic Activity* 02, Brookings Institution, Washington DC.

[5] "Marketable Treasury Securities Redemption Operations", US Department of the Treasury, January 2000.

Price action in the Treasury market after the announcement of the buybacks showed that Treasuries were acquiring a scarcity premium compared to other fixed income products. In particular, investors such as insurance companies and pension funds with longer-dated liabilities increased their demand for long bonds, thereby bidding up their price and decreasing their yield. The perceived future scarcity of longer-dated Treasuries led to a significant inversion of the Treasury yield curve in a rather short time. The yield on the 30-year Treasury bond declined by 40 basis points from 6.55% early January to 6.15% in late February. During the same period the yield on the two-year note increased by 10 basis points to 6.4% (Graph 3). In other words, the yield curve, usually measured as the yield differential between two- and 30-year bonds, inverted from plus 25 basis points to minus 25 basis points in less than two months. It was only later in 2000 that the yield curve became less inverted and eventually positively sloped again. This had mainly to do with increased expectations of near-term monetary policy loosening, which led to a decrease in shorter-term yields. Furthermore, 30-year bonds underperformed after comments by the US Treasury that it was important to retain a complete Treasury interest rate curve, thereby implying that it might continue to issue new 30-year debt in the foreseeable future.

Graph 3



Source: Bloomberg.

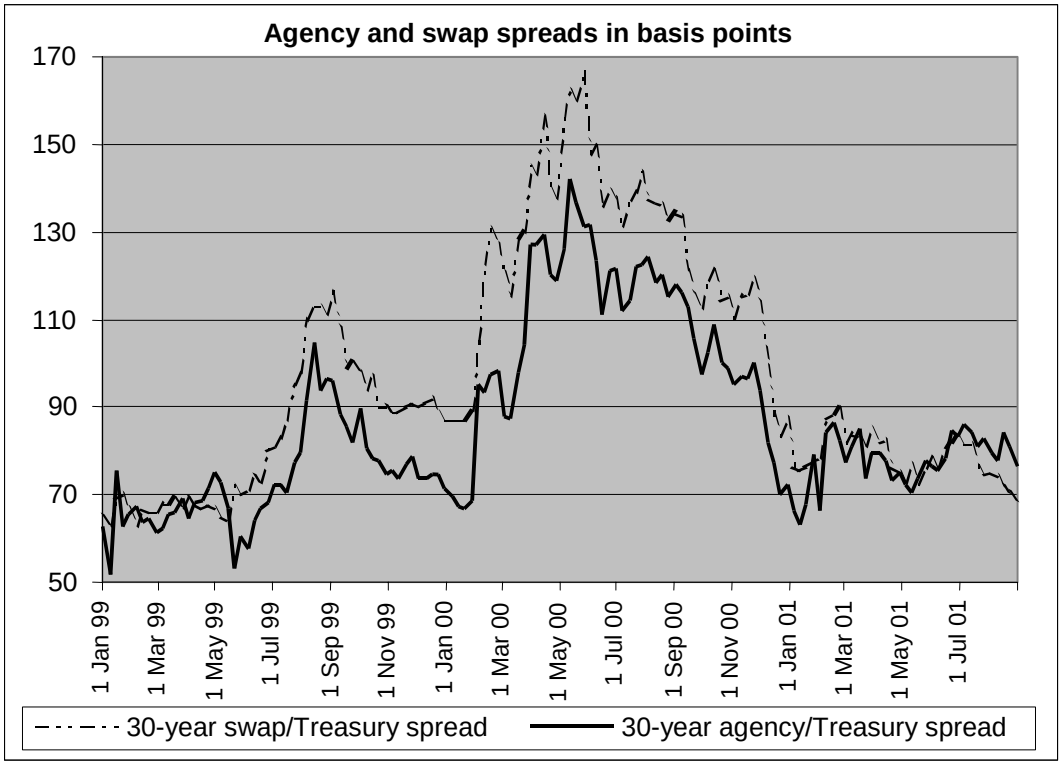
In early 2000, a second, strongly related, important movement on the US fixed income market happened in the spreads of Treasuries vis-à-vis other high-quality fixed income products such as agency bonds[6] and interest rate swaps.[7] These spreads widened significantly in the days and weeks

[6] Agency bonds are issued by so-called Government Sponsored Enterprises (GSEs), of which the housing GSEs Federal National Mortgage Association (Fannie Mae), Federal Home Loan and Mortgage Corporation (Freddie Mac) and Federal Home Loan Bank System (FHLB) are the three most important. These agencies are private banks which are closely involved in the US mortgage market. They were created by the US government and Congress and enjoy a special status that means that market participants consider them almost as good a credit quality as the US Treasury. The agencies have a triple-A credit status. It must be noted, however, that they do not carry the full faith and credit of the US government. For a further explanation see, for instance, Lehman Brothers, *Guide to Agency and Government-Related Securities*, 2001.

[7] An interest rate swap is an agreement whereby two parties agree to exchange periodic interest payments. One party makes fixed interest payments at designated dates for the life of the contract. The other party makes payments based on a floating

after the announcement of the buyback programme. The yield differential between the 30-year Treasury bond and 30-year agency bonds increased from 70 basis points in early January 2000 to about 100 basis points at the end of February (Graph 4). The differential between 30-year bond yields and 30-year interest rate swap rates showed a similar pattern. During the remainder of the year spreads widened even further. Apart from the perceived future scarcity of Treasuries, this further spread widening in the spring of 2000 was also connected to proposals in the US Congress for an overhaul of the legislation with regard to the US agencies. Investors considered the proposals a threat to the credit status of the agencies. Up until then these government-sponsored entities were considered as virtually default risk free because of their perceived implicit guarantees by the US government. As the proposals would set the agencies further apart from the government, credit risk was perceived to be larger than before. Hence agency spreads widened. Later in 2000 spreads tightened considerably as the chances of the legislative proposals being actually adopted by Congress diminished significantly.

Graph 4



Source: Bloomberg.

5. Swaps or agency bonds as new benchmarks?

With the reduction in the issuance of Treasury paper, an important question within the US fixed income market has become whether Treasuries will be able to retain their benchmark status. If Treasuries are getting scarcer, they may very well lose some of their favourable characteristics.[8] For

rate, usually six-month Libor. For example, at any point in time the 10-year swap rate indicates what fixed rate a bank is prepared to pay at that time in exchange for receiving six-month Libor during the 10-year lifetime of the contract. For a further explanation see, for instance, Frank J Fabozzi, *Handbook of Fixed Income Instruments*, Irwin Professional Publishing, Burr Ridge, 5th edition, 1997.

[8] For an extensive discussion see Garry J Schinasi, Charles F Kramer and R Todd Smith, *Financial Implications of the Shrinking Supply of U.S. Treasury Securities*, International Monetary Fund, March 2001.

instance, if Treasuries have a volatile scarcity or liquidity premium, they will move not only because of general changes in interest rate expectations but also because of changes in their perceived scarcity and/or liquidity. This will make them less attractive as a hedging and pricing vehicle. In practice, issuers of and traders in corporate debt already largely see interest rate swaps as the vehicle of choice as far as hedging is concerned. Agency bonds, too, are widely used for hedging purposes. Interest rates on agency bonds and interest rate swaps move more closely in line with each other and with corporate bonds than Treasury rates do. The use of Treasuries as a hedging vehicle has been declining for a few years and not just since early 2000. The crisis surrounding the hedge fund Long-Term Capital Management (LTCM) in the autumn of 1998 is often mentioned as an important watershed in this respect. During that crisis Treasuries were heavily used as a safe and liquid haven, so in the flight to quality and liquidity, Treasury yields declined significantly compared to agency bond yields and interest rate swap rates. Consequently, the correlation between Treasury rates and other fixed income rates declined notably, thereby making Treasuries less interesting as a hedging vehicle. This episode taught traders in and issuers of corporate debt that it might be better to hedge their interest rate exposure by using swaps or agency bonds rather than Treasuries.

Both the shrinking supply of Treasuries and their decreased use as a hedging vehicle seem to have reduced liquidity in the Treasury market in recent years, as witnessed by increased bid-ask spreads and a reduction in trading activity and market turnover.[9] There are also other factors that may explain the reduced market liquidity. The number of primary dealers in Treasury debt has decreased considerably during the last few years because of continued consolidation in the financial industry. Incidentally, this consolidation may affect dealing not only in Treasuries but also in agency securities. Furthermore, banks seem to be less willing to commit capital to market-making activities. Consequently, dealers are holding smaller inventories of Treasuries and are less willing to take large positions and risks. This trend is probably reinforced by increased price transparency and concomitant reduced profit margins due to the strong growth of electronic trading platforms. These platforms have probably also influenced liquidity in the markets. So far the rise of electronic trading platforms has consolidated rather than fragmented the fixed income markets. Going forward, fragmentation may become an issue, thus hampering liquidity.[10] On the other hand, it may be argued, that increased market transparency enables a better insight into market depth, thus increasing liquidity.

For various reasons several investment banks think that interest rate swaps are a likely candidate to become a new benchmark in the US fixed income markets.[11] First, interest rate swaps have a high credit quality, as they are based on Libor rates. As such they represent generic high-quality (double-A) bank credit rather than a specific name, such as, for instance, a US agency. Ultimately, the credit quality of interest rate swaps is sensitive to the credit quality of the banking panel that is behind the Libor fixing. In addition to this generic risk, an interest rate swap bears counterparty risk vis-à-vis the bank with which the contract was concluded. This risk concerns the replacement cost of the contract in the event the counterparty defaults. Second, the swap market is very liquid, although off-market swaps may not always be easy to unwind. The outstanding notional amount of interest rate swaps was estimated at USD 44,000 billion at the end of 1999, compared to about USD 3,500 billion of government debt held by the public. It is worth noting that, in contrast to securities, the supply of interest rate swaps is infinite, since new contracts can be concluded all the time. Average daily turnover in swaps has been estimated at more than USD 60 billion of 10-year note duration equivalents, compared to about USD 100 billion of 10-year note duration equivalents in Treasuries.[12] Trading in interest rate swaps involves bid-ask spreads of about 1-2 basis points, which is higher than for on-the-run Treasuries and about comparable to agency debt. That swaps are increasingly used as a hedging and pricing vehicle is illustrated by the fact that many new corporate debt issues are already marketed on a spread to swaps/Libor basis rather than as a spread over Treasuries. Moreover,

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[9] See Michael J Fleming, "The Benchmark U.S. Treasury Market: Performance and Possible Alternatives", *FBRNY Economic Policy Review*, Federal Reserve Bank of New York, April 2000.

[10] Committee on the Global Financial System, *Implications of Electronic Trading in Financial Markets*, Bank for International Settlements, Basel, 2001.

[11] John Youngdahl, Brad Stone and Hayley Boesky, "The Implications of a Disappearing Treasury Debt Market", *Goldman Sachs Global Economic Paper* no 48, July 2000.

[12] "The Outlook for Swaps as a Hedge Vehicle", JP Morgan Securities, January 2000. Turnover data for swaps concern 1998 and for treasuries 1999.

relative value analysis in high-quality credit products is more and more being conducted against swaps rather than Treasuries. In this sense the US fixed income market is converging with European fixed income market practice, where pricing and comparisons on Libor basis have been common for a long time. This is probably due, to a large extent, to the non-existence of real European benchmark government securities, with a lot of relatively small government issuers instead.

Agency debt with a bullet structure is a second candidate to gain some of the advantages of benchmark status in the US fixed income market.[13] Compared to swaps, agency notes have the benefit that there is no need to sign all kinds of documentation with counterparties.[14] Furthermore, agency debt has an advantage for investors with real money to invest because they can use it to actually put away their money. In the case of swaps, on the other hand, interest rate risks are traded but actual underlying notional amounts are not exchanged and even not needed. Therefore, agencies may be a more appropriate investment vehicle for so-called real money investors than for leveraged investors.[15] For a couple of years, two of the major agencies, Fannie Mae and Freddie Mac, have been issuing large (USD 3-10 billion) liquid bullet issues in several maturities (two-, three-, five-, 10- and 30-year debt) on a regular basis. With the programmes for these so-called benchmark and reference notes the two agencies have more or less copied the issuance practices of the US Treasury and tried to establish themselves as the new benchmarks and a substitute for Treasuries, with the ultimate goal of lowering their funding costs. The large liquid agency debt issues trade at about a 1-2 basis point bid-ask spread for trade amounts up to USD 250 million. Liquidity in agency debt trading is enhanced by an increased activity in repo markets for agency debt, with issues trading both as general collateral and as specials. Liquidity was even further reinforced by the creation of futures and option contracts on agency debt in the spring of 2000.

The amount of outstanding debt with a maturity greater than one year of the three largest agencies (Freddie Mac, Fannie Mae and FHLB) has grown very rapidly in recent years, from USD 438 billion at the end of 1997 to USD 1,037 billion at the end of 2000 (ie an average annual growth rate of 33%). During the same period gross issuance of long-term debt by the three largest agencies (from almost USD 300 billion to over USD 400 billion) started to outpace that of the US Treasury (from about USD 500 billion to about USD 250 billion). Investment bank Salomon Smith Barney estimates that under reasonable assumptions the agency debt market could be larger than the tradable supply of Treasuries by the year 2004.[16]

Up until now it has not really been possible to say what product will become the future benchmark instrument in the US fixed income market. Some commentators say that benchmark status might be divided between different products for different purposes. There is no logical alternative to Treasuries as far as lack of credit risk is concerned. Analysts at Goldman Sachs expect swaps to replace Treasuries as the main benchmark for hedging, pricing, reference and analytical purposes.[17] On the other hand, they expect agency bonds to be an important cash instrument. Furthermore, agency bonds will continue to be used as a hedge vehicle as well. If Treasuries disappear, agency bonds will be the largest remaining asset class with a triple-A credit status and with well-developed large, liquid issuance. Because, compared to interest rate swaps, agency bonds have a relatively easy legal structure and a close resemblance to Treasuries, they may appeal to “real” investors who used to invest heavily in Treasuries. Swaps may become the vehicle of choice for financial intermediaries and leveraged investors instead.

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[13] Securities with a bullet structure have a complete redemption of the principal at a fixed end date. This stands in contrast to paper with a redemption of the principal spread over several dates (based on, for instance, a lottery mechanism) or to callable securities, which may be redeemed earlier if certain conditions are met.

[14] To conclude swap trades it is necessary to have signed legal documentation with the counterparty. Moreover, to mitigate counterparty credit risk exposure, use is made of bilateral netting and collateral agreements. This may require additional legal documentation.

[15] In the market, accounts with money to invest, like pension and mutual funds, insurance companies and central banks, are called “real money accounts” as opposed to “leveraged accounts” and “fast money accounts”. The latter two types of investors trade in the fixed income market but do not have real “own” money to invest. They use borrowed money instead. Money may be raised by borrowing from banks or by repoing out securities.

[16] Salomon Smith Barney, *2001 Guide to Agency Debt Securities*, August 2001.

[17] John Youngdahl, Brad Stone and Hayley Boesky, ‘The Implications of a Disappearing Treasury Debt Market’, *Goldman Sachs Global Economic Paper* no 48, July 2000.

6. Central banks as holders of US Treasuries

Traditionally, central banks and official institutions have been large holders of US dollar-denominated assets. According to IMF figures and estimates by UBS, central banks collectively held USD 2,050 billion of foreign exchange reserves in January 2001. During the 1990s about 65% of these foreign exchange reserves were held in US dollars. Historically, as much as 70% of the foreign exchange reserves have been invested in the corresponding government bond market. Central banks and official institutions have invested a very large share of their exchange reserves in Treasuries because of their favourable benchmark features described above. It is important to note that, in comparison with other investing institutions such as pension funds, insurance companies and the like, central banks have somewhat different needs for their fixed income investments. In deciding on their investment of foreign exchange reserves, central banks tended and still tend to focus more on features like liquidity, reliability, lack of default risk and the ability to own and trade large amounts, especially also in times of market unrest, rather than on return per se. It must be noted that central banks own their investments in exchange reserves to a large extent for other reasons than institutional investors. Central banks hold their dollar reserves to be able to fund foreign exchange interventions whereby dollars are sold in exchange for local currency. Moreover, exchange reserves may serve as a monetary policy tool. By buying or selling foreign currency, the central bank can loosen or tighten conditions in the domestic money market (the collective balance held by commercial banks at the central bank). Furthermore, exchange reserves may be used to finance balance of payments deficits, or to fulfil obligations vis-à-vis institutions like the IMF.

A common feature of the above reasons for holding exchange reserves is that the events that may give rise to the use of reserves can happen at (very) short notice. Therefore, many central banks feel that it is important that their exchange reserves can be liquidated easily at short notice without incurring too many costs. With the shrinkage of the supply of Treasuries and a possible decrease in the liquidity of the Treasury market, central banks, like other investors, have started to look for possible alternative or complementary instruments in which to invest their exchange reserves. Agency debt is clearly one of the important alternatives that central banks, including the Netherlands Bank, have looked at.

7. Specific developments affecting national central banks in the euro area

In recent years, national central banks (NCBs) in the euro area have been confronted with specific developments that have influenced their foreign exchange reserve management. With the start of the so-called third phase of European monetary union on 1 January 1999 the European System of Central Banks (ESCB), comprising the European Central Bank and the NCBs, took over monetary policy decision power from the 11 euro area NCBs. From that moment on monetary policy decisions for the euro area were taken by the Governing Council of the ECB, consisting of the six members of the ECB Executive Board, located in Frankfurt, and the presidents and governors of the 11 euro area NCBs. In 2001 Greece joined EMU: thus the euro area expanded to 12 countries and the governor of the Greek central bank joined the ECB Governing Council. An important feature of the setup of monetary and foreign exchange policy in the euro area is that the ECB owns its own gold and foreign exchange reserves for monetary and foreign exchange policy purposes. At the start of monetary union the 11 NCBs contributed in total EUR 40 billion worth of reserves to the ECB. This was done in the form of gold, US dollars and Japanese yen. The ECB reserves are managed by the NCBs on behalf of the ECB. Between the ECB and the NCBs there exists a “Guideline on the management of the foreign reserve assets of the European Central Bank by the national central banks”. This guideline contains, amongst others, regulations governing the way NCBs can invest the reserves they manage on behalf of the ECB.

The ECB can use its reserves for foreign exchange and monetary policy purposes, just like NCBs in the euro area used to do in the past. It is worth noting that when the ECB intervenes on the foreign exchange markets it uses its own foreign exchange reserves and not the reserves held by the NCBs. The same also holds in cases where NCBs carry out interventions as members of the ESCB. For

instance, the interventions in the autumn of 2000 were carried out by both the ECB and NCBs using the ECB's foreign exchange reserves. However, if the value of the ECB's reserves were to fall below a certain threshold, the ECB may make an additional call on the NCB in order to replenish its reserves.[18] Except for the possibility of an additional call for reserves, NCBs also hold their own exchange reserves for other purposes.[19] For instance, they can be used for the fulfilment of obligations towards organisations such as the IMF. They may be used, within certain limits, for operations carried out when acting as an agent for customers, including national governments. And they may be used for portfolio investment transactions as part of general asset management operations.

Another consequence for euro area NCB reserves that stemmed naturally from the start of monetary union is the fact that reserves denominated in the former euro area currencies ceased to be foreign exchange reserves but were transformed into local currency assets. This has probably been an important development for several NCBs. Many NCBs were holders of substantial amounts of Deutsche marks before the start of monetary union. In most countries, monetary policy before monetary union consisted of a very close peg of the domestic currency to the Deutsche mark. In order to be able to maintain that peg, NCBs considered it necessary to own substantial amounts of Deutsche mark reserves, which might be sold in the foreign exchange market if need be. In the case of the Netherlands Bank, the run-up to monetary union and the concomitant loss of the need for Deutsche marks for monetary and foreign exchange policy was used as an opportunity to scrutinise the balance sheet, taking into consideration, amongst others, the foreign exchange and interest rate risks on both the assets and the liabilities side. It is likely that other NCBs undertook similar exercises and made changes in the composition of their reserves in the run-up to monetary union, for instance by reducing the overall size of reserves or by selling Deutsche marks for other currencies. Nevertheless, after the introduction of the euro some NCBs retained considerable amounts of euro-denominated former foreign exchange reserves.

Because of this changed nature of NCB reserves, the importance of features like liquidity, the ability to own and trade large amounts and a very high default-free risk nature have probably diminished in favour of an increased importance of return on investment. In the case of the Netherlands Bank, there have been significant changes in the management of its own US dollar reserves and in the euro-denominated assets that used to be Deutsche mark reserves. The Bank conducted a reassessment of its fixed income investment framework and specifically of the role of spread products within it. This exercise resulted in a decision to add spread products to the benchmarks of the fixed income portfolios. Furthermore, it was decided to implement additional risk measures to contain the risks stemming from spread products.

One important consideration behind the decision to substantially increase the exposure to spread products was that research shows that in the longer run investments in high-quality credit products yield a higher return and lower return volatility than investments in government bonds.[20] The higher return is compensation for lower liquidity and the risk of default and downgrades. The lower return volatility of high-quality spread products may be a result of the fact that the interest rate spread differential between spread products and government bonds tends to be negatively correlated to the level of interest rates of government bonds. This negative correlation is probably connected to the fact that economic growth tends to increase yields on government bonds whereas at the same time credit quality tends to improve in periods of a booming economy. Consequently, credit spreads often narrow when government bond rates rise and vice versa. It is important to note, however, that other factors, too, may play a significant role in explaining spreads between Treasuries and high-quality spread products. In recent years, for instance, the relative actual and expected supply of agency versus Treasury securities seemed to account for much of the spread development as well.

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[18] See Council Regulation (EC) No 1010/2000 of 8 May 2000 concerning further calls of foreign reserve assets by the European Central Bank.

[19] In this regard Articles 23 and 31 of the Statute of the ESCB are of importance.

[20] See "How much Credit?", JP Morgan, London, May 1999 and "Introducing total return swap indices", JP Morgan, London, June 2000.

8. Benchmark structure of the DNB fixed income portfolios investment framework

Until 1999, the fixed income portfolios of the Netherlands Bank were in US dollars, Deutsche marks, Japanese yen and Dutch guilders. The Dutch guilder investments were part of the own funds portfolio of the Bank, which also includes fixed income instruments in foreign currencies and equities. The size of this portfolio is equal to the size of the Bank's own capital and reserves. Since the start of monetary union in 1999, the Netherlands Bank has managed the "Dutch part" of the ECB dollars and yen on behalf of the ECB. These investments are regulated within a management framework established by the Governing Council of the ECB. Apart from "ECB reserves" the Bank manages its own dollar and yen reserves and one euro portfolio and its own funds portfolio. The own foreign exchange reserves, the euro portfolio and the own funds portfolio are managed according to the Bank's own investment framework. In remainder of this paper we focus on the dollar portfolio.

Since the early 1990s, the framework for the management of the reserves of the Netherlands Bank has consisted of several layers with the use of so-called benchmark portfolios. In general, benchmark portfolios fulfil two aims. First, they give guidance to the investment policy. The overall duration or interest rate risk position, yield curve position and spread risk position of the benchmark determine the positioning of the actual portfolio to a large extent. The degrees of freedom given to the managers of the actual portfolio are expressed in modified duration terms. Second, the benchmark portfolio serves as a point of reference for the return of the actual portfolio. Differences between the return of the actual portfolio and the benchmark portfolio give an indication of the quality of the management of the actual portfolio. Of course, the differences in return are also dependent on the extent to which the managers make use of their degrees of freedom.

In the case of the Netherlands Bank there are two benchmark portfolios for each actual portfolio. First, there is a strategic benchmark portfolio. It is set yearly by the Governing Board of the Bank and reflects longer-term preferences. Then there is a tactical benchmark portfolio, which is set monthly by an Investment Committee.[21] Within certain limits, this portfolio can deviate from the strategic portfolio in terms of, amongst others, interest rate exposure and yield curve exposure. The aim of the tactical benchmark portfolio is to be able to take advantage of shorter-term developments and opportunities in the fixed income markets. Finally, there is the actual portfolio, managed by several portfolio managers. The actual portfolio can deviate from the tactical benchmark within certain limits as well. It is important to note that the Bank's benchmark portfolios do not consist of individual instruments. Instead, they consist of indices for different maturities, so-called grid points, for different types of instruments. These indices provide for the total return of different maturities and they are based on specific bonds. The strategic and tactical benchmark portfolios are allocated to different maturities. Up until the year 2000, the indices used in the dollar benchmarks concerned eurodollar bank deposits for one- and three-month maturities, Treasury bills for three-, six- and 12-month maturities and Treasury notes and bonds for two-, three-, four-, five-, seven-, 10- and 30-year maturities. The benchmark portfolios did not contain spread products like agency bonds.

9. Incorporation of interest rate risk and yield curve risk in the benchmarks

The interest rate risk of the benchmark portfolios is expressed in terms of modified duration.[22] The overall modified duration of the strategic dollar benchmark portfolio is decided upon once per year. The modified duration is allocated to different maturities and instruments (bank deposits and government bills, notes and bonds) along the yield curve. The overall modified duration and the

[21] Chaired by a member of the Governing Board and further consisting of a Deputy Executive Director, members of the Asset Management division of the Financial Markets Department and a member of the Econometric Research and Special Studies Department of the Bank. A member of the Risk Management division of the Financial Markets Department is present as well, but she or he does not take part in the decision-making process.

[22] Modified duration is a measure for the interest rate sensitivity of a fixed income portfolio. A modified duration of 1 means that if the level of interest rates increases by 100 basis points, the market value of the portfolio will decrease by 1%.

distribution over the curve are based on an optimisation of risk/reward characteristics without explicitly incorporating a view on interest rates over a year horizon. The calculations take into account several restrictions with regard to, amongst others, a minimum desired return and maximum VaR. The resulting strategic benchmark sets the basis for the interest rate risk and risk resulting from movements in the shape of the yield curve. Around the strategic benchmark there exist degrees of freedom for the tactical benchmark. The tactical benchmark is set once a month by the Investment Committee, based on a proposal by the portfolio managers. The degrees of freedom for the tactical benchmark concern both the overall modified duration and partial modified durations per maturity grid point. The modified duration of the tactical benchmark portfolio is allowed to deviate from the modified duration of the strategic benchmark to a certain extent. In a similar vein, there exist degrees of freedom around the different maturity grid points. Finally, the actual portfolio may differ from the tactical benchmark within certain bands as well. The degrees of freedom for the tactical benchmark vis-à-vis the strategic benchmark and for the actual portfolio vis-à-vis the tactical benchmark are set once per year. They are based on an allowed maximum VaR vis-à-vis the strategic and tactical benchmark, respectively.

Table 1 gives an example of how a strategic benchmark portfolio with a modified duration of 1.4 might be allocated over different maturities along the yield curve. The table also illustrates the degrees of freedom for the Investment Committee, which is responsible for the tactical benchmark. In the example the overall modified duration of the tactical benchmark may deviate from the strategic benchmark by a certain amount (dfict) of duration points. Per maturity grid point the Investment Committee is allowed to deviate from the partial modified duration by another amount (dfic) of duration points. The data further illustrate the degrees of freedom for the portfolio managers who manage the actual portfolio. Their overall modified duration is allowed to deviate from the tactical benchmark's modified duration by a certain amount (dfpmt) of duration points, while the partial modified duration per grid point is allowed to deviate by another amount (dfpm) of duration points. It is worthy of note, however, that the limits set for the tactical benchmark vis-à-vis the strategic benchmark are the maximum limits for the actual portfolio as well. So, if the tactical benchmark deviates from the strategic benchmark by +0.15 duration points in a specific maturity, then there are only dfpm–0.15 duration points left over for the actual portfolio to go long vis-à-vis the tactical benchmark.

Table 1

Example of an allocation of an overall modified duration over maturity grid points and of the degrees of freedom for the strategic and tactical benchmark and the actual portfolio

	Strategic benchmark	Tactical benchmark	Actual portfolio
1-month	0.05	0.05 ± dfic	TB ± dfpm
3-month	0.10	0.10 ± dfic	TB ± dfpm
6-month	0.10	0.10 ± dfic	TB ± dfpm
12-month	0.20	0.20 ± dfic	TB ± dfpm
2-year	0.25	0.25 ± dfic	TB ± dfpm
3-year	0.15	0.15 ± dfic	TB ± dfpm
4-year	0.10	0.10 ± dfic	TB ± dfpm
5-year	0.20	0.20 ± dfic	TB ± dfpm
7-year	0.10	0.10 ± dfic	TB ± dfpm
10-year	0.10	0.10 ± dfic	TB ± dfpm
30-year	0.05	0.05 ± dfic	TB ± dfpm
Total	1.40	1.40 ± dfict	TB ± dfpmt

TB = tactical benchmark modified duration; dfic = partial modified duration degrees of freedom for Investment Committee; dfpm = partial modified duration degrees of freedom for portfolio managers; dfict = modified duration degrees of freedom for the Investment Committee for the total modified duration of the tactical benchmark; dfpmt = modified duration degrees of freedom for the portfolio managers for the total modified duration of the actual portfolio.

Modified duration of the actual portfolio may not exceed the limits for the tactical benchmark vis-à-vis the strategic benchmark.

Table 2 illustrates how the Investment Committee may take a position vis-à-vis the strategic benchmark in order to express its views as to the direction of interest rates and the shape of the yield curve. In the example the Committee expects interest rates to decrease and the yield curve to steepen. Therefore, it takes an overall long position in modified duration terms of 0.2 duration points. Moreover, it establishes a long position in the shorter-term maturities and a short position in the longer-term maturities. This way the portfolio will benefit if interest rates decline in general and if the curve steepens and shorter-term maturities outperform longer-term maturities. The table also illustrates the degrees of freedom left over for the managers of the actual portfolio. It can be seen that for some maturities the room for manoeuvre for the portfolio managers is less than dfpm duration points vis-à-vis the tactical benchmark since the tactical benchmark is already using up some of the discretion versus the strategic benchmark. This is for example the case in the two- and 10-year grid points.

The allocation of the strategic benchmark is the same as in Table 1. However, the Investment Committee expects interest rates to come down. It therefore increased the overall modified duration by 0.2 duration points to 1.6. Moreover, the Committee expects the yield curve to steepen between the six-month to three-year part of the curve on the one hand and the seven to 30-year part on the other hand. Therefore, it increased the modified duration in the first maturity area and decreased it in the second.

Table 2

Example of an allocation of the overall modified duration over maturity grid points

	Strategic benchmark	**Tactical benchmark**	**Deviation**	**Degrees of freedom actual portfolio vs tactical benchmark**
1-month	0.05	0.05	0	±dfpm
3-month	0.10	0.10	0	±dfpm
6-month	0.10	0.20	+ 0.10	– dfpm – +dfpm–0.10
12-month	0.20	0.30	+ 0.10	– dfpm – +dfpm–0.10
2-year	0.25	0.35	+ 0.10	– dfpm – +dfpm–0.10
3-year	0.15	0.25	+ 0.10	– dfpm – +dfpm–0.10
4-year	0.10	0.10	0	±dfpm
5-year	0.20	0.20	0	±dfpm
7-year	0.10	0.05	– 0.05	– dfpm+0.05 – +dfpm
10-year	0.10	0.00	– 0.10	– dfpm+0.10 – +dfpm
30-year	0.05	0.00	– 0.05	– dfpm+0.05 – +dfpm
Total	1.40	1.60	+ 0.20	

Dfpm = partial modified duration degrees of freedom for portfolio managers.

10. Eligible investment instruments and credit limits

The Bank's US dollar-denominated foreign reserves are invested in a range of financial instruments. The eligible instruments are bank deposits, US Treasury paper, certain US agency securities, certain types of sovereign paper (dollar-denominated securities issued by certain governments, not being the US Treasury), supranational paper, certain asset-backed securities and several products issued by the BIS. Other instruments at the disposal of portfolio managers are foreign exchange swaps, interest rate swaps and eurodollar interest rate, note and bond futures. Characteristic of the spread products that the Bank invests in is that they have a very high credit quality. In the case of the US dollar reserves this mainly concerns agency paper and so-called Medium-Term Instruments (MTIs) issued by the

BIS.[23] The spread of these instruments compared to comparable government bonds is mainly a reflection of liquidity risk, rather than credit risk. Compared to government bonds the liquidity of agency bonds is lower. Moreover, in times of tensions in the market the liquidity of agency bonds often tends to decrease compared to the liquidity of government bonds.[24]

Until 2001 the strategic and tactical benchmark portfolios did not contain spread products, except for bank deposits. The actual portfolios, however, were allowed to invest in spread products. In order to contain credit risks, limits are in place for bank deposits. These concern both limits for the overall exposure to bank deposits as well as limits for individual banks. Worthy of note is that the limit size is dependent on the remaining maturity of the deposit. So, a USD 100 million bank deposit with a remaining time to maturity of six weeks has a greater impact on the limit usage than a USD 100 million bank deposit with just one week to go before maturity. Furthermore, limits are in place for individual issuers like the US agencies, supranationals and sovereigns. The sizes of these limits are not dependent on the remaining time to maturity of the investment. These limits are set for two reasons. First, they mitigate default risk, although it is recognised that the chances of these very high quality credits going into default are negligible. Second, they aim to prevent the portfolio from being too concentrated in a few issuers: that would make the portfolio vulnerable to negative events surrounding specific issuers, such as a possible downgrade.

11. Inclusion of spread products in the benchmark and risk management framework

A consequence of the fact that spread products were not included in the benchmark portfolios was that the actual portfolio could only position itself neutral or overweight spread product. It was not possible to take a short position vis-à-vis the benchmarks. In the past this was not felt as too big a problem for several reasons. First, the limit sizes for spread products were not that large compared to the size of the overall portfolios. Second, particularly in the case of the US dollar portfolio, the investments in spread products used to be in shorter-term maturity instruments. Therefore, spread risk (to be explained below) was considered limited. Until the late 1990s most of the agency limits were used to buy so-called agency discount notes. These are bills issued by the agencies with a maximum maturity of one year. However, with the start of the benchmark note and reference note programmes by Fannie Mae and Freddie Mac, the focus of attention increasingly shifted to longer-term agency paper. Additionally, the advent of the euro and the ECB reserves rendered the liquidity needs of the Bank's own exchange reserves somewhat less important. At the same time there was the prospect of a significant shrinkage of Treasury issuance in the foreseeable future with an increased agency paper issuance. All these factors combined led to the above-mentioned reassessment of the fixed income investment framework and specifically of the role of spread products within it.

As of early 2001 spread products were included in the new strategic benchmark for the dollar portfolio and the tactical dollar benchmark. On a strategic level, the Governing Board decided to implement an investment mix of 60% government paper and 40% credit products for the dollar fixed income portfolio. This mix was based, amongst others, on longer-term risk/return considerations. In addition, the Board took into account considerations such as the possibility of a call of reserves by the ECB and obligations vis-à-vis institutions like the IMF. These considerations argued in favour of retaining a substantial amount of the portfolio in highly liquid Treasury paper. The new strategic dollar benchmark portfolio was constructed in a similar way to before. There were two main differences. First, the 60/40 government/credit mix was taken into account. Second, calculations were made taking into account both the Treasury and the agency yield curve (three-, six- and 12-month discount notes and two-, three-, four-, five-, seven-, 10- and 30-year notes), as well as eurodollar bank deposit rates for the very short maturities. Agency securities were used as a proxy for all eligible spread products, including

[23] The BIS issues MTIs in USD, EUR and GBP. The USD MTIs are comparable to US Treasuries in terms of interest calculations, coupon payments and the like. They are available along the yield curve from one to five years. They are priced at a stable margin below the Libor swap curve. See 'USD MTIs: An Investment Opportunity for Central Banks', Bank for International Settlements, 1999.

[24] Developments in the US fixed income markets after the recent terrorist attacks on the United States are a case in point. Liquidity in the agency bond market was more severely hit than liquidity in the Treasury market.

MTIs, supranationals and the like. This approximation was done for simplicity reasons and because the majority of investments in spread products are in agencies. The strategic benchmark's overall modified duration and the distribution over the Treasury and agency curve are based on an optimisation of risk/reward characteristics without explicitly incorporating a view on interest rates over a one-year horizon. Furthermore, like before, the calculations take into account several restrictions with regard to, amongst others, a minimum desired return and maximum VaR. The resulting strategic benchmark determinates the interest rate risk and risk resulting from movements in the shape of the yield curve.

With the inclusion of spread products in the benchmark portfolios and thereby in the investment framework, a new risk was explicitly taken on board in the framework as well: spread products carry spread risk, which is clearly distinct from interest rate risk and yield curve risk. Spread risk may be defined as the risk resulting from a change in the interest rate differential between a spread product and a benchmark interest rate. Usually, government bonds with a similar maturity or modified duration are taken as a reference point. As a risk measure for credit spread movement one can use spread duration. This measure is fairly similar to modified duration as a measure for interest rate risk. Spread duration is defined as a credit bond's percentage price movement given a percentage point change in the interest rate differential between the credit bond and its reference bond. If, for instance, the spread between a three-year maturity credit bond with a modified duration of 2.8 and a three-year government bond with a similar modified duration narrows by 10 basis points, the price of the credit bond will increase by 0.28% (10 basis points times 2.8).

In the new benchmark and risk management framework the Bank took into explicit consideration various risks of spread products. Default risk was dealt with in the same fashion as in the past, namely with limits. These were both limits for individual banks with regard to bank deposits and limits for specific issuers of paper such as agencies and supranationals. Some new measures to contain spread risk were introduced. Spread risk was contained by introducing deviation bands for the overall spread duration of the portfolios. Spread duration is that part of the total modified duration of the portfolio that is accounted for by spread products. It was decided to give the Investment Committee's tactical benchmark portfolio a certain amount of spread duration points leeway around the overall spread duration of the strategic benchmark portfolio. This way the Investment Committee is able to go short spread products vis-à-vis the strategic benchmark if it expects spreads to widen and vice versa. For similar reasons, the portfolio managers were given the same amount of spread duration points leeway vis-à-vis the tactical benchmark portfolio. However, the portfolio managers were not allowed to have the actual portfolio deviate more spread duration points from the strategic benchmark than the maximum deviation allowed between the strategic and tactical benchmark. For the sake of simplicity, there was no introduction of partial spread duration limitations per maturity grid point. Instead, deviation bands remained for the partial overall modified duration (duration stemming from government bonds and spread products combined) per maturity grid point.

12. Summary

This contribution has discussed some developments that have taken place in fixed income markets, and specifically in the high-quality US fixed income markets, in recent years. The probable sharp shrinkage in the amount of outstanding US government debt is a big challenge for many market participants. Traditionally, US Treasuries have played a significant role in the market as a safe and liquid investment vehicle and as a pricing and hedging vehicle. It is likely that under current policy prospects, Treasuries will lose some, if not all, of these benchmark features during the years to come. Debt issued by the so-called agencies is a candidate to take over part of the benchmark status of Treasuries. The same holds true for interest rate swaps.

For central banks the possible disappearance of Treasuries in the longer run and the possible decreased liquidity of Treasury debt in the shorter run is an important development. Central banks have always invested substantial amounts of foreign reserves in US Treasury debt. In the future they may face the task of finding alternative means to invest their money. Agency debt and other high-quality spread products are likely to be important candidates for this. For central banks in the euro area there are some specific developments. The liquidity needs of their own reserves are probably lower than in the past and Deutsche mark reserves have been transformed into domestic currency assets.

For the Netherlands Bank the above-mentioned events led to a reassessment of its reserve and risk management framework. More specifically, the importance of high-quality spread products in the own dollar portfolio increased significantly. High-quality spread products were also included in the benchmark portfolios. For portfolio managers this meant that they were given the possibility to go both long and short spread products. The inclusion of spread products in the benchmarks implied that spread risk was also explicitly included in the benchmark framework. In order to contain spread risk, several limits and degrees of freedom were introduced for both the Investment Committee and the actual portfolio.