

Monetary policy transmission in the euro area

The monetary transmission mechanism consists of the various channels through which monetary policy actions affect the economy and the price level in particular. A good understanding of the transmission mechanism is an important prerequisite for implementing a sound policy, as it allows a judgement to be formed as to the extent and the timing of monetary policy decisions which are appropriate in order to maintain price stability.

This article reviews the main aspects of the monetary policy transmission mechanism in the euro area. Knowledge of the various transmission channels is in all circumstances necessarily limited, as the simultaneous occurrence of shocks, technological and structural change and the effects of policy changes makes a precise assessment of the effects of monetary policy very difficult. In addition, in the euro area, the establishment of a new policy regime may have changed, and may continue to change, some economic relationships, and in many areas a statistical and econometric framework for analysing the euro area economy as a whole is still being developed. In such a context, it is important not to rely too heavily on a single paradigm, but to have an open and flexible analytical approach. The Eurosystem's monetary policy strategy, with its prominent role for money and a broadly based assessment of the outlook for price developments and risks to price stability, is designed with this in mind. Moreover, the considerable degree of uncertainty surrounding the strength and the timing of the effects of monetary policy actions suggests that an overly activist approach to monetary policy, aiming at fine-tuning price developments, should be avoided.

Typically, two broad stages are considered in the transmission mechanism. In the first stage, changes in money market conditions affect financial markets, as reflected in asset prices and general liquidity and credit conditions. In the second stage, those changes in financial market conditions affect spending and prices. This article describes how the timing and the strength of the various channels in each of these two stages depend on the economic and financial structure of the euro area economy. It also emphasises the important role of inflation expectations in determining the timing and size of monetary policy effects.

I Introduction

The primary goal of the Eurosystem's monetary policy is to maintain price stability. Monetary policy decisions are transmitted through the economy in a variety of ways, all of which have an indirect effect on the evolution of prices of goods and services. The monetary transmission mechanism is the term used to denote the combination of different channels through which, often after long, variable and not fully predictable lags, monetary policy affects output and prices.

The transmission mechanism primarily works in two broad stages. In the first stage, changes in the policy interest rate or in base money lead to changes in financial market conditions, as reflected in market interest rates, asset prices, the exchange rate and general liquidity and credit conditions in the economy. In the second stage, the changes in financial market

conditions lead to changes in nominal spending on goods and services by households and firms. In the long run, such nominal changes will not affect the real sector of the economy, but only the general price level. In the short run, however, changes in nominal spending may have an impact on real economic activity. The extent to which this happens depends on the degree of nominal price rigidities and on the flexibility of the economy more generally. In addition, there are more direct channels of transmission, the most important being the effect of policy actions on inflation expectations which may directly influence pricing decisions.

The analysis and the monitoring of the various transmission channels of monetary policy impulses are complicated by two factors. First, the patterns of monetary policy

transmission are continuously evolving in response to changes in economic behaviour and institutional structure. At present, this may be particularly applicable to the euro area on account of the structural change occurring – notably in the financial sector – in part as a result of the introduction of the euro and the adoption of the single monetary policy. In addition, other forces, such as technological change or demographic shifts, can significantly alter the way in which the economy functions. The transmission mechanism is thus surrounded by a high degree of uncertainty.

Second, it should be borne in mind that monetary policy does not work in isolation. Short-term price developments in the euro area are affected by a number of domestic and external influences other than monetary policy. For example, the rapid rise in oil prices in the second half of 1999 and in the first few months of 2000 had a significant influence on inflation, as measured by the Harmonised Index of Consumer Prices (HICP). The central bank needs to disentangle the effects of such shocks from other influences and the impact of its own policy. The simultaneous occurrence of external shocks, technological and structural change and the transmission of monetary policy changes entails considerable uncertainty for the central bank in discerning the effects of monetary policy changes.

A better understanding of the various transmission processes can help to improve the conduct of monetary policy in a number

of ways. First, owing to the lags in the monetary transmission mechanism, monetary policy needs to be forward-looking. This forward-looking orientation is emphasised in the Eurosystem's monetary policy strategy (see, for example, the article entitled "The stability-oriented monetary policy strategy of the Eurosystem" in the January 1999 issue of the ECB Monthly Bulletin). Knowledge of the lag structure and the strength of the transmission mechanism allows a judgement to be formed as to the timing and the extent of interest rate decisions which are called for in order to keep future inflation in check. Such knowledge is also necessary to assess the extent to which previous policy decisions still have to produce their full effect.

Furthermore, a better understanding, even if necessarily incomplete, of the different transmission channels facilitates a sound assessment of which indicators are most useful in examining the monetary policy stance. For example, the fact that the euro area economy is a large, relatively closed economy implies that the exchange rate channel is likely to be of less importance in the monetary transmission mechanism than in smaller economies with a high share of foreign trade. By contrast, findings that developments in broad money aggregates have significant predictive content for future inflation suggest a role for money in the transmission of monetary impulses in the euro area. Such findings have been important in shaping the Eurosystem's monetary policy strategy.

2 Inflation as a monetary phenomenon: the role of money and credit

There is widespread agreement that, ultimately, inflation is a monetary phenomenon. A sustained rise or fall in inflation cannot occur without being either caused or accommodated by changes in the growth rate of money. The long-run relationship between money and prices characterises virtually all theoretical models

and is empirically robust over a number of dimensions: across countries, over time, across monetary regimes and for various monetary aggregates.

The relationship between money, the price level and output can be most easily seen through the so-called quantity equation. This

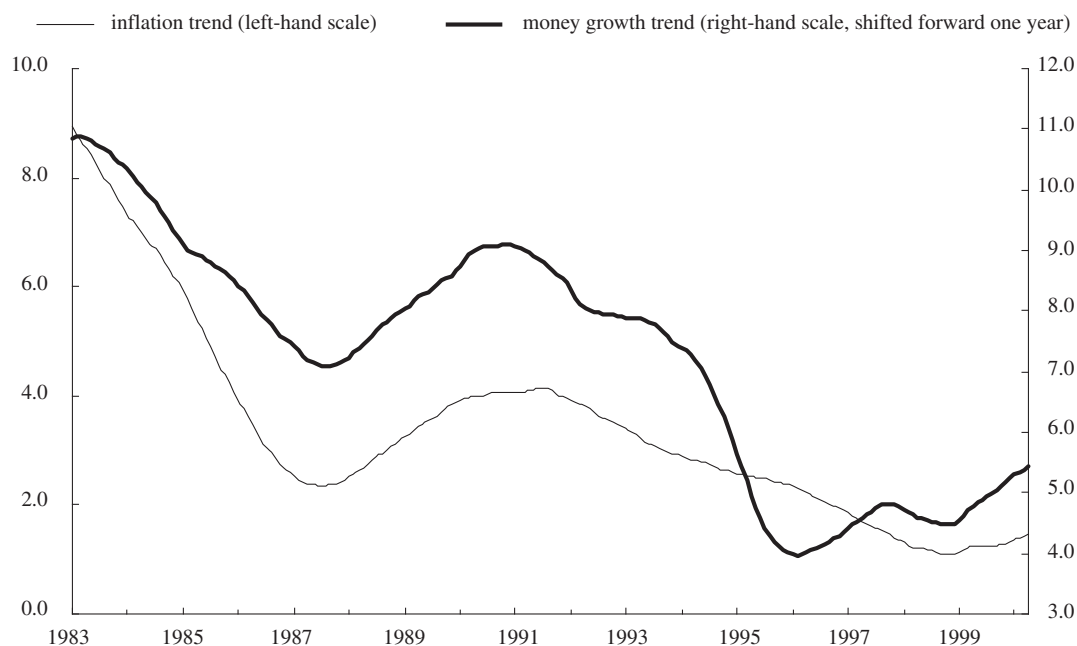
relationship relates the quantity of money to prices, output and the velocity of money (the inverse ratio of money to nominal income). In the long run, trends in both velocity and output are independent from the growth rate of money. As a result, excessive and persistent monetary growth tends to be associated with persistent inflation. The quantity relationship forms the basis of the calculation of the Eurosystem's reference value for the growth of M3 (for further information see the article entitled "Euro area monetary aggregates and their role in the Eurosystem's monetary policy strategy" in the February 1999 issue of the ECB Monthly Bulletin). Chart I provides an illustration of the close relationship between the smoothed growth rate of M3 and the rate of inflation in the euro area.

Clearly, in the short to medium term, the usefulness of money as a gauge of inflationary pressures depends on the predictability of the velocity of money, or, in different terms, on the stability of estimated money

demand functions. Standard formulations of money demand relate monetary aggregates to output, the price level and other macroeconomic variables, such as nominal interest rates. Although one should be aware of the uncertainties implied by the change in the monetary regime, the available evidence suggests that such a stable money demand relationship exists in the euro area. Moreover, deviations of actual money holdings from the levels which such relationships would predict appear to lead future inflation, sometimes outperforming more traditional indicators such as various measures of the gap between actual and potential output, in particular with regard to longer horizons.

As mentioned above, the transmission of monetary policy impulses to the economy consists of a complex combination of various, often intertwined, channels, whereby both prices and quantities are subject to adjustment. The exact role of money and credit in these transmission processes is

Chart I
Money growth and inflation trends in the euro area
(monthly data)



Note: The money growth trend is the 24-month moving average of the annual percentage change of M3. The inflation trend is the 24-month moving average of the annual percentage change in consumer prices (the CPI until January 1996, the HICP thereafter).

still subject to considerable debate. Some economists dismiss an active role for money: in their view, the transmission of monetary impulses runs primarily through interest rates and other financial prices and their effect on spending and inflation. Money and credit would then only play a passive role, as banks expand and contract their assets and liabilities to match changes in their demand. According to this view, money and credit indicators are only useful as information variables, i.e. to the extent that they give advance information regarding changes in nominal spending, for example, because they become available sooner. Other economists believe that the process of money and credit creation, which starts with base money (including currency in circulation and the deposit base of financial institutions at the central bank), plays an active causal role in the transmission of monetary impulses. According to this view, excess money creation is not immediately cleared through changes in financial prices

and may affect spending directly as banks, consumers and firms gradually adjust their balance sheets to achieve desired money holdings.

In the light of the existing empirical evidence, the view that money creation plays an active role in the transmission process can neither be confirmed with certainty nor be easily dismissed. On the other hand, a structural role for money is difficult to incorporate into more traditional macroeconomic models in which price and wage pressures arise primarily from imbalances in goods and labour markets. The Eurosystem's monetary policy strategy, incorporating a prominent role for money and a broadly based assessment of the outlook for future price developments, ensures that both paradigms are taken into account, while dealing with some of the fundamental uncertainties regarding the transmission of monetary policy.

3 The importance of expectations and the stability-oriented strategy

When analysing the monetary transmission mechanism, the importance of the formation of expectations on the part of the various actors in the economy cannot be overemphasised. The role of expectations is derived from the influence which they have on the actual behaviour of economic agents. Households and firms generally have to make decisions which will have consequences in the future. For instance, households decide how much to consume and how much to save, thereby deciding on their future consumption possibilities. Firms have to make investment decisions, thereby deciding on future production capacity. Workers or their representatives negotiate with firms on future wages, thereby deciding on future income and future costs. As a result, economic agents will in general decide on the direction and magnitude of their actions in a forward-looking manner, taking into account their expectations of future inflation and general economic developments.

The key role of expectations in the working of the economy has a number of significant implications for the monetary transmission mechanism and the conduct of monetary policy in general. First, the Eurosystem's monetary policy strategy, with its emphasis on price stability in the medium term, has an important role in anchoring inflation expectations at low levels. This is because changes in inflation expectations can have a strong impact on future inflation outcomes through their direct influence on pricing decisions. For example, they play an important role in labour markets in which wages are negotiated in a forward-looking manner, as is quite common in the euro area. In the Eurosystem's monetary policy strategy, the precise definition of price stability is a key element, since it guides economic agents in taking forward-looking decisions on expectations of price stability.

Second, the effects on financial markets and the economy as a whole of a change in ECB interest rates will depend on whether such a move was anticipated and, more generally, on how it affects expectations of future interest rate decisions and future output and inflation. As it is generally difficult to measure expectations or – even more so – to predict how they will respond to news, this adds a further layer of uncertainty to the assessment of the transmission mechanism.

Third, the key role which expectations play implies that, together with the size or the timing of a policy move, the policy context in which this move occurs is important in explaining its effects. Here again, the role of

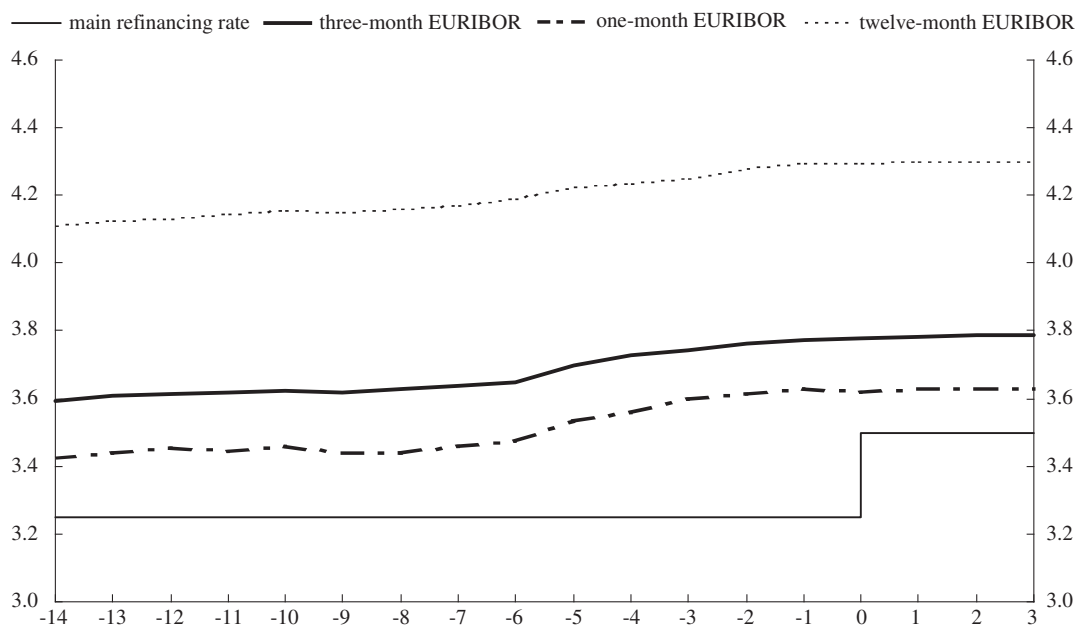
the Eurosystem's monetary policy strategy, and its credibility, in guiding expectations can be seen as part of the broader transmission of monetary policy. When financial markets and, more generally, agents in the economy understand the goals of monetary policy and how interest rates are set to achieve these goals, they will broadly anticipate policy moves and thereby facilitate the task of the central bank. For example, bond markets will automatically anticipate a rise in policy rates, in nominal and in real terms, when there are signs of inflationary pressures. The resulting increase in short-term to medium-term market interest rates will have a tightening impact on the economy and will thereby help the central bank to maintain price stability.

4 From changes in the main refinancing rate to changes in financial and asset market conditions

The chain of cause and effect in the euro area monetary transmission mechanism starts with changes in ECB interest rates – the interest rates on the main refinancing operations and on the standing facilities – and with the ensuing changes in money market conditions. Other interest rates, the exchange rate and asset prices will adjust to the new money market conditions with variable lags. In addition, adjustments of non-price terms, such as credit availability in credit markets, may occur. The magnitude, direction and timing of these changes will generally depend on the structure of financial markets and on the economic characteristics of market participants. In particular, the degree of competition, the liquidity of markets and the scope for arbitrage across different financial instruments will have a direct effect on financial and asset market linkages.

Before discussing these policy-induced changes in financial market conditions in more detail, it is worth re-emphasising two challenges which any empirical analysis of these transmission channels will face. First, the changes in financial market conditions will

partially lead, rather than lag, the policy decisions when the latter are broadly anticipated. As an illustration, Chart 2 shows the average evolution of short-term market interest rates before the policy interest rate moves decided by the Governing Council of the ECB on 3 February, 16 March and 27 April 2000, in which the main refinancing rate was increased by 25 basis points each time. It can be observed that market rates started to move towards their new level several days before the day of the policy interest rate change and hardly adjusted further when the rate change occurred. This indicates that markets broadly anticipated the policy interest rate moves and that, as a consequence, market rates increased in advance of rather than after the move. Second, within a stability-oriented monetary policy strategy, policy actions will normally be taken in response to economic developments which entail risks to price stability. Of course, financial markets will also be affected by these economic shocks. It is often extremely difficult to separate the effects of a policy action from the direct effects of those economic shocks on financial markets and on the economy in general.

Chart 2**Average rate evolution around ECB interest rate moves***(daily data)**Source: ECB.**Note: Day 0 is the day of the increase of 25 basis points in the main refinancing rate. Interest rates are average rates 14 days before and 3 days after the increases of 25 basis points on 3 February, 16 March and 27 April 2000.*

Following a change in money market conditions, arbitrage opportunities usually cause rapid adjustments of other financial and asset market prices. However, owing to the important role of expectations, the magnitude and even the sign of those effects after the interest rate move are not unambiguous.

For example, the expectations' theory of the term structure of interest rates posits that longer-term nominal interest rates should be approximately equal to an average of the current and expected future short-term rates over the maturity of the longer-term investment. How an unexpected change in current short-term rates affects longer-term rates thus depends on how it affects the expected future path of the nominal short-term rate. When the change is expected to persist, longer-term rates will, in general, change in the same direction as well. By contrast, when the change is expected to be quickly reversed, longer-term rates may not be affected very substantially, or may even decline if the policy move leads to

a fall in inflation expectations. The shape of the euro area yield curve since the beginning of 1999 has undergone significant changes as a consequence of revisions to the expected future evolution of short-term interest rates (see the article entitled "The information content of interest rates and their derivatives for monetary policy" in the May 2000 issue of the ECB Monthly Bulletin).

One factor behind the revisions in expectations following monetary policy moves is the credibility of monetary policy itself. If the central bank is perceived as acting in a timely manner in order to maintain price stability, inflation expectations and thus expected future nominal interest rates may not be affected very much. As a result, long-term interest rates will remain relatively stable. Indeed, in countries with low and stable inflation, the sensitivity of changes in long-term rates to an unexpected change in the policy rate has generally been lower than in countries with high and variable inflation. In addition, longer-term interest rates can

also incorporate other factors, such as liquidity or inflation-risk premia, which can change over time and in response to policy changes.

Another arbitrage condition, the so-called uncovered interest parity condition, posits a link between nominal interest rate differentials in different currencies and their nominal exchange rate. This condition implies that the domestic-foreign interest rate differential is approximately equal to the expected depreciation of the exchange rate over the holding period, i.e. an investor should expect to obtain the same return on his or her investments in various currencies. Again, this relationship can only be expected to hold approximately, since exchange risk, liquidity and other premia can drive a wedge between the expected returns. In practice, the empirical evidence does not provide strong support in favour of the uncovered interest parity hypothesis when tested in conjunction with the hypothesis of rational expectations in the exchange market. Typically, the actual impact of changes in short-term interest rates on the exchange rate depend on how expectations of future interest rate changes and other economic variables are affected.

Finally, changes in market interest rates may also have an effect on the market value of securities and real assets such as equities, bonds and real estate. Arbitrage conditions equate the value of securities and real assets with their discounted future revenue streams. For example, the value of equity can be understood as the present discounted value of future dividends which themselves depend on future profits of the firm. As a result, an interest rate rise might have an effect on asset prices through two different channels. The first channel works through the intertemporal discount rate. When interest rates rise, the discounting of future money flows occurs at a higher rate, which diminishes the present discounted value. A second channel works through the effect of the interest rate rise on the future revenue stream. This is especially relevant for equities:

an interest rate rise increases the financial costs of firms and may have a negative impact on the demand for their products, which normally leads to decreased profits. The decreased profits will also have a negative effect on stock prices. If decreased profits are associated with a higher risk of non-payment, risk premia on bonds might also increase. However, as explained above, an increase in policy rates can also contribute to a decline in inflation risk premia and longer-term interest rates, which could have a positive effect on the market value of securities and assets.

Transmission through the banking sector

Market interest rates eventually also influence the whole spectrum of retail interest rates in credit and deposit markets. These rates represent the prices for the intertemporal allocation of resources for many agents in the economy. Borrowing and lending in the euro area still predominantly take place through the intermediation of the MFI sector. The amount outstanding of MFI credit to enterprises of the euro area was 45.2% of GDP at the end of 1999. The outstanding values of corporate debt securities was 7.4% of GDP, whereas the debt securities issued by the corporate sector in the United States amounted to 29% of GDP at the end of 1999. The ratio of total bank assets to GDP in 1999 was 175.4% in the euro area, as compared with 98.8% in the United States.

The pass-through from market interest rates to retail bank interest rates depends on the interplay of supply and demand for credit and deposits and on the structure of banking markets. A number of structural factors – such as competition in the financial services industry, preferences regarding the maturity of credit or deposit contracts or the adjustability of interest rates, various risk premia and the administrative cost of effectively changing interest rates – influence the adjustment in retail bank markets. As can be seen from Chart 3, retail bank interest rates in the euro area tend to follow money

Table I**Key characteristics of the euro area and the United States***(percentage of GDP in 1999)*

GDP components	Euro area	United States
Private consumption	56.8	67.6
Government consumption	20.1	14.4
Gross fixed capital formation	20.7	20.3
Exports	16.9	10.8
Imports	15.4	13.5
Financial markets		
Stock market capitalisation	90.2	179.8
Debt securities	98.8	166.2 ¹⁾
<i>of which, issued by:</i>		
Government	54.9	48.4
Banks ²⁾	36.4	46.8
Corporate sector	7.4	29.0
Bank assets ³⁾	175.4	98.8
<i>of which:</i>		
Loans to government	13.5	...
Loans to the corporate sector	45.2	12.6
Loans for house purchase	27.8	24.6
Other loans to households	16.7	8.6

Sources: ECB, BIS, Eurostat and Federal Reserve flow of funds.

1) This figure includes debt securities issued by government-sponsored enterprises and federally related mortgage pools (42% of GDP).

2) MFIs excluding the Eurosystem for the euro area. All financial institutions for the United States.

3) MFIs excluding the Eurosystem for the euro area. Commercial banks, savings institutions, credit unions and money market funds for the United States.

Owing to differences in reporting, numbers are not fully comparable between the euro area and the United States.

market rates quite closely, while being smoother.

The pass-through from money market interest rates to bank credit or deposit interest rates is a gradual process. In many cases, the pass-through to bank credit and deposit interest rates is interdependent. A bank which faces low competition in the collection of time deposits can afford to take more time in passing through increases in money market interest rates into the yield it offers on time deposits. In addition, such a bank is under less pressure to increase the interest rate on credit than a bank whose funding costs have increased in proportion to the changes in the money market interest rates. Historical experience, in European economies and elsewhere, has often shown that bank rate adjustments are not only slow, but that the speed differs for upward and downward changes. When markets are not

fully competitive, this rate-setting behaviour may allow banks to benefit from changes in the general level of interest rates.

Some economists emphasise the role played by credit supply in the transmission process. An increase in short-term interest rates is usually accompanied by a reduction in the growth of overnight deposits. This can lead banks to reduce their supply of loans, in particular if the banks cannot easily replace those deposits with other liabilities. Bank-dependent borrowers such as small and medium-sized enterprises and households could then face a squeeze in their borrowing possibilities. However, from an empirical point of view, the simultaneous movements in loan demand and supply make identification of the different channels a non-trivial task. It thus remains uncertain whether monetary policy can significantly affect the supply of loans stemming from banks.

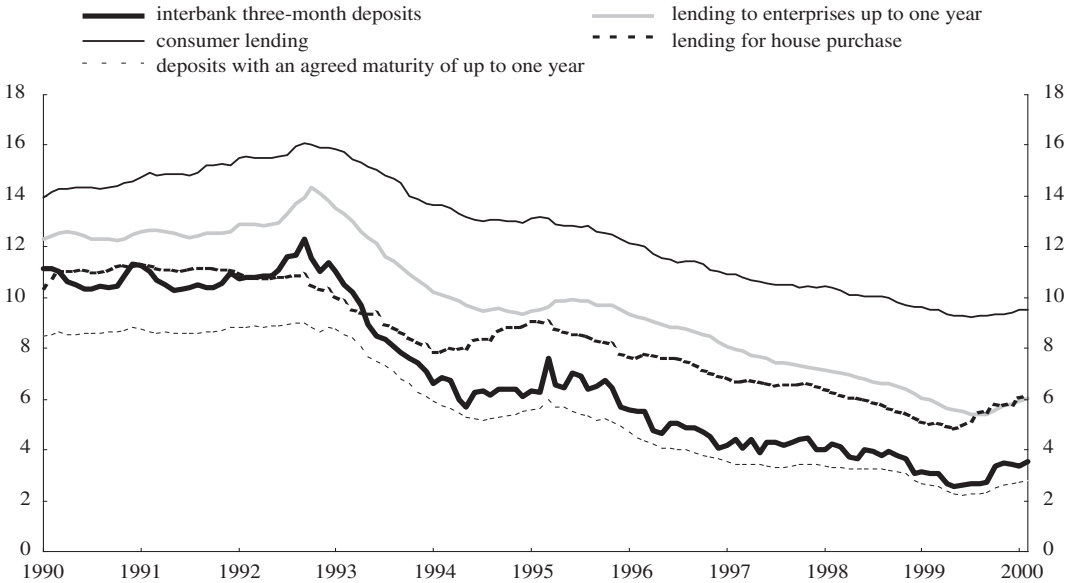
As the financial sector of the euro area is currently undergoing profound restructuring processes, the adjustments in retail bank markets which follow a change in policy rates are also likely to evolve. In certain areas, the disintermediation of banks, a process in which financing intermediated by the banking sector is being replaced by direct financing, particularly through financial markets, is already well advanced. For example, savings are increasingly being invested in mutual funds. In particular, the development of money market mutual funds is inducing banks to offer better yields on traditional deposits and to bring rates on deposits more quickly into line with those on the money market.

More generally, the growing competition in every segment of the financial services industry is inducing banks in the euro area to be more efficient in the pricing of all of their products. Interest rate margins on bank deposits have been eroding since the 1990s. The supply of credit to firms is now confronted with an expansion of the market for corporate debt securities. However, competition is also increasing in segments where banks compete mostly among themselves, such as the mortgage market. Both the disintermediation and the rationalisation of the European banking sector are likely to induce banks to transmit changes in market conditions to their customers faster than has been the case in the past.

Chart 3

Money market and retail bank interest rates in the euro area

(annual percentages rates; monthly data)



Source: ECB.

5 From changes in financial and asset markets to changes in spending

The changes in financial market conditions discussed above will, with lags, lead to changes in nominal spending. If prices were fully flexible, no changes in real spending would be expected. In general, however, prices adjust only gradually. As inflation expectations take this slow adjustment into account, nominal changes in financial market conditions will in the short run translate into real changes. In particular, under constant short-term inflation expectations, a change in the nominal interest rate will imply a change in the short-term real interest rate.

Not all spending components are affected equally, and the effects might be spread over time. The strength and timing of the changes in spending will largely depend on the financial and economic structure of the economy. In addition, other factors, such as shifts in foreign demand, government spending and changes in expected profits and wages, will also have an impact on aggregate demand, making any inference about the importance of the different factors' strength and magnitude difficult.

Cost of capital effects

Real interest rates are an important factor in determining the cost of capital. For instance, when the real interest rate on bank loans or bonds increases, the cost for firms of holding inventories or investing in equipment, machinery and real estate financed through bank loans or bonds will increase. This makes investment less profitable. It also makes waiting to invest until real interest rates decline more attractive. Business investment is thus usually negatively affected by real interest rate increases, *ceteris paribus*. Empirically, however, it has proven to be difficult to show this relationship owing to pro-cyclical movements of real interest rates. The impact and the lag structure of the effects of the interest rate changes will differ across industries. For example, capital intensive

industries, which have a need for large investments, are likely to be affected more strongly than less capital-intensive services industries.

Such cost-of-capital effects can also be an important determinant of spending by households on consumer durables such as cars and on houses. Often such items are partially financed by consumer loans or mortgages. In addition, changes in the real interest rate affect the return on savings. For instance, a decline in interest rates makes saving less attractive and may lead households to increase consumption. Generally, such intertemporal substitution effects between consumption and saving are, however, found to be quite small.

A lack of consistent data series across the euro area on various categories of consumption and investment spending prevents a systematic assessment of how different spending categories respond to monetary policy impulses. Econometric evidence for a wide range of countries suggests that investment, which is likely to be much more sensitive to changes in the cost of capital, responds more strongly than consumption to a change in interest rates.

Income effects

A change in interest rates also has a bearing on the flows of interest income received by creditors and of interest payments paid by debtors. Like most economies, the euro area is characterised by net creditor households, while the public and corporate sectors are net debtors. An increase in interest rates will therefore increase the aggregate disposable income of households, but reduce the profits of the corporate sector and increase the deficit of the public sector. The magnitude of these income effects depends on the size and the composition of the balance sheets of non-financial agents and especially on the

maturity of their assets and liabilities. In addition, the lags with which income effects occur will be influenced by whether interest payments vary with short-term interest rates or are fixed.

The financial accounts of the household and corporate sectors in the euro area as a whole are still not completely finalised. However, available evidence from the balance sheets of households and enterprises in the large countries of the euro area shows that, at an economy-wide level, the response of the net interest income/payments to changes in the short-term interest rate is likely to be rather small. The financial costs of the corporate sector, the debt of which consists in part (one-third) of maturities of below one year, are likely to rise somewhat after an increase in interest rates, in particular as the short-term debt is rolled over and financed at higher rates. The reduced cash flow may reinforce the cost-of-capital effect on investment spending by weakening the financial position of enterprises and increasing the required risk premium on their debt.

In the case of the household sector, a large proportion of interest-bearing assets and liabilities are at longer-term fixed rates, although practices regarding fixed versus variable rate financing vary across countries. As a result, flows of interest income will generally adjust only gradually to changes in interest rates. The redistribution of income among firms or households will only have an impact on aggregate demand if net debtors have a higher propensity to spend out of changes in income than net lenders. This is likely to be the case if borrowers are credit-constrained.

Wealth effects

Finally, as noted above, changes in interest rates may affect the value of financial assets, such as equities and bonds, and of real assets, such as property, and therefore have a direct effect on the value of the wealth of households which have these assets in their

portfolios. The extent to which such changes in the value of wealth affect spending will depend on the propensity to use such wealth to finance consumption, as well as on the size and the composition of the wealth and the perceived persistence of the changes in those asset prices. As the response of consumption to changes in wealth is generally estimated to be small, changes in asset prices will only have a significant macroeconomic effect on spending if they are sizeable and occur on assets which are widely held by a significant proportion of the population.

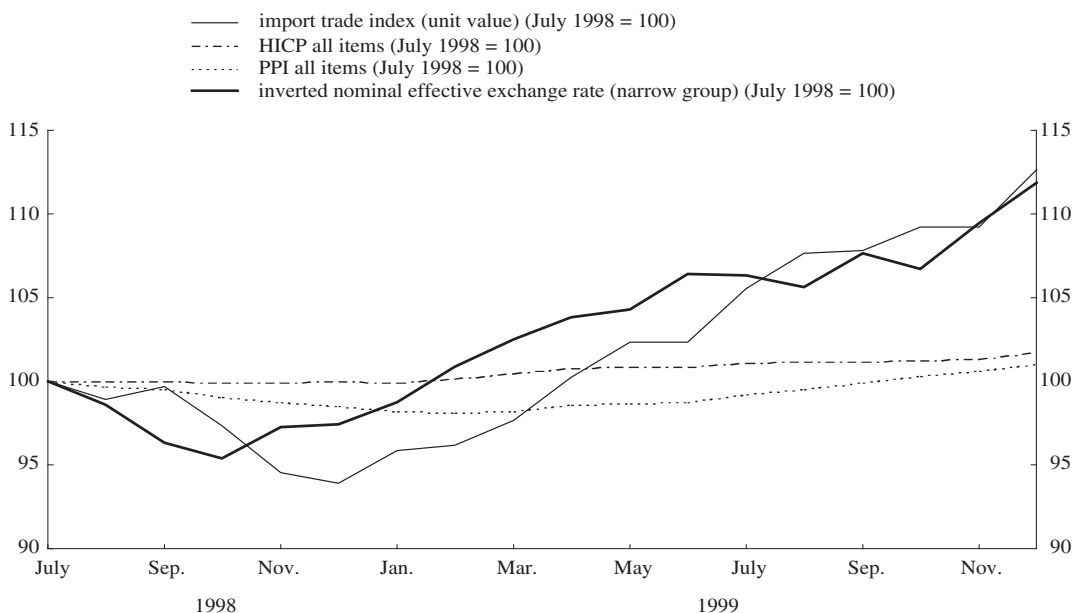
Although growing in importance, stock market capitalisation in the euro area, which amounted to 90.2% of GDP at the end of 1999, is about half that in the United States (see Table 1) and stock ownership is not as widespread. As a result, large movements in stock prices are less likely to have significant direct effects on consumer spending. Moreover, in the light of the volatility of stock prices, economic agents may discount some of the recent upward and downward movements as temporary, in which case spending would not be significantly affected (see Box 2 entitled "Recent trends in the volatility of stock price indices" in the May 2000 issue of the ECB Monthly Bulletin).

In the euro area, wealth effects on households are likely to take place more significantly through other asset prices. Bonds, which are usually held by households either directly or indirectly, represent about 100% of GDP. However, to the extent that most of the corresponding debt is held by domestic residents, such effects are mainly distributional. Even more important among households' assets is real estate. On average, the owner occupancy ratio, i.e. the proportion of households which own their homes, is close to 50% in the countries of the euro area. Such wealth effects through the housing market could become more significant to the extent that borrowing using the private home as collateral becomes more widespread, as appears to be the case in a number of euro area countries with booming housing markets.

Chart 4

Effective exchange rates and price indices

(monthly data)



Source: ECB.

Finally, changes in interest rates may also affect the value of a firm's portfolio of fixed assets, such as machinery and business real estate. To the extent that those assets are used as collateral in credit contracts, changes in the value of this portfolio may affect credit terms and, indirectly, firm spending.

Exchange rate effects

Changes in the exchange rate have a direct effect on consumer price inflation through their effect on import prices. Changes in import prices of goods which are used as input in the production process have an effect on firm costs and, therefore, tend to lead to changes in producer prices. Chart 4 illustrates the close relationship between the nominal effective exchange rate and import prices. Owing to the relatively limited share of imported goods, the response of the HICP is, however, much more subdued.

A change in the exchange rate also has an impact on trade. For example, a real depreciation in the exchange rate of the euro makes export products and services less expensive in foreign currency terms. In general this leads to a higher foreign demand for goods and services from the euro area and an increase in the volume of exports. In a similar vein, a real depreciation will make imported products which are priced in foreign currency more expensive in euro terms and, therefore, will generally dampen imports. An appreciation has the opposite effect. However, the impact of small changes in net exports on total aggregate demand in the euro area should not be overstated. The euro area as a whole is a relatively closed economy which is comparable with the United States (see Table I); its exports to countries outside the euro area amount to around 16.8% of GDP, while the figure for imports is around 15.2%.

Box

The interest rate transmission mechanism in the euro area: methodologies and an illustration

There is a large body of academic and central bank literature which attempts to estimate the strength and the timing of the effects of a change in policy interest rates on economic activity and prices. In this literature, various econometric methodologies are used, including so-called Vector Autoregressive (VAR) models, small structural models and large macroeconomic models.

Each methodology has its strengths and weaknesses. VAR models and small structural models have the advantage of being tractable and not so data-intensive, as they are usually estimated with few variables. However, this also forms one of their weaknesses, since important variables might be excluded from influencing results. The lack of economic structure and the difficulty in identifying the chain of causation among the key variables of interest has left VAR models open to criticism. Moreover, these models are only able to produce estimates of an unexpected shock to monetary policy and are not designed to analyse changes in the systematic component of monetary policy, which is likely to be more important. Small structural models allow such an analysis to be carried out, but often at the cost of oversimplifying the dynamic relationships between economic variables. Finally, large macroeconomic models have the advantage of incorporating the most important variables and relationships, but are usually highly data-intensive and require strong identifying assumptions. Specification errors in one part of the model may induce errors in the rest of the model owing to the many linkages which these models usually contain.

Given the above considerations, no single methodology can be considered as providing all the necessary answers. Instead, the various methodologies should be seen as being complementary. Given the importance of understanding the transmission mechanism for monetary policy, the Eurosystem is engaged in intensive research of the various transmission channels in the euro area. Three lines of research are being pursued in parallel. First, structural econometric models, both area-wide and multi-country, are being constructed. This work is being conducted within the framework of active co-operation between the research areas of the ECB and the NCBs. Second, small simulation models and VARs of the euro area are being estimated and analysed using macroeconomic data. These models provide, inter alia, alternative benchmarks for examining the transmission process. Third, microeconomic data (specifically at the individual bank and firm level) are being used to examine, in a more focused manner, the patterns of monetary transmission in the euro area. For the latter purpose, a Eurosystem Monetary Transmission Network has been created, bringing together researchers at the ECB and at the NCBs engaged in empirical research in this area.

Most of the existing macroeconomic literature focusing on individual countries finds that unexpected temporary shocks to the short-term interest rate have a relatively swift, but often limited, effect on real output and a much slower, but longer-lasting, effect on prices. While this overall pattern is relatively consistent across countries and time periods, there is much less certainty about the exact size and timing of these effects. Attempts at using these macroeconomic techniques to identify cross-country differences, for example, have generally not yielded robust results. This lack of robustness should not be surprising given, first, the difficulties involved in distinguishing the effects of a policy move from the effects of other shocks, second, the important role of expectations (which cannot be observed) in the transmission process and, third, the changing nature of the transmission mechanism on account of structural and policy regime shifts.

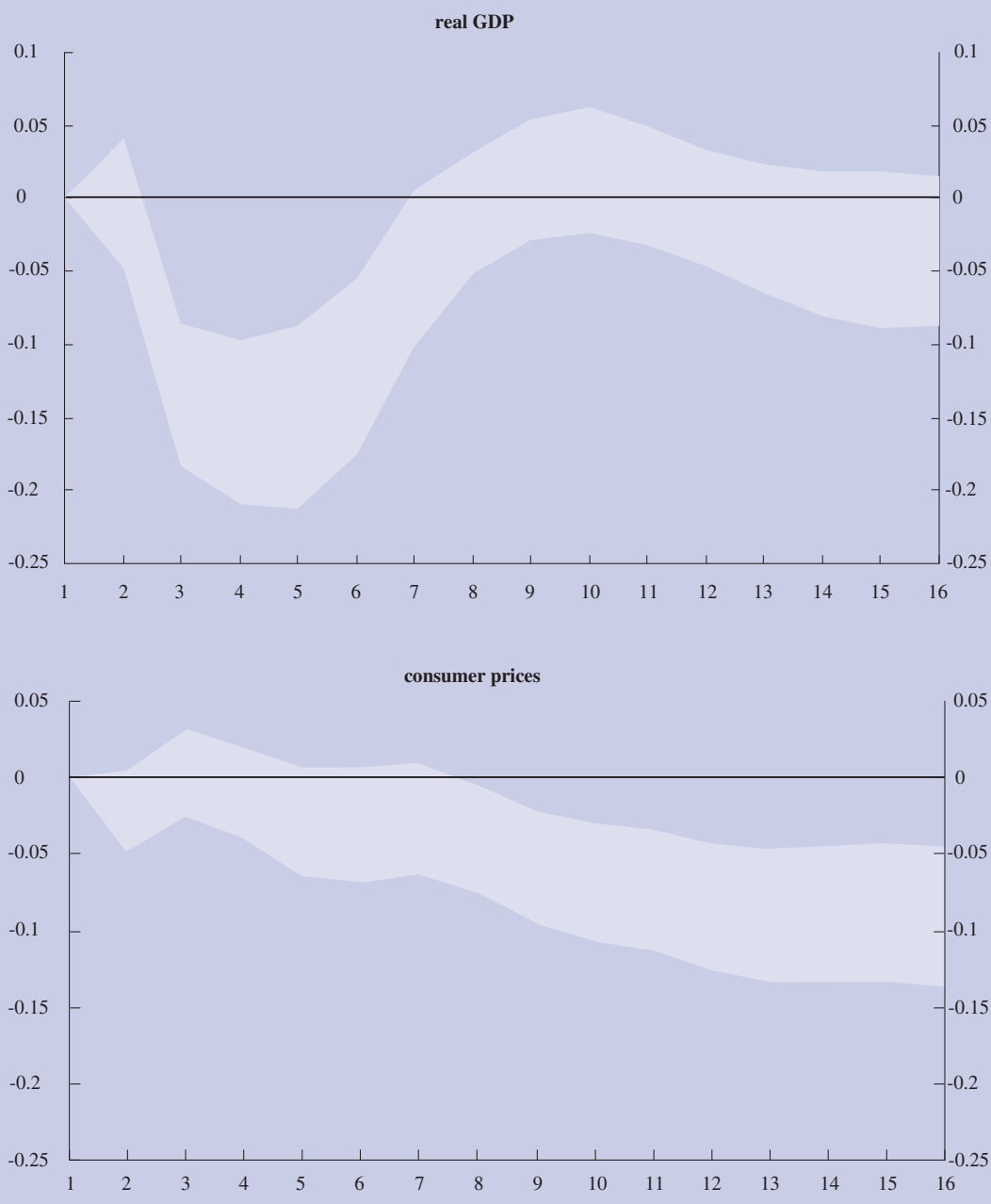
The lack of firm evidence of significant cross-country differences in the transmission mechanism adds to the validity of analyses focused on the euro area as a whole. At the same time, however, given these existing analytical uncertainties, any estimates of the effects of a policy move should be considered with caution. This is particularly true in the light of the fact that, at present, euro area models need to be estimated over a sample period for most of which the 11-country euro area did not yet constitute a single currency area. In the charts below the results of a simple VAR impulse response simulation, which represents and summarises the results existing in the relevant literature, are reported for purely illustrative purposes. The model is estimated over the period from 1980 to 1998 using quarterly data of real GDP, consumer prices, M3, a short-term nominal

interest rate and a real effective exchange rate. In addition, the VAR incorporates a constant, a linear trend, an index of commodity prices, the US short-term nominal interest rate and US real GDP as exogenous variables. The monetary policy shocks are identified by applying the standard Choleski decomposition to the VAR residuals, with the variables ordered as mentioned above.

The results reported in the charts below are broadly in line with the relevant literature and the description of the monetary transmission mechanism discussed in this article. An unexpected, temporary rise in the short-term interest rate of about 25 basis points tends to be followed by a temporary fall in output after two quarters. Prices are far more sluggish and only start to fall significantly below zero after six quarters. The confidence bands around these estimates are large, pointing to the considerable degree of uncertainty which surrounds estimates of the effects of monetary impulses.

Responses to a temporary interest rate shock

(percentage deviations, quarters, estimation period: 1980-98, 90% confidence band)



6 Changes in spending and inflation

The speed with which changes in spending translate into price pressures depends on the degree of nominal price rigidities and the flexibility of the economy more generally. In the long run, the level of output tends to be determined by supply-side factors such as technology, the capital stock and the size of the labour force. This long-run level of output (or potential output) may vary over time on account of many factors, such as changes in labour participation rates, investment in capital, the invention of new technologies or changes in the tax regime. Moreover, in the short run, the labour force can be employed more or less intensively by using overtime and additional shifts, etc. In addition, the capital stock might be used more or less intensively by adjusting the utilisation of the available capacity. However, in normal circumstances increases in aggregate demand beyond potential output tend to create bottlenecks in the economy, which fuel inflationary pressures.

These inflationary pressures may arise through different channels. As firms are producing above capacity, they will increase employment and demand additional labour and/or overtime. When labour markets are already tight, this will lead to increasing wage pressure. As wages increase over and above productivity levels, unit labour costs rise and the cost of production increases. In addition, input shortages and production above capacity at inefficient levels lead to unit cost pressures. Ultimately these cost pressures

will be reflected in price inflation, as firms attempt to maintain their profitability.

Slow adjustments of real wages and other relative prices will, in general, lead to more protracted effects on the real economy. Existing econometric evidence for the euro area suggests that while nominal price rigidities have been comparable with, for example, the United States, on average the speed of adjustment of real wages to changes in unemployment and productivity changes has been much slower. This is documented, for example, in a recent study by the OECD entitled "EMU one year on". There is also widespread agreement that a large proportion of the unemployment in the euro area is structural. In the absence of structural reform, this entails the danger that any fall in unemployment caused by increased demand might lead relatively rapidly to pay pressures, which, in the absence of countervailing productivity increases, would lead to price pressures and risks to price stability. Further structural reform to enhance the flexibility of labour and goods markets in the euro area would make a contribution towards solving the structural unemployment problem and attaining higher levels of non-inflationary growth, while also taking fuller advantage of the benefits of new information and communication technologies. At the same time, such reforms will also facilitate the Eurosystem's primary task of maintaining price stability.

7 Concluding remarks

Changes in monetary policy ultimately affect prices through a multitude of complex and often intertwined channels. This article has provided a broad overview of the existing knowledge with regard to the transmission mechanism in the euro area. In conclusion, in the light of their policy implications, three aspects need to be given particular emphasis. First, there are

considerable lags in the transmission of monetary impulses to the economy. This implies that attempts at controlling short-term shocks to the price level would face considerable difficulty and could have destabilising effects in the longer run. Instead, monetary policy-makers need to be forward-looking and continuously to

assess how current economic conditions affect the medium-term outlook for price stability.

Second, there is considerable uncertainty surrounding the strength and the timing of the link between monetary policy actions and changes in the price level. This applies in particular to the euro area, in which structural change may have occurred as a consequence of the adoption of a single monetary policy. Moreover, in many areas a statistical framework for analysing the euro area as a whole is still being developed. Given this uncertainty, ambitious attempts at fine-

tuning the economy or relying on a single model or indicator would be unwise. Finally, the formation of inflation expectations by households, firms, wage-setters and financial market participants forms an essential element in the transmission and effectiveness of monetary policy. The Eurosystem's stability-oriented monetary policy strategy is designed with a view to meeting the above-mentioned challenges successfully. It provides a forward-looking policy framework, which is intended to anchor inflation expectations at levels consistent with price stability.