GOVERNMENT SECURITIES MARKETS AND MONETARY POLICY *

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Abstract

This paper analyses the two main roles government securities play in monetary policy, namely their use in open market operations and their use as a source of information on market expectations about future interest rates, inflation and output. The use of these assets by the Fed and the Eurosystem in their open market operations is briefly reviewed and the most widely used indicators based on government securities prices are presented. The second part of the paper deals with the implications of the changing supply of these assets. More specifically, it reviews the events of 2000, when the projected decline in the supply of government securities in many industrialised countries led to some distortions in the prices of these assets. The extent to which there are other instruments that can play similar roles to those currently played by government securities is also discussed.

1 Introduction

Government securities and the markets on which they are traded generally have certain features that distinguish them from other instruments. These include minimal credit risk, high market liquidity, a wide range of maturities and a complete market structure that includes cash, repo and derivatives segments. Because of these characteristics, these assets and their markets play important roles for both private agents and central banks. The former use these securities as a risk-free investment, as collateral, as a benchmark for pricing fixed-income securities and for hedging interest-rate risks. For central banks, government security prices are an important source of information on market expectations about future interest rates, inflation and output. Additionally, these assets normally play a key role in the implementation of monetary policy.

During 2000, the projected decline in the supply of government securities in a number of industrialised countries introduced some distortions into the prices of these assets, especially in the United States, and forced some changes in the design of monetary policy implementation in some of these countries. These events illustrate that the changing supply of government securities can significantly affect the roles played by these assets in monetary policy.

Against this background, the goal of this paper is to discuss the roles government securities play in monetary policy and the implications of the changing supply of these assets.

The rest of the paper is structured as follows. Section 2 briefly reviews the use of government securities by the Fed and the Eurosystem in their open market operations, and presents the most widely used indicators based on government securities prices. Section 3 discusses the events of 2000 and the lessons that can be drawn from them. Section 4 analyses the extent to which there are other instruments that can play similar roles and, finally, the last section draws the main conclusions.

2 Government securities and monetary policy

Government securities and the markets on which they are traded have certain characteristics that distinguish them from other available instruments. These characteristics normally include minimal credit risk, due to the taxation authority or the ability of the government to monetise debt; high liquidity, due to well-developed market infrastructure and a large pool of investors; a wide range of available maturities; and a complete market structure that includes cash, repo and derivatives segments. Apart from minimal credit risk, the other characteristics are linked to the size of these markets, which is a result of accumulated fiscal deficits, especially during the eighties and the first half of the nineties.

These characteristics and the relative importance of these markets is not, of course, the same across all countries. Table 1 shows the absolute and relative size of the major government securities markets together with non-government fixed-income securities. The two largest markets are the US and the Japanese markets. In the euro area, government bond markets are increasingly seen as one single market that is comparable in terms of size to the US or Japanese markets. However, the multiplicity of issuers and differences in credit rating distinguishes the euro-area government market from its US and Japanese counterparts. Chart 1 shows the outstanding amounts of both government and non-government securities between 1990 and 2004 in the US and the euro area.

2.1 Monetary policy implementation

Central banks use government securities in their open market transactions, although to varying degrees. More specifically, they use outright or repo transactions with these securities to add or drain reserves from the system. The extent to which these assets are used depends, among other factors, on the design of the operational framework of monetary policy. In the United States, for example, the Fed intervenes frequently in the markets to maintain the federal funds rate around its target level. Permanent additions to reserves are conducted through secondary market purchases whereas temporary additions to reserves are conducted through intervention in the repo market. In this latter case the Fed lends funds for a short period (of between one and ninety days) and accepts fixed-income securities as collateral. To temporarily drain reserves, the Fed enters into reserve repo transactions. The bulk of all these interventions are conducted with government securities. For example, in 2003 all outright transactions were undertaken using US treasuries. Repurchase agreements are collateralised using both US treasuries and federal agency obligations.

By contrast, in the euro area the Eurosystem intervenes less frequently and relies to a lesser extent on government securities. More specifically, the Eurosystem has not yet conducted outright transactions. Instead it uses reverse transactions to provide or drain liquidity. These operations are applicable on the basis of repurchase agreements or collateralised loans, based on underlying eligible assets. Eligible assets include government securities, other fixed-income instruments, equity and non-marketable debt instruments such as bank loans, trade bills and mortgage-backed promissory notes. All these assets are subject to valuation haircuts, i.e. a certain percentage is deducted from the market value of the underlying asset. The haircuts differ according to the residual maturity, coupon structure and liquidity category of the instrument.[1]

The share of government securities used as collateral in Eurosystem credit operations has shown a downward trend since 1999. At the end of 2003 these types of assets

[1] See ECB (2004a) for more details on the implementation of monetary policy in the euro area.

accounted for a share of around 38%. The most widely used assets are currently debt instruments issued by credit institutions, which accounted for 52% at the end of 2003. The share of corporate bonds, though small, has moved on a continuously growing path to reach 6% in the same period.[2]

2.2 The information content of government securities prices

Certain indicators based on government securities prices are widely used by central banks to approximate market expectations about the future path of interest rates, inflation and economic activity. The last two non-observable variables are relevant elements in the assessment of the macroeconomic outlook as determinants of economic agents' saving and expenditure decisions. In the case of market inflation expectations, they are also useful for the monetary authorities as an indicator of the credibility of price stability. The main advantage of indicators based on market prices, in comparison with alternative methods such as those based on opinion surveys or econometric analysis, is that prices are updated continuously, so they offer timely information.

The term structure of nominal interest rates contains information on the expected future path of short-term interest rates. According to the expectation theory of interest rates the implied forward rate from t+m to t+m+n is equivalent to the interest rate at term n expected to prevail at time t+m. The wide range of maturities for government securities and their minimal credit risk make these assets an ideal source of information to derive forward rates. To do this the standard approach consists of assuming a certain functional form for the zero coupon yield curve or for the term structure of the forward rates and estimating the parameters by minimising some distance between observed bond prices and theoretical prices.[3]

However, in practice the information content of implicit forward rates might be distorted by the existence of certain premia, such as term or liquidity premia. The term premium would appear if investors are risk-averse and demand compensation for the risk of holding a long-term debt security. The existence of this premium means that the implicit forward rates would overstate the market expectations about future interest rates.

A liquidity premium would appear if government securities displayed a different degree of liquidity along the yield curve and investors valued asset liquidity. More specifically, they would require a liquidity premium for holding fewer liquid assets in order to compensate them for bearing higher transactions costs. The empirical evidence supports the hypothesis that the relative pricing of government securities contains liquidity premia. The size of this premium varies depending, among other things, on the market structure. For example, Blanco (2001) documents that, in the euro area markets, these premia appear to be relatively small (between 5 and 10 basis points), whereas in the US market these premia could be as high as 50 basis points (Warga (1992). The different pattern between both sides of the Atlantic might possibly reflect the fact that in the US market on-the-run issues (i.e. the last issue for a given maturity) are relatively smaller compared to total market size (Alonso et al, 2004). This is because in Europe, issuing is concentrated in a smaller number of maturities and issues are reopened over several consecutive auctions until the outstanding amount reaches a certain level.

In the euro area, the lack of a single government yield curve complicates the estimation of the term structure of interest rates. To illustrate this, Chart 2 displays the estimated zero coupon yield curve as of 27 September 2004 for the three largest issuers (Germany, France and Italy). While similar, some differences emerge. At the short end of the curve Italian securities appear to show the lowest yield, possibly reflecting the higher relatively liquidity of these assets. However, the yields of Italian bonds show higher yields for longer-term

[2] See ECB (2004b) for more details on the use of collateral.
[3] The two most popular approaches to modelling the term structure of interest rates are those proposed by Nelson and Siegel (1987) and Svensson (1994).

maturities as compared to French and German bonds, which reflect the higher credit risk of Italian debt, which is rated AA- by Standard and Poor's, whereas the other two issuers are rated AAA.

The nominal term structure of interest rates also contains information on inflation and output expectations. The rationale for that is the classic Fisher (1930) equation, which decomposes a nominal interest rate of a given maturity into a real rate and an inflation expectations component, both for the period from the present to maturity of the instrument. If real activity is linked to real interest rates, then the nominal interest rate should contain information on future activity and price movements, and the term structure of nominal interest rates should reflect a term structure of expectations regarding future output and inflation.

However, long-term nominal interest rates might contain an inflation risk premium if investors demand compensation for bearing this type of risk. Therefore, the existence of this premium might distort the information content of interest rates in respect of inflation and output.

Several papers document that the spread between long and short-term nominal interest rates helps to predict real activity and inflation. Papers by Harvey (1988), Chen (1991), Estrella and Hardouvelis (1991) provide evidence of the ability of the term spread to predict real activity in the United States whereas Mishkin (1990) and Jorion and Mishkin (1991) document the information content of the same variable in forecasting future changes in inflation. Estrella and Mishkin (1997) provide similar results for a number of European countries including Germany, France, Italy and the UK.

The main drawback of indicators based on nominal interest rates is that they do not identify whether changes are due to movements in expected long-term inflation or changes in real yields. In this regard, inflation-indexed bonds contain useful information that might help to identify these two components. Inflation-indexed bonds are fixed-income securities whose nominal cash flows are adjusted to an inflation index. These instruments have traditionally emerged in countries experiencing very high rates of inflation. In these cases, the issuance of indexed debt by the government has commonly been aimed at developing long-term capital markets and improving the credibility of anti-inflation policies. More recently, indexed-bond markets have also emerged in a number of industrialised countries with moderate inflation rates and with price stability-oriented monetary policies. These countries include the United Kingdom, Australia, Canada, Sweden, the United States, France, Italy, Greece and New Zealand.

The yield on an inflation-indexed bond thus provides an estimation of the real interest rate for the same term as the residual maturity of the instrument. Inflation expectations derived from bond markets are normally proxied by the spread between the nominal yield on a conventional bond and the real yield on an indexed bond with a similar maturity, the same issuer and denominated in the same currency. However, this indicator, which is habitually referred to as the *break-even inflation rate*, may measure inflation expectations with an error due to the effect of, among other things, imperfect indexation, taxes, inflation risk and liquidity premia.[4]

Alternative, more sophisticated methods to estimate inflation expectations using prices of indexed bonds have appeared in the literature. For example, Deacon and Derry (1994) proposed the estimation of an *Inflation Term Structure* for the British indexed-bond market. More recently, Sack (2000) proposed an alternative indicator, which he called *Inflation Compensation Measure,* for the US indexed-bond market. However, Alonso et al (2001) show that in the French case, the inflation compensation measure proves to be very similar to the break-even rate, suggesting that, in their sample, the joint impact of the biases controlled by this alternative indicator is small.

[4] See Alonso et al (2001) for a discussion on these biases.

Another popular indicator based on government securities prices is the credit spread, defined as the difference between the yield of a bond issued by an entity subject to credit risk and the risk-free rate, normally proxied as the yield of a government security with a similar maturity and denominated in the same currency. This indicator measures the risk premium investors demand for bearing credit risk. However, recent empirical work has suggested that the credit spread is only partly related to credit risk. Elton et al (2001) find that taxation and risk premia compensating for systematic risk on corporate bonds together account for two-thirds of the spread between ten-year US corporate bonds and treasuries. The expected loss from default accounts for only 18%. Collin-Dufresne et al (2001) show that the factors suggested by traditional models of default risk explain only one-quarter of the variation in credit spreads, and that the majority of the remaining variance is captured by a single principal component.

3 The events of 2000

After having grown rapidly during the eighties and the first half of the nineties, the relative size of government securities markets showed a downward trend during the second half of the nineties in many industrialised countries. This pattern, which reflected the improvements in the fiscal situation, led some governments to significantly cut back on new issues of debt securities and some, like the US Treasury in January 2000, launched buy-back programs to maintain large issue sizes of the on-the-run securities. At that time the projected fiscal surpluses in some of these countries, like Australia and the United States, meant there was a possibility that the supply of government debt could well disappear in the following 5 to 10 years.

These developments altered the normal dynamics of the US Treasury market. Fleming (2000), Schinasi (2001), Blanco (2002) and others documented a number of anomalies in that market during 2000. First, spreads between non-Treasury instruments such as swaps or agencies and US Treasury yields rose dramatically to reach historical highs. To illustrate this, Chart 3 depicts 10-year swap spreads in both the US and the euro-area markets. The latter series is proxied using German bonds and swaps in euros (in the pre-EMU period, DM swap rates). As is apparent from Chart 3, in the US market the swap spread reached record levels (more than 135 basis points), about 95 basis points above the average level of 1991-1997 and significantly above the level observed during the autumn 1998 events. Since then the swap spread has trended downwards and, during 2003 and 2004, it fluctuated around historical average levels. Some papers, such as Reinhart and Sack (2002) and Blanco (2002), attribute this, at least partially, to the emergence of a negative scarcity premium in the US Treasury bond yields. The presence of this premium meant that US Treasury bond yields understated the true level of risk-free interest rates. By contrast, in the euro area swap spreads rose much more moderately. The presence of a scarcity premium might possibly reflect the lack of perfect substitutes for treasuries and the relative inelasticity of investor demand, which would reflect the existence of some types of investors who place a very high value on the safety and liquidity of these assets, including foreign official institutions (Reinhart and Sack ,2002). By contrast, in the euro area swap spreads rose much more moderately. This result is not surprising bearing in mind that, contrary to what has occurred in the US, in the euro area the stock of government bonds continued growing and was expected to continue on this path in the following years.

Second, the US Treasury yield curve was inverted during most of the year 2000, which contrasts with the upward slope of the swap curve (see Chart 4). This pattern reflected the higher scarcity premium of long-dated bonds. Chart 5 depicts the term spread computed as the difference between the 10-year and the 2-year yields using data from both the US treasuries and swaps in US dollars. It can be seen that, for most of the period, the information content of both measures is similar. However, during 2000 large discrepancies between both indicators are observed in both the level and the intensity of changes. By contrast, in the euro area discrepancies in the term spread derived from the swap and the government debt market were relatively limited, although a widening between both indicators was also observed during 2000 (see Chart 6).

Third, the correlations between US Treasury yield changes and movements of non-Treasury instruments yields declined, possibly reflecting the idiosyncratic behaviour of the treasuries' prices.

Fourth, the yield spread between off-the-run and on-the-run issues with similar maturities as well as the bid-ask spreads of the on-the-run issues rose during 2000 (Fleming,

2000). This latter development suggests a reduction in market liquidity. However, it is unclear to what extent it is linked to a shrinking supply of US treasuries or results from other factors.

All in all, the foregoing evidence suggests that the information content of the government bond yield curve for extracting expectations about the future path of interest rates, inflation and output were significantly affected in the US due to imbalances between supply and demand. This episode illustrates how the changing supply of government securities might affect the information content of indicators based on government securities prices.

The projected decline in government securities also led some central banks to introduce changes in the design of monetary policy implementation. For instance, the Federal Reserve Bank of New York asked for and was given authority to accept a broader range of collateral in repurchase agreements. Similarly, the Reserve Bank of Australia conducted all domestic monetary operations, until 1997, using only Commonwealth government securities. Sine then the range of eligible assets for repo transactions has been expanded several times (Edey and Ellis, 2002).

4 Are there other instruments that can play similar roles to those that government securities are currently playing?

The experience of the Eurosystem illustrates that central banks can expand the supply of assets significantly by accepting a number of different instruments as collateral, including private debt securities, equities and even non-marketable securities. Compared with government securities, the lower liquidity and higher risk of these instruments can be easily overcome by introducing higher haircuts than those applied to comparable government bonds.

Regarding the information content of interest rates, there are currently certain cash and derivatives instruments that can be used to extract market expectations about the expected path of interest rates and about inflation and economic activity.

Interest rates swaps are convenient instruments that can be used to derive the term structure of nominal interest rates. An interest rate swap is an agreement between two parties in which, during the life of the contract, one party receives floating flows linked to a short-term interest rate, generally the LIBOR rate, and pays the other party a fixed interest rate, which is called the swap rate. Swap rates at various maturities make up a yield curve and a zero coupon yield curve can be easily estimated.

The volume of swap transactions has increased dramatically in recent years (see Chart 7). Currently, the two most active markets are those denominated in euro and US dollars.

For the purpose of extracting market expectations, swaps have a number of advantages over government securities. First, coupon-related effects do not appear in their valuation since they always trade at par. Second, the relative liquidity of this market has improved as a result of the increasing use of this instrument by market participants. Third, the absence of underlying fundamental assets for swaps means that there is no supply limit and no need to borrow securities to go short. In the euro area, swaps have one additional advantage over government securities, namely the existence of a single curve, which contrasts with government securities.

However, swaps contain a credit premium because the floating leg is indexed to LIBOR, which is itself a default-risky interest rate. Hull, Predescu and White (2003) note that the n-year swap rate should be thought of as the rate of interest on an n-year loan that is structured such that the obligor is certain to have an acceptable credit rating at the beginning of each accrual period, which is six months for plain vanilla swaps in the United States and may be as high as twelve months in other markets. This is because the panel of the reporting banks in the LIBOR is regularly refreshed and banks whose credit rating deteriorates drop out from the panel. Therefore, the credit risk premium embedded in swap rates will generally be relatively low since one-year default probabilities of institutions included in the panel of reporting banks, normally rated AA, are also very low.

The existence of counterparty credit risk might be another shortcoming of swaps. However, this risk is currently very low given the set of collateralisation and documentation standards recently developed by dealers and customers. Therefore, the impact on pricing due to this factor is probably negligible.

Alternatively, highly rated and liquid bonds could be used to estimate zero coupon yield curves.

Chart 8 displays yield curves for the euro and the US dollar derived from government securities and swaps as of 27 September 2004. For both currencies, the shape of the curves is very similar. In terms of levels, the swap rates are above comparable government securities

bonds, which reflects the credit risk embedded in those instruments. The spread between swaps and government securities is, however, relatively small.

Interest rate futures are another instrument that contains information on the expected path of short-term interest rates. These contracts are widely used by central banks and private analysts to proxy market expectations about interest rates. Available contracts are for a limited set of expiration months, which normally coincide with the quarterly cycle (March-June-September-December). Interest rate futures are exchange-traded instruments that display a relatively high level of liquidity for the main currencies. However, trading is normally concentrated in the short-term expiring contracts.

To extract market information on inflation expectations, an alternative instrument to inflation-indexed bonds is inflation-linked swaps (ILS). In these instruments one party commits to pay the other party a stream of fixed payments in return for a stream of inflation-linked payments. These payments can take place at the maturity of the contract –zero coupon ILS- or each year over the life of the contract –multipayment ILS. The ILS markets have grown rapidly in recent years and currently trade taking the same underlying inflation indexes used in the inflation-linked markets. The fixed payment contains information on market inflation expectations. More specifically, assuming a zero-inflation risk premium and the absence of relative liquidity premia along the ILS curve, it is possible to derive a term structure of inflation expectations.

Compared to inflation-indexed bonds, one advantage of ILS is that a wider range of maturities is normally available, making it easier to derive a term structure of inflation expectations. One possible drawback is the existence of a counterparty risk due to the bilateral nature of the contracts, which are traded on OTC markets. However, as in the case of interest rate swaps, this risk is generally mitigated through collateral.

Regarding market information on credit quality, alternative indicators to the credit spread based on credit derivatives prices could be used. Credit derivatives are instruments designed to transfer credit risk from the investor exposed to the risk to an investor willing to assume it. These contracts were introduced in 1992 and, in recent years, trading has grown dramatically. Single-name credit default swaps (CDS) are the most liquid of the several credit derivatives currently traded. A single-name CDS is a contract that provides protection against the risk of a credit event by a particular company or country. The buyer of protection makes periodic payments to the protection seller until the occurrence of a credit event or the maturity date of the contract, whichever is first. If a credit event occurs the buyer is compensated for the loss (possibly hypothetically) incurred as a result of the credit event, which is equal to the difference between the par value of the bond or loan and its market value after default.

Duffie (1999) and Hull and White (2000) show that there is a theoretical relationship linking CDS prices and credit spreads. More specifically, they show that, under certain conditions, CDS prices are equivalent to credit spreads. Recent empirical work suggests that this theoretical relationship holds reasonably well when the risk-free interest rate in the credit spread is proxied by the swap rate.[5] There is also some empirical evidence supporting the view that CDS prices tend to incorporate news faster (Blanco, 2005). However, in some cases, due to contract specifications, CDS prices might incorporate a cheapest-to-deliver option and, as a result, this indicator might overstate the true credit risk.

[5] See Blanco et al (2004) and Hull et al (2003).

5 Concluding remarks

This paper has analysed the two main roles government securities play in monetary policy, namely their use in open market operations and to extract market expectations about the path of interest rates, inflation and economic activity. Certain features, such as their minimal credit risk, high market liquidity, wide range of maturities and a complete market structure, make them ideal instruments to perform the two aforementioned functions.

As regards open market operations, the use of government securities varies from country to country depending, among other things, on the design of monetary policy and the market structure. The Fed, for instance, relies heavily on these assets both in outright and repo transactions. By contrast, the Eurosystem has not yet made use of outright operations and in repo transactions the share of government securities collateralised accounts for less than 50%.

The paper has also reviewed the main indicators based on government securities prices that many central banks regularly follow. These indicators normally provide valuable information on market expectations. The main advantage of these indicators, in comparison with alternative methods such as those based on opinion surveys or econometric analysis, is that prices are updated continuously, so they offer timely information. However, sometimes their information content might be distorted by the presence of various premia, such as liquidity or inflation premia, and other biases. Therefore, caution should be taken when interpreting these indicators.

The implications of the changing supply of government securities have also been analysed. In particular, the experience of the year 2000, when the projected decline in the supply of government securities in various industrialised countries introduced some distortions in the prices of these assets, illustrates that the changing supply of government securities can significantly affect the roles played by these assets in monetary policy.

Finally, the extent to which there are other instruments that can play similar roles to those currently played by government securities has been discussed. As regards open market operations, the experience of the Eurosystem illustrates that central banks can indeed rely on other asset classes for the conduct of monetary policy. On the information content of interest rates, there are currently a number of derivatives contracts that contain similar information to that extracted from government securities prices. In fact, some of these instruments display some advantages compared to government securities. For instance, interest rate swaps and CDSs trade at a constant maturity base and at par. This feature facilitates the interpretation of market data and limits distortions caused by coupon-related effects. However, the information content of some of these instruments, such as interest rate swaps, might be distorted due to the existence of a time-varying credit risk premium embedded in their pricing.

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SIZE OF FIXED-INCOME SECURITIES MARKETS
2004 Q1

TABLE 1

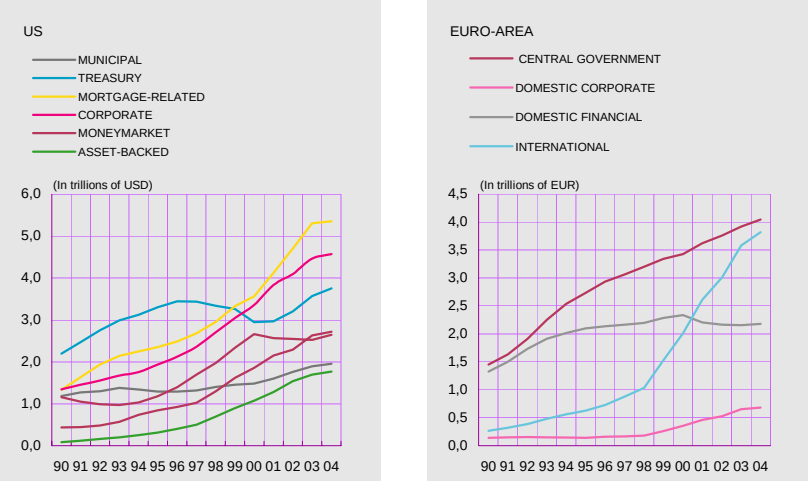
EUR millions

	Government	Of wich: Central Government	Private
Austria	168.521	133.543	171.466
Belgium	303.010	258.296	132.772
Germany	960.406	800.001	1.823.871
Spain	366.247	312.748	401.587
Finland	85.488	54.471	61.846
France	852.749	847.476	1.280.596
Greece	196.826	141.001	6.872
Ireland	31.250	29.687	216.541
Italy	1.245.828	1.188.319	804.319
Luxembourg	392	392	146.515
Netherlands	210.406	208.157	1.028.387
Portugal	85.651	66.749	56.119
Euro area	4.506.773	4.040.841	6.130.890
US	4.262.026	3.089.510	13.098.740
Japan	5.425.638		1.748.037
UK	488.465		1.796.302
Canada	491.165		314.463
Australia	86.306		374.264

SOURCE: BIS.

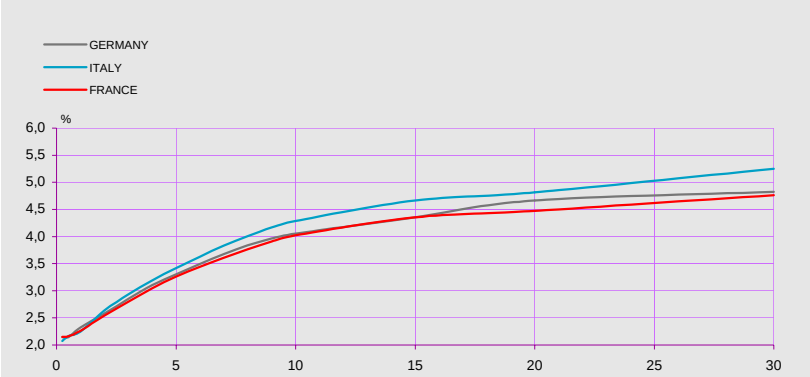
OUTSTANDING AMOUNTS OF FIXED-INCOME SECURITIES

CHART 1



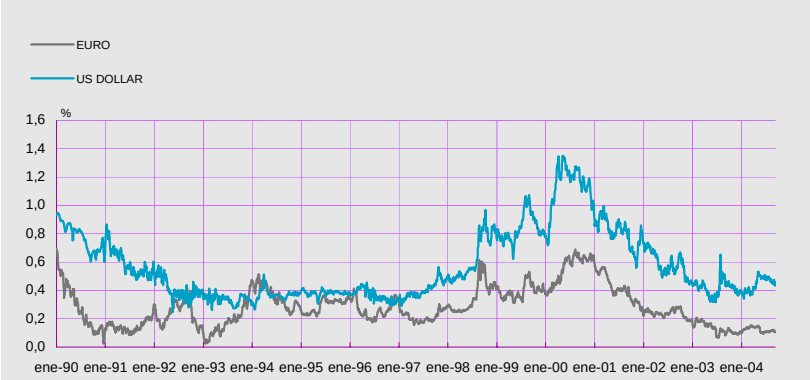
SOURCE: ECB, BIS and Bond Market Association.

ZERO COUPON YIELD CURVES IN THE THREE LARGEST EURO-AREA MARKETS. 27/9/04 CHART 2



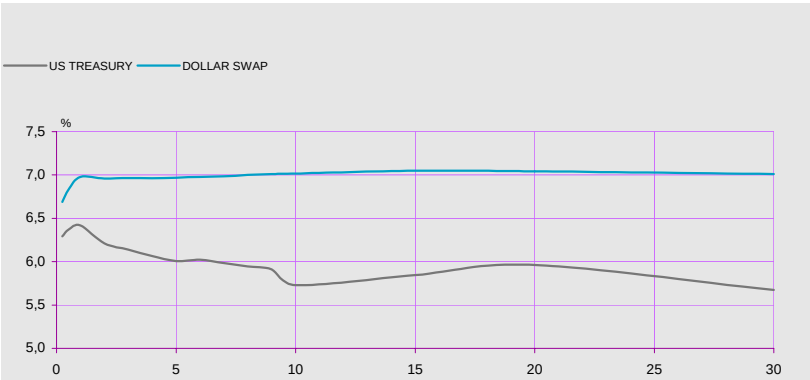
SOURCE: Bloomberg.

10-YEAR SWAP SPREADS CHART 3



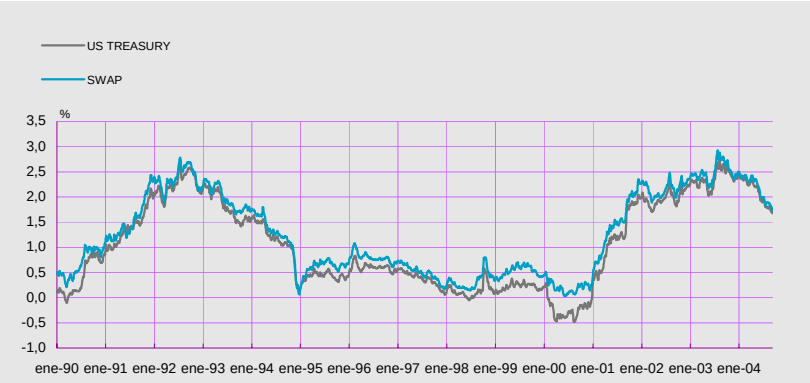
SOURCE: Bloomberg.

YIELD CURVES IN US MARKETS, 28 AUGUST 2000 CHART 4



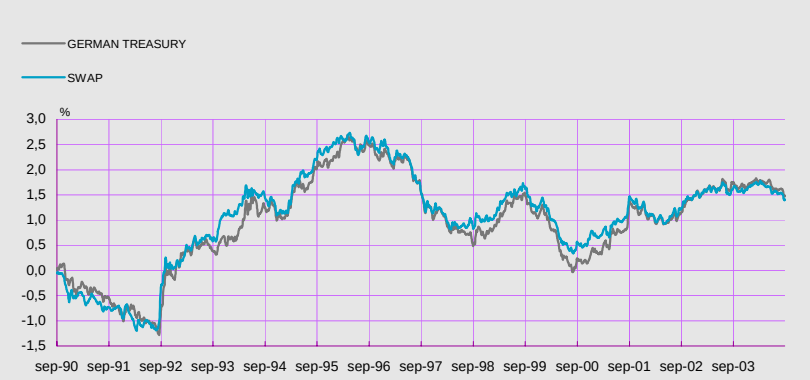
SOURCE: Bloomberg.

SLOPE OF THE YIELD CURVE, US MARKETS CHART 5



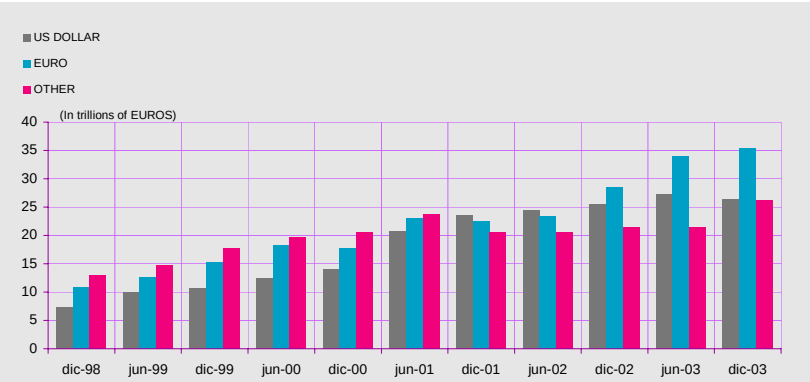
SOURCE: Bloomberg.

SLOPE OF THE YIELD CURVE, EURO-AREA MARKETS CHART 6



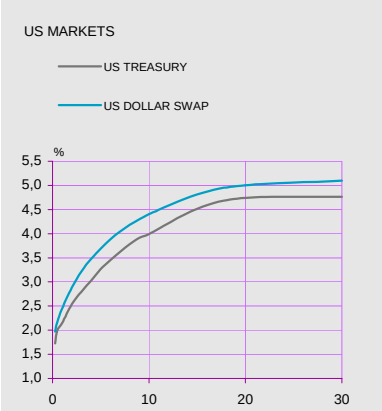
SOURCE: Bloomberg.

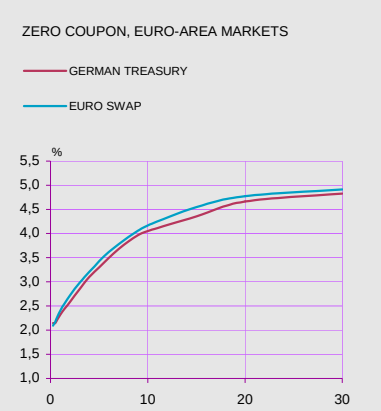
NOTIONAL AMOUNT OUTSTANDING OF INTEREST RATE SWAPS CHART 7



SOURCE: BIS.

YIELD CURVE IN THE US AND THE EURO-AREA, 27-SEP-04 CHART 8





SOURCE: Bloomberg.