EUROPEAN CENTRAL BANK

EUROSYSTEM

Price stability: why is it important for you?

Teachers' booklet

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Address
Kaiserstrasse 29
60311 Frankfurt am Main
Germany

Postal address
Postfach 16 03 19
60066 Frankfurt am Main
Germany

Telephone
+49 69 1344 0

Website
http://www.ecb.europa.eu

Fax
+49 69 1344 6000

Author
Dieter Gerdesmeier

Concept and design
MEDIA CONSULTA Advertising GmbH
Wassergasse 3
10179 Berlin
Germany

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Dieter Gerdesmeier
Frankfurt am Main, January 2011

Summary

The Treaty establishing the European Community has assigned the Eurosystem – which comprises the European Central Bank (ECB) and the national central banks (NCBs) of those countries that have adopted the euro as their currency – the primary mandate of maintaining price stability. This mandate is considered to be the principal objective of the Eurosystem for good economic reasons. It reflects the lessons we have learnt from previous experience and is supported by economic theory and empirical research, which indicate that by maintaining price stability, monetary policy will make a significant contribution to general welfare, including high levels of economic activity and employment.

Given the widespread recognition of the benefits of price stability, we consider it essential to explain, particularly to young people, the importance of price stability, how it can best be achieved, and how maintaining it supports the broader economic goals of the European Union.

The benefits of price stability, as well as the costs associated with inflation or deflation, are closely associated with money and its functions. Chapter 2 is therefore devoted to the functions and history of money. This chapter explains that in a world without money, i. e. in a barter economy, the costs associated with the exchange of goods and services, such as information, search and transportation costs, would be very high. It illustrates that money helps goods to be exchanged more efficiently and therefore enhances the well-being of all citizens. These considerations are followed by a more detailed discussion of the role and the three basic functions of money. Money serves as a medium of exchange, as a store of value and as a unit of account. The precise forms of money used in different societies have changed over time. Commodity money, metallic money, paper money and electronic money are particularly noteworthy. The main developments in terms of the history of money are briefly reviewed and explained.

Chapter 3 focuses in more detail on the importance of price stability. It explains that inflation and deflation are economic phenomena that could have serious negative consequences for the economy. The chapter begins with a definition of these concepts. In principle, inflation is defined as a general increase in the prices of goods and services over a protracted period, resulting in a decline in the value of money and thus its purchasing power. Deflation is when the overall price level falls over a protracted period.

The European Central Bank

After a short section illustrating some of the problems associated with measuring inflation, the chapter goes on to describe the benefits of price stability. Price stability supports higher living standards by reducing uncertainty about general price developments, thereby improving the transparency of the price mechanism. It makes it easier for consumers and companies to recognise price changes which are not common to all goods (so-called "relative price changes"). Moreover, price stability contributes to general well-being by reducing inflation risk premia in interest rates, by rendering activities which aim at hedging against inflation risks unnecessary and by reducing the distortive effects of taxation systems and social security systems. Finally, price stability

prevents the arbitrary distribution of wealth and income associated, for instance, with the erosion of the real value of nominal claims (savings in the form of bank deposits, government bonds, nominal wages) resulting from inflation. Large erosions of real wealth and income due to high inflation can be a source of social unrest and political instability. To sum up, by maintaining price stability, central banks help broader economic goals to be achieved, thus contributing to general political stability.

Chapter 4 focuses on the factors determining price developments. Starting with a brief overview of the role and limitations of monetary policy, it proceeds to explain how a central bank can influence short-term interest rates. The central bank is the monopolistic (i.e. the only) supplier of banknotes and central bank deposits. As banks need banknotes for their clients and have to fulfil minimum reserve requirements (i.e. deposits) with the central bank, they usually ask a central bank for credit. The central bank can set the interest rate on its loans to the banks, which subsequently influences the other market interest rates.

The changes in market interest rates affect spending decisions by households and companies and therefore, ultimately, economic activity and inflation. For instance, higher interest rates make it more expensive to invest and therefore tend to result in lower expenditure for investment. They also generally make saving more attractive and tend to reduce consumption demand. So under normal circumstances it can be expected that a rise in interest rates will lead to a decline in consumption and investment expenditures, which – all other things being equal – should ultimately lower inflationary pressures. While monetary policy can have some impact on real activity, this effect is only transitory and not permanent. However, monetary policy has a lasting impact on price developments and, as a result, inflation.

This chapter reviews in some detail the factors driving the inflationary process over shorter horizons. As illustrated by a rather simple model describing the concepts of aggregate supply and aggregate demand, a number of economic factors can lead to movements in price levels in the short term, among them increases in consumption and investment, rising government budget deficits as well as higher net exports. In addition, higher input prices (e.g. for energy) or wage increases not matched by productivity gains can lead to upward pressures on inflation.

Against this background, particular emphasis is placed on the fact that monetary policy cannot fully control short-term price developments. However, the chapter also explains that, when taking a longer-term perspective, inflation is a monetary phenomenon. It is, therefore, undeniable that monetary policy, by responding to risks to price stability, can control inflation over medium to long-term horizons.

The closing chapter contains a short description of the monetary policy of the ECB. Following a closer look at the process leading to Economic and Monetary Union, the subsequent sections deal with the institutional framework of the single monetary policy, the ECB's monetary policy strategy and the monetary policy instruments used by the Eurosystem. In order to clarify the Eurosystem's objective of maintaining price stability, as laid down in the Treaty, the Governing Council of the ECB gave the following quantitative definition in 1998: "*Price stability shall be defined as a year-on-year increase in the Harmonised Index of Consumer Prices (HICP) for the euro area of below 2 %. Price stability is to be maintained over the medium term*". Furthermore, the Governing Council made it clear in May 2003 that, within this definition, it aims to keep inflation rates below but "*close to 2 % over the medium term*".

In the ECB's strategy, monetary policy decisions are based on a comprehensive analysis of the risks to price stability. Such an analysis is performed on the basis of two

complementary perspectives for determining price developments. The first is aimed at assessing the short to medium-term determinants of price developments, with a focus on real economic activity and financial conditions in the economy. It takes account of the fact that over those horizons, price developments are heavily influenced by the interplay of supply and demand in the goods, services and input (i.e. labour and capital) markets. The ECB refers to this as the "economic analysis". The second perspective, referred to as the "monetary analysis", focuses on a longer-term horizon, exploiting the long-term link between the quantity of money in circulation and prices. The monetary analysis serves mainly as a means of cross-checking, over a medium to long-term perspective, the short to medium-term indications for monetary policy stemming from the economic analysis.

Based on this assessment, the Governing Council of the ECB decides on the level of short-term interest rates to ensure that inflationary and deflationary pressures are counteracted and that price stability is maintained over the medium term.

In the ECB's strategy, monetary policy decisions are based on a comprehensive analysis of the risks to price stability.

Chapter 1
Introduction

When asked about general economic conditions in opinion polls, European citizens usually express their desire to live in an environment without inflation or deflation. The Treaty establishing the European Community has given the Eurosystem the mandate to maintain price stability. This makes good economic sense. It reflects the lessons we have learnt from history and is supported by economic theory and empirical research, which suggest that, by maintaining price stability, monetary policy will contribute most to general economic welfare, including high levels of economic activity and employment.

Given the widespread recognition of the benefits of price stability, it is important that everyone, and young people in particular, understands the importance of price stability, how it can best be achieved, and how maintaining stable prices supports the broader economic goals of the European Union.

This book consists of various chapters: each of them contains basic information and can be referred to individually, as and when required. The degree of complexity is, however, higher in Chapters 4 and 5 than in the first few chapters. In order to understand fully Chapter 5, it is necessary to have read Chapter 3 and, in particular, Chapter 4 carefully. Additional boxes are provided to address some specific issues in more detail.

The benefits of price stability, or the costs associated with inflation or deflation, are closely linked to money and its functions. Chapter 2 is therefore devoted to the functions and history of money. The chapter explains that in a world without money, i. e. in a barter economy, the transaction costs associated with the exchange of goods and services are very high. It also illustrates that money helps to achieve a more efficient exchange of goods and thereby enhances the welfare of consumers. These considerations are followed by a more detailed discussion of the role and the basic functions of money in Section 2.1. The forms of money used in societies have changed over time. The main historical developments are briefly reviewed and explained in Section 2.2.

Chapter 3 explains the importance of price stability. It first defines the concepts of inflation and deflation (Section 3.1). After a short section illustrating some measurement issues (Section 3.2), the next section describes the benefits of price stability and, conversely, the negative consequences of inflation (or deflation) in detail (Section 3.3).

Chapter 4 focuses on the factors determining price developments. Beginning with a brief overview (Section 4.1), it proceeds to investigate the influence of monetary policy on interest rates (Section 4.2). Subsequently the effects of interest rate changes on expenditure decisions by households and firms (Section 4.3) are illustrated. In the next section, the factors driving the inflationary process over the shorter term are reviewed (Section 4.4). Particular emphasis is placed on the fact that monetary policy alone does not control short-term price developments, as a number of other economic factors can have an impact on inflation within this timescale. However, it is acknowledged that monetary policy controls inflation over the longer term (Section 4.5).

This book consists of various chapters: each of them contains basic information and can be referred to individually, as and when required.

The closing chapter contains a short description of the ECB's monetary policy. Following a closer look at the process leading to Economic and Monetary Union (Section 5.1), the subsequent sections deal with the institutional framework of the single monetary policy (Section 5.2), the ECB's monetary policy strategy (Section 5.3) and the Eurosystem's operational framework (Section 5.4).

For more detailed information, please consult the Glossary and Bibliography at the end of this book.

Chapter 2
Money – a short history

Money is an indispensable part of modern life. This chapter attempts to deal with questions such as what money is, why we need money, why money is accepted and for how long money has existed.

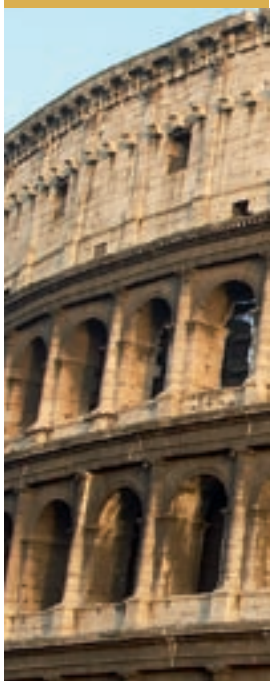
Section 2.1
explains the functions of money.

Section 2.2
provides an overview of the various goods that have served as money in the past.

2.1 Functions of money

History of the word "money"

Money plays a key role in today's economies. It is certainly no exaggeration to say that "money makes the world go round" and that modern economies could not function without money. The English word "money" is of Roman origin. In ancient Rome, however, the word "Monetor" or "Moneta" meant advisor, i. e. a person who warns or who makes people remember. According to some historians, the meaning of the word goes back to a key event in Roman history. A flock of geese in a sanctuary of the Goddess Juno on Capitoline Hill squawked an alarm to alert the Roman defenders during an invasion of the Gauls in 390 B.C. and thus saved them from defeat. In return, the Romans built a shrine to Moneta, the goddess who warns or who gives advice. In 289 B.C. the first Roman mint was built in or near this temple, initially producing bronze and later silver coins. Many of these coins were cast with the head of Juno Moneta on their face. Hence the words "money" and "mint" are derived from her name.



The English word "money" is of Roman origin.

Functions of money

What is money? If we have to define money today, we first think of banknotes and coins. These assets are regarded as money since they are liquid. This means that they are accepted and are available to be used for payment purposes at any time. While it is uncontested that banknotes and coins fulfil this purpose, nowadays a number of other forms of assets exist which are very liquid and can be easily converted into cash or used to make a payment at very low cost. This applies, for instance, to overnight deposits and some other forms of deposits held with banks.[1] Consequently, these instruments are included in those definitions of money often referred to as "broad money".

The various forms of money have changed substantially over time. Paper money and bank deposits did not always exist. It would therefore be useful to define money in more general terms. Money can be thought of as a very special good that fulfils some basic functions. In particular, it should serve as a medium of exchange, a store of value and a unit of account. Therefore, it is often stated that *money is what money does*.

In order to better illustrate these functions, consider how people had to conduct their transactions before the existence of money. Without money, people were forced to exchange goods or services directly for other goods or services through bartering. Although such a "barter economy" allows for some division of labour, there are practical limitations and any exchange of goods implies substantial so-called "transaction costs".

The most apparent problem with a barter economy is that people have to find a counterpart who wants exactly the same good or service that they are offering and who is offering what they want in return. In other words: a successful barter transaction requires a *mutual coincidence of wants* to exist. A baker who, for instance, wanted a haircut in exchange for some loaves of bread would have to find a hairdresser who is willing to accept those loaves of bread in exchange for a haircut. However, if the hairdresser needed a pair of shoes instead, he would have to wait until a shoe-shop owner wanted to get a haircut in exchange. Such a barter economy would therefore imply substantial costs related to searching for the appropriate counterpart and waiting and stockpiling.

[1] Overnight deposits are funds which are immediately available for transaction purposes. It should be mentioned that electronic money on prepaid cards is included in overnight deposits.

Money as a medium of exchange

To avoid the inconveniences associated with a barter economy, one of the goods can be used as a medium of exchange. This crude form of money used for exchange is then called *commodity money*. Bartering one good against money and then money against another good might at first glance further complicate transactions. At second glance, however, it becomes clear that the use of one good as a medium of exchange facilitates the whole process to a considerable extent, as the mutual coincidence of wants is no longer required for an exchange of goods and services to take place. It is obvious that one precondition for this particular good to fulfil the function of money is that it is accepted throughout the economy as a medium of exchange, be it because of tradition, informal convention or law.

At the same time, it is obvious that goods serving as a medium of exchange should have some specific technical properties. In particular, goods serving as commodity money should be easy to carry, durable, divisible and their quality should be easy to verify. In a more economic sense, of course, money should be a rare good, as only rare goods have a positive value.

Money as a store of value

If the good used as money maintains its value over time, it can be held for longer periods. This is particularly useful because it allows for the act of sale to be separated from the act of purchase. In this case, money fulfils the important function of a store of value.

It is for these reasons that commodities that also serve as a store of value are preferable to commodities that only serve as a medium of exchange. Goods such as flowers or tomatoes, for instance, might in principle serve as a medium of exchange. However, they would not be useful as a store of value and would therefore probably not have been used as money. So if this function of money does not work properly (for instance if the good serving as money loses its value over time), people will make use of the value-storing function of other goods or assets or – in extreme cases – even go back to bartering.

Money as a unit of account

Of equal importance is the function of money as a unit of account. This can be illustrated by going back to our previous example. Even if the difficulty of the mutual coincidence of wants is overcome, people would still have to find the exact exchange ratio between bread and haircuts or between haircuts and shoes, for example. Such "exchange ratios" – the number of loaves of bread worth one haircut, for instance – are known as *relative prices* or *terms of trade*. In the market place, the relative price would have to be determined for each pair of goods and services and, of course, everybody involved in the exchange of goods would need all the information about the terms of trade between all goods. It is easy to show that, for two goods, there is only one relative price, while for three goods there are just three relative prices (namely bread against haircuts, haircuts against shoes and bread against shoes). In the case of ten goods, however, there are already 45 relative prices, and with 100 goods the number of relative prices amounts to 4950.[2] Therefore, the greater the number of goods

Money should serve as a medium of exchange, a store of value and a unit of account.

[2] More generally for n goods, there are $\frac{n \times (n-1)}{2}$ relative prices.

being exchanged, the more difficult it becomes to gather information on all possible "exchange rates". Consequently, collecting and remembering information on the terms of trade creates high costs for the participants in a barter economy, increasing disproportionately with the number of goods exchanged. These resources could be used more efficiently in other ways if one of the existing goods is used as a unit of account (a so-called "numeraire"). In this case, the value of all goods can be expressed in terms of this "numeraire" and the number of prices which consumers have to identify and remember can be reduced significantly.[3] Therefore, if all prices were labelled in money terms, transactions would be much easier. More generally speaking, not only can the prices of goods be expressed in money terms, but so too can the price of any asset. All economic agents in the respective currency area would then calculate things such as costs, prices, wages, income, etc. in the same units of money. As in the above-mentioned functions of money, the less stable and reliable the value of money, the more difficult it is for money to fulfil this important function. A commonly accepted reliable unit of account thus forms a sound basis for price and cost calculations, thereby improving transparency and reliability.

A variety of items have served as commodity money – for example brightly coloured shells.

2.2 Forms of money

Over time, the nature of goods serving as money has changed. It is widely agreed that what at times became the prime function of these goods was often not the same as their original purpose. It seems that goods were chosen as money because they could be stored conveniently and easily, had a high value but a comparably low weight, and were easily portable and durable. These widely desired goods were easy to exchange and, therefore, came to be accepted as money. So the evolution of money depends on a number of factors, such as the relative importance of trade and the state of development of the economy.

Commodity money

A variety of items have served as commodity money, including the wampum (beads made from shells) of the American Indians, cowries (brightly coloured shells) in India, whales' teeth in Fiji, tobacco in the early colonies in North America, large stone discs on the Pacific Island of Yap and cigarettes and liquor in post-World War II Germany.

Metallic money

The introduction of metallic money was a way by which ancient societies tried to overcome the problems associated with using decaying commodities as money. It is not known exactly when and where metallic money was used for the first time. What is known, however, is that metallic money was in use in around 2000 B.C. in Asia, although in those times its weight does not seem to have been standardised nor its value certified by the rulers. Chunks or bars of gold and silver were used as commodity money since they were easy to transport, did not decay and were more or less easily divisible. Moreover, it was possible to melt them in order to produce jewellery.

[3] Namely to $n - 1$ absolute prices.

Metallic coins

Europeans were among the first to develop standardised and certified metallic coins. The Greeks introduced silver coins around 700 B.C.; Aegina (595 B.C.), Athens (575 B.C.), and Corinth (570 B.C.) were the first Greek city-states to mint their own coins. The silver content of the Athenian *drachma*, famous for depicting the legendary owl, remained stable for nearly 400 years. Greek coins were therefore widely used (their use was further spread by Alexander the Great), and have been found by archaeologists in a geographical area ranging from Spain to modern India. The Romans, who had previously used cumbersome bronze bars called *aes signatum* as money, adopted the Greek innovation of using official coins and were the first to introduce a bi-metal scheme using both the silver *denarius* and the gold *aureus*.

Under the Emperor Nero in the first century A.D., the precious metal content of the coins started to diminish as the imperial mints increasingly substituted gold and silver for alloy in order to finance the empire's gigantic deficit. With the intrinsic value of the coins declining, the prices of goods and services began to rise. This was followed by a general rise in prices that may have contributed to the downfall of the Western Roman Empire. The more stable Eastern Roman *solidus*, introduced by Constantine the Great in the fourth century A.D., was maintained at its original weight and precious metal content until the middle of the 11th century, thus gaining a reputation that made it the most important coinage for international trade for over five centuries. Byzantine Greek coins were used as international money and were found by archaeologists as far away as Altai in Mongolia. In the mid-11th century, however, the Byzantine monetary economy collapsed and was replaced by a new system which lasted throughout the 12th century, until the Crusader conquest of Constantinople in 1204 eventually ended the history of Graeco-Roman coinage.

The Greeks and Romans had spread the custom of using coins and the technical knowledge of how to strike them over a vast geographical area. For most of the Middle Ages locally minted gold and silver coins were the dominant means of payment, although copper coins were increasingly being used. In 793 A.D. Charlemagne reformed and standardised the Frankish monetary system, introducing a monetary standard according to which one Frankish silver pound (408g) equalled 20 shillings or 240 pence – this standard remained valid in the United Kingdom and Ireland until 1971.

After the fall of Constantinople, the Italian merchant city-states of Genoa and Florence introduced gold coinage in 1252 with the *genoin* of Genoa and the *fiorina* (or *florin*) of Florence. In the 15th century their place was taken by the *ducato* of Venice.

Paper money

The Chinese began using paper money around 800 A.D. under Emperor Hien Tsung and continued to do so for several hundred years. This paper money had no commodity value and was money only by imperial decree, or so-called *fiat money* (i.e. money *without* intrinsic value). Paper money was most widespread in China around 1000 A.D., but it was abandoned around 1500 when Chinese society went into decline following the Mongol Conquest.

The Chinese began using paper money around 800 and continued to do so for several hundred years.

Obligations

It was, however, difficult to conduct long-distance trade as long as value could only be stored in the form of commodities and coins. The Italian city-states were therefore the

first to introduce certificates of indebtedness ("obligations" or "bills of exchange") as a means of payment.

To reduce the risk of being robbed on their journeys, merchants took these obligations with them. Debtor and lender were mentioned in the certificates, a payment date was fixed, and the amount of gold or silver noted. Soon, merchant bankers began to trade these obligations. First evidence of such a contract dates back to 1156.

Obligations continued to be used mostly by Italian merchants, and the bi-metal scheme remained dominant until the Thirty Years' War. Due to the economic turmoil caused by the war, rulers such as the Swedish kings started to prefer paper money. This was subsequently introduced by the Bank of England in 1694 and the Banque générale in France in 1716. The advent of paper fiat money in Europe marked the beginning of a new phase in the evolution of money. The responsibility for establishing and regulating the system of fiat money in a country remained with the governments, but other public or private institutions such as central banks and the financial system played an increasingly crucial role in the success of the national currency.

Gold standard

Since the adoption of fiat money approximately two centuries ago the monetary system has undergone great change. Paper money was – and still is – legal tender only by an act of the competent authority. It was issued in fixed units of national currency and had a clearly defined nominal value. For a long time, the nation states held gold reserves in their central banks to ensure the credibility of their currency – a system known as the *Gold Standard*. Currencies in the form of coins and fiduciary paper notes were convertible into gold at a fixed parity. The United Kingdom was effectively the first country to set up a gold standard in 1816, the exchange rate of pounds into gold having been determined in 1717 at 3.811 pounds sterling per ounce by Sir Isaac Newton himself.

With the start of World War I many countries began printing more and more money in order to finance the cost of the war. In Germany, for instance, the number of banknotes issued by the Reichsbank grew from 2,593 million in 1913 to a total of 92,844,720.7 billion banknotes in circulation on 18 November 1923. This ultimately led to hyperinflation.[4] With more money circulating most countries suspended the convertibility of their currencies into gold as its increased quantity was no longer balanced by the national gold reserves.

The nation states held gold reserves in central banks to ensure the credibility of their currency.

Gold exchange standard

The British gold standard finally collapsed in 1931, but the system was revived at the 1944 international conference held in Bretton Woods, New Hampshire. Here, a revised gold standard was agreed upon: the exchange rates of the national currencies of the major economic powers were pegged to the dollar and the dollar was convertible into gold at a fixed price of USD 35 per ounce. The Bretton Woods monetary system is therefore sometimes called the *gold exchange standard*. Central banks stood ready to provide dollars in exchange for their national currency and vice versa.

4 See Davies (1994, p. 573) for a more detailed overview.

The Bretton Woods monetary system collapsed in 1971 and since then the currencies of the major economies have remained pure fiat money. In addition, most countries have allowed the exchange rates of their currencies to float.

The evolution of money has not stopped. These days, various forms of intangible money have emerged, among them so-called "electronic money" ("e-money"), or electronic means of payment, which first appeared in the 1990s. This kind of money can be used to pay for goods and services on the internet or using other electronic media. Upon receiving authorisation from the buyer for the payment to take place, the vendor contacts the issuing bank and is transferred the funds. At present there are various card-based electronic money schemes in Europe, generally operated by financial institutions.

These days, various forms of intangible money have emerged, among them so-called "electronic money".

Chapter 3
The importance of price stability

This chapter provides detailed information to help answer questions such as what price stability, inflation and deflation are, how inflation is measured, what the difference between nominal interest rates and the real return is, and what the benefits of price stability are, or in other words, why it is important for central banks to ensure price stability.

Section 3.1
explains some basic economic terms such as the concepts of inflation, deflation and price stability.

Section 3.2
focuses on the problems associated with measuring inflation.

Section 3.3
provides an overview of the benefits of price stability.

3.1 What is price stability?

Inflation and deflation

Inflation and deflation are important economic phenomenona that have negative consequences for the economy. Basically, inflation is defined as a general, or broadly-based, increase in the prices of goods and services over an extended period which consequently leads to a decline in the value of money and thus its purchasing power.

Deflation is often defined as the opposite of inflation, namely as a situation whereby the overall price level falls over an extended period.

When there is no inflation or deflation, we can say that there is price stability if, on average, prices neither increase nor decrease but stay stable over time. If, for instance, EUR 100 can buy the same basket of goods as it could, say, one and two years ago, then this can be called a situation of absolute price stability.

Movements in individual prices and in the general price level

It is important to make a distinction between movements in prices of any individual good or service and movements in the general price level. Frequent changes in individual prices are quite normal in market-based economies, even if there is price stability overall. The changes in supply and/or demand conditions of individual goods or services inevitably lead to changes in their price. For example, in recent years we have seen substantial declines in the prices of computers and mobile phones, mainly resulting from rapid technological progress. However, from the beginning of 1999 to mid-2006, oil and other energy prices increased, partly as a result of concerns regarding the future supply of energy and partly as a result of increased demand for energy, in particular from fast-growing economies. On the whole, inflation in most industrialised countries remained low and stable – stability in the general price level can go hand-in-hand with substantial changes in individual prices as long as falling and rising prices offset each other so that the overall price level remains unchanged.

3.2 Measuring inflation

Measurement issues

How can inflation be measured? There are millions of individual prices in an economy. These prices are subject to continuous moves which basically reflect changes in the supply of and the demand for individual goods and services and thus give an indication of the "relative scarcity" of the respective goods and services. It is obvious that it is neither feasible nor desirable to take all of these prices into account, but neither is it appropriate to look at just a few of them, since they may not be representative of the general price level.

Consumer Price Index

Most countries have a simple common-sense approach to measuring inflation, using the so-called "Consumer Price Index" (CPI).[5] For this purpose, the purchasing patterns of consumers are analysed to determine the goods and services which consumers typically buy and which can therefore be considered as somehow representative of the average consumer in an economy. As such they do not only include those items which consumers buy on a day-to-day basis (e.g. bread and fruit), but also purchases of durable goods (e.g. cars, PCs, washing machines, etc.) and frequent transactions (e.g. rents). Putting together this "shopping list" of items and weighting them according to their importance in consumer budgets leads to the creation of what is referred to as a "market basket".[6] Each month, a host of "price surveyors" checks on the prices of these items in various outlets. Subsequently, the costs of this basket are then compared over time, determining a series for the price index. The annual rate of inflation can then be calculated by expressing the change in the costs of the market basket today as a percentage of the costs of the identical basket the previous year.

However, the developments of the price level as identified by such a basket only reflect the situation of an "average" or representative consumer. If a person's buying habits differ substantially from the average consumption pattern and thus from the market basket on which the index is based, that person may experience a change in the cost of living that is different to the one shown in the index. There will therefore always be some people who experience a higher "inflation rate" for their "individual basket" and some who face a lower "individual rate of inflation". In other words, the inflation measured by the index is only an approximate measure of the average situation in the economy; it is not identical to the overall price changes faced by each individual consumer.

Box 3.1 Measuring inflation – a simple example

Let us illustrate the considerations above by means of a simple numerical example. Suppose that a representative market basket of the yearly expenditure of teenagers is 100 sandwiches, 50 soft drinks, ten energy drinks and one mountain bike.

	Quantity	Price (Year 1)	Price (Year 2)	Price (Year 3)
Sandwiches	100	EUR 1.00	EUR 1.20	EUR 0.90
Soft drinks	50	EUR 0.50	EUR 0.40	EUR 0.70
Energy drinks	10	EUR 1.50	EUR 1.70	EUR 1.20
Mountain bike	1	EUR 160.00	EUR 173.00	EUR 223.00
Cost of the market basket		EUR 300.00	EUR 330.00	EUR 360.00
Price index		100.00	110.00	120.00

[5] In fact, the Consumer Price Index, which measures the price changes in consumer goods and services, is not the only price index in an economy. Another index which is of similar economic importance is the Producer Price Index. This index measures the changes made by domestic producers of goods and services to sales prices over time.

[6] More precisely, these goods are weighted according to final monetary expenditure shares of private households. In practice, the weights in the basket are periodically revised in order to reflect changes in consumer behaviour.

The total cost of the basket can then be calculated by multiplying the quantities by the respective prices and adding everything up. It is easy to see that between the first and second year, the cost of this basket of goods has risen from EUR 300 to EUR 330, or by 10 %. From the first to the third year, the cost has risen from EUR 300 to EUR 360, or by the equivalent of 20 %.

Another way to express this is by means of a price index. In order to compute the price index, the cost of the market basket in any period is divided by the cost of the market basket in the base period, and the result is multiplied by 100. In the table above, year 1 is the base period. The price index for year 3 is therefore:

Price Index = $(P_3/P_1) \times 100 = (360/300) \times 100 = 120.00$

The price index tries to give a general picture of what is happening to a great many prices. As the example shows, the price index may rise despite some prices actually declining.

Measurement problems

For various reasons, there are some difficulties associated with any attempt to express the overall change in prices as one number.

First, an existing basket usually becomes less and less representative over time as consumers increasingly substitute more expensive goods for cheaper ones. For example, higher petrol prices might lead some people to drive less and buy a higher quantity of other goods instead. Therefore, if the weights are not adjusted, the change in the index may slightly overestimate the "true" price increases. Second, changes in quality are sometimes difficult to incorporate into the price index. If the quality of a product improves over time and the price also rises, some of the change in price is due to the improved quality. Price increases which are due to quality changes cannot be considered as giving rise to inflation, as they do not reduce the purchasing power of money. Changes in quality are commonplace over long periods of time. For example, today's car differs considerably from those manufactured in the 1970s, which in turn were very different from those of the 1950s. Statistical offices spend a lot of time making adjustments for quality changes, but by their very nature such adjustments are not easy to estimate.

Apart from new varieties of *existing* goods (e.g. the introduction of new breakfast cereals), an important and difficult subject is the inclusion of *new* products. For example, after DVD players came on the market, there was an inevitable time lag until they could be captured in price statistics, since information on the market shares, the main distribution channels, the most popular makes, etc., was needed. But if it takes too long to incorporate new products into the price index, the price index fails to fully reflect the actual average price changes consumers are facing.

In the past, a number of economic studies have identified a small but positive bias in the measurement of national consumer price indices, suggesting that a measured inflation rate of, say, smaller than ½ percentage point might in fact be consistent with "true" price stability. For the euro area (i.e. all the EU countries that have adopted the euro as their currency), no precise estimates for such a measurement bias are available.

However, one can expect the size of such a possible bias to be rather small for two reasons. First, the Harmonised Index of Consumer Prices (HICP) – this is a harmonised CPI for all euro area countries – is a relatively new concept. Second, Eurostat, the European Commission agency responsible for this area of statistics at the EU level, has attempted to avoid a measurement bias in the HICP by setting appropriate statistical standards.

Nominal and real variables

As is explained above, in the case of inflation, a given amount of money can buy increasingly fewer goods. This is the same as saying that there is a fall in the value of money or a decrease in its purchasing power. This observation brings us on to another important economic issue: the difference between nominal and real variables. A nominal variable is one that is measured in current prices. Such variables usually move with the price level and therefore with inflation. In other words, the effects of inflation have not been accounted for. Real variables, however, such as real income or real wages, are variables where the effects of inflation have been deducted or "taken out".

Let us assume that a worker's earnings increase by 3 % in nominal (i.e. in money) terms per year, in other words his monthly earnings increase from, say, EUR 2000 to EUR 2060. If we further assume that the general price level were to increase by 1.5 % over the same period, which is equivalent to saying that the rate of inflation is 1.5 % per annum, then the increase in the real wage is $((103/101.5)-1) \times 100 \approx 1.48\,\%$ (or approximately $3\,\% - 1.5\,\% = 1.5\,\%$). Therefore, the higher the rate of inflation for a given nominal wage increases, the fewer goods the worker can buy.

Another important distinction is between nominal and real interest rates (see also the Box below). By way of an example, let us suppose that you can buy a bond with a maturity of one year at face value which pays 4 % at the end of the year. If you were to pay EUR 100 at the beginning of the year, you would get EUR 104 at the end of the year. The bond therefore pays a nominal interest rate of 4 %. Note that the interest rate refers to the nominal interest rate, unless otherwise stated.

Now let us suppose that the inflation rate is again 1.5 % for that year. This is equivalent to saying that today the basket of goods will cost EUR 100, or next year it will cost EUR 101.5. If you buy a bond with a 4 % nominal interest rate for EUR 100, sell it after a year and get EUR 104, then buy a basket of goods for EUR 101.5, you will have EUR 2.5 left over. So, after factoring in inflation, your EUR 100 bond will earn you about EUR 2.5 in "real" income, which is equivalent to saying that the real interest rate is about 2.5 %. It is obvious that if inflation is positive then the real interest rate is lower than the nominal interest rate.

Box 3.2 The relationship between expected inflation and interest rates – the so-called "Fisher effect"

Economists call the interest rate that the bank (or a normal bond) pays the *nominal* interest rate. The real interest rate is defined as the increase in the purchasing power achieved with this investment. If i denotes the nominal interest rate, r the

real interest rate and π the rate of inflation, then the relationship between these three variables can be written as:[7]

$$r = i - \pi$$

Following on from this, the real interest rate is the difference between the nominal interest rate and the rate of inflation. By rearranging this equation, it is easy to see that the nominal interest rate equals the sum of the real interest rate and the inflation rate:

$$i = r + \pi$$

So, what would this equation tell us about the determinants of nominal interest rates?

When a borrower (for example a person who wants to buy a new car) and a lender (for example a bank) agree on a nominal interest rate, they do not know exactly what the inflation rate will be for the loan period. It is therefore important to distinguish between two concepts of the real interest rate: the real interest rate the borrower and lender expect when the loan is made, called the *ex ante* real (r^*) interest rate, and the real interest rate actually realised, called the *ex post* interest rate (r).

Although borrowers and lenders cannot predict future inflation accurately, it seems quite plausible that they do have some expectation of the future inflation rate. Let π denote actual realised inflation and π^e the expectation of this rate of inflation. The ex ante real interest rate is $i - \pi^e$, and the ex post real interest rate $i - \pi$. The two interest rates differ when actual or realised inflation differs from expected inflation. Clearly the nominal interest rate cannot take account of future realised inflation because this is not known when the nominal interest rate is set. The nominal interest rate can only take into account expected inflation.

$$i = r^* + \pi^e$$

Expressed in this way, the equation is called the Fisher equation, after economist Irving Fisher (1867–1947). It basically shows that the nominal interest rate can change for two reasons, namely because the expected real interest rate (r^*) changes or because the expected inflation rate (π^e) changes. More precisely, the equation postulates that, given the ex ante real rate, the nominal interest rate i moves in parallel with changes in expected inflation π^e. This one-for-one relationship between the expected inflation rate and the nominal interest rate is called the "Fisher effect", i.e. where higher inflation leads to higher nominal interest rates.

A high nominal interest rate on a bank deposit or government bond may therefore simply reflect high inflation expectations and does not necessarily signal that the real return on this investment is expected to be high as well. This concept is important for everyone who borrows or lends money.

It should also be noted, that, under certain circumstances, interest rates can include risk premia. These usually encompass inflation (uncertainty) risk premia, exchange rate risk premia and default risk premia.

[7] Note that this relationship is just an approximation, which is only reasonably accurate as long as r, i and π are relatively small. In fact, it can be demonstrated that $1 + r = (1 + i) \times (1 + \pi)$ or $r = i - \pi - r \times \pi$. Of course, for low levels of r and π, the term $r \times \pi$ becomes negligible and, therefore, $r = i - \pi$ is the approximation used.

3.3 The benefits of price stability

Price stability supports higher living standards by helping to …

The information above explains why inflation and deflation are generally undesirable phenomena. Indeed, there are substantial disadvantages and costs related to inflation and deflation. Price stability prevents these costs from arising and brings about important benefits for all citizens. There are several ways in which price stability helps to achieve high levels of economic welfare, e.g. in the form of high employment.

… reduce uncertainty about general price developments and thereby improve the transparency of relative prices …

First, price stability makes it easier for people to identify changes in the prices of goods expressed in terms of other goods (i.e. "relative prices"), since such changes are not concealed by fluctuations in the overall price level. For example, let us suppose that the price of a certain product increases by 3 %. If the general price level is stable, consumers know that the relative price of this product has increased and may therefore decide to buy less of it. If there is high and unstable inflation, however, it is more difficult to find out the relative price, which may have even declined. In such a situation it may be better for the consumer to buy relatively more of the product whose price has increased by "only" 3 %.

In the case of general deflation, consumers may not be aware of the fact that a fall in the price level of a single product merely reflects general price developments and not a fall in the relative price level of this good. As a result, they may mistakenly buy too much of this product.

Consequently, if prices are stable, firms and consumers do not run the risk of misinterpreting changes in the general price level as relative price changes and can make better informed consumption and investment decisions.

Uncertainty about the rate of inflation may also lead firms to make wrong employment decisions. To illustrate this, let us suppose that in an environment of high inflation, a firm misinterprets the increase in the market price of its goods by, say, 5 %, as a relative price decrease as it is not aware that the inflation rate has recently fallen from, say, 6 % to 4 %. The firm might then decide to invest less and lay off workers in order to reduce its production capacities, as it would otherwise expect to make a loss given the perceived decrease in the relative price of its goods. However, this decision would ultimately turn out to be wrong, as the nominal wages of employees due to lower inflation may increase by less than that assumed by the firm. Economists would describe this as a "misallocation" of resources. In essence, it implies that resources (capital, labour, etc.) have been wasted, as some employees would have been made redundant because of instabilities in price developments.

A similar waste of resources would result if workers and unions were uncertain about future inflation and therefore demanded a rather high nominal wage increase in order to avoid high future inflation leading to significant declines in real wages. If firms had

Price stability makes it easier for people to identify changes in the prices of goods.

lower inflation expectations than workers/unions in such a situation, they would consider a given nominal wage increase as a rather high real wage increase and may therefore reduce their workforce or, at least, hire fewer workers than they would without the *high "perceived" real wage increase*.

Price stability reduces inflation uncertainty and therefore helps to prevent the mis-allocation of resources described above. By helping the market guide resources to where they can be used most productively, lasting price stability increases the efficiency of the economy and, therefore, the welfare of households.

… reduce inflation risk premia in interest rates …

Second, if creditors can be sure that prices will remain stable in the future, they will not demand an extra return (a so-called "inflation risk premium") to compensate them for the inflation risks associated with holding nominal assets over the longer term (see Box 3.2 for details). By reducing such risk premia, thereby bringing about lower nominal interest rates, price stability contributes to the efficiency with which the capital markets allocate resources and therefore increases the incentives to invest. This again fosters job creation and, more generally, economic welfare.

… avoid unnecessary hedging activities …

Third, the credible maintenance of price stability also makes it less likely that individuals and firms will divert resources from productive uses in order to protect themselves (i. e. to "hedge") against inflation or deflation, for example by indexing nominal contracts to price developments. As full indexation is not possible or is too costly, in a high-inflation environment there is an incentive to stockpile real goods since in such circumstances they retain their value better than money or certain financial assets. However, an excessive stockpiling of goods is clearly not an efficient investment decision and hinders economic and real income growth.

Lasting price stability increases the efficiency of the economy and, therefore, the welfare of households.

… reduce distortionary effects of tax systems and social security systems …

Fourth, tax and welfare systems can create incentives which distort economic behaviour. In many cases, these distortions are exacerbated by inflation or deflation, as fiscal systems do not normally allow for the indexation of tax rates and social security contributions to the inflation rate. For instance, salary increases that are meant to compensate workers for inflationary developments could result in employees being subject to a higher tax rate, a phenomenon that is known as *"cold progression"*. Price stability reduces these distortionary effects associated with the impact of inflationary or deflationary developments on taxation and social systems.

Box 3.3 Hyperinflation

A situation in which the rate of inflation is very high and/or rises constantly and eventually becomes out of control is called "hyperinflation". Socially, hyperinflation is a very destructive phenomenon which has far-reaching consequences for individuals and society as a whole. Although there is no generally accepted definition of hyperinflation, most economists would agree that a situation where the *monthly* inflation rate exceeds 50 % can be described as hyperinflation.

Hyperinflation and periods of very high inflation occurred several times during the 20th century. Below are some examples of countries that experienced such high annual rates of inflation and the respective figures for the years indicated:

1922	Germany	5,000 %
1985	Bolivia	more than 10,000 %
1989	Argentina	3,100 %
1990	Peru	7,500 %
1993	Brazil	2,100 %
1993	Ukraine	5,000 %

Let us briefly illustrate the consequences of such a phenomenon. An inflation rate of 50 % per month implies an increase of more than 100-fold in the price level over a year and an increase of more than two million-fold over three years. There is no doubt that such rates of inflation place a heavy burden on society.

In fact, in Germany, the hyperinflation that followed World War I and peaked in 1923 had devastating economic, social and – as is widely agreed – political consequences.

As many people lost their savings, this led to a substantial loss in wealth for broad segments of the population. The realisation that price levels were constantly rising sparked a vicious circle. People naturally asked for higher wages, anticipating higher price levels in the future. These expectations became a reality, since higher wages translated into higher costs of production, which again meant higher prices. In the same vein, people started to pass on their money – which lost its value – by spending faster and faster.

The Government reacted to the decline in the value of money by adding more and more zeros to the paper currency, but over time it became impossible to keep up with the exploding price level. Eventually these hyperinflation costs became intolerable. Over time money completely lost its role as a store of value, unit of account and medium of exchange. Barter became more common and unofficial monies, such as cigarettes, which did not lose their value due to inflation, started to replace official paper money.

… increase the benefits of holding cash …

Fifth, inflation can be interpreted as a hidden tax on holding cash. In other words, people who hold cash (or deposits which are not remunerated at market rates) experience a decline in their *real* money balances and thus in their real financial wealth when the price level rises, just as if part of their money had been taxed away. So, the higher the expected rate of inflation (and therefore the higher nominal interest rates – see Box 3.2), the lower the demand by households for cash holdings (Box 3.4 shows why higher nominal interest rates imply a reduction in the demand for (non-remunerated) money). This happens even if inflation is not uncertain, i.e. if it is fully expected. Consequently, if people hold a lower amount of cash, they must make more frequent visits to the bank to withdraw money. These inconveniences and costs caused by reduced cash holdings are often metaphorically described as the "shoe-leather costs" of inflation, because walking to the bank causes one's shoes to wear out more quickly. More generally, reduced cash holdings can be said to generate higher transaction costs.

Box 3.4 Demand for cash

Due to its liquidity, money provides a service to its holder in the form of making transactions easier. Otherwise, people would not obviously have an incentive to hold money which is not remunerated. By holding cash, people are subject to so-called "opportunity costs", as alternative assets pay a positive rate of interest which they would miss out on. Therefore, a higher level of expected inflation, and therefore a higher nominal interest rate (see Box 3.2), tend to have a negative impact on the demand for money.

Consider a situation whereby the short-term market interest rate paid on bank deposits or a government bond is just 2%. In such a case, holding EUR 1000 in banknotes implies that EUR 20 per year is lost. The interest rate on alternative investment opportunities is the opportunity cost of holding banknotes.

Now let us assume that because of higher inflation nominal interest rates increase and you receive 10% interest on your bank account instead of 2%. If you still held EUR 1000 in cash your opportunity costs would be EUR 100 per year or around EUR 2 per week. In this case you may decide to reduce your money holding by, say, EUR 500 and therefore increase your interest income by around EUR 1 per week or EUR 50 per year. In other words, the higher the interest rate, the lower the demand for banknotes. Economists say the demand for money is "interest elastic".

… prevent the arbitrary distribution of wealth and income …

Sixth, maintaining price stability prevents the considerable economic, social and political problems related to the arbitrary redistribution of wealth and income witnessed during times of inflation and deflation from arising. This holds true in particular if changes in

the price level are difficult to anticipate, and for groups in society who have problems protecting their nominal claims against inflation. For instance, if there is an unexpected increase in inflation, everyone with nominal claims, for example in the form of longer-term wage contracts, bank deposits or government bonds, experiences losses in the real value of these claims. Wealth is then transferred in an arbitrary manner from lenders (or savers) to borrowers because the money in which a loan is ultimately repaid buys fewer goods than was expected when the loan was made.

Should there be unexpected deflation, people who hold nominal claims may stand to gain as the real value of their claims (e.g. wages, deposits) increases. However, in times of deflation, borrowers or debtors are often unable to pay back their debt and may even go bankrupt. This could damage society as a whole, and in particular those people who hold claims on, and those who work for, firms that have gone bankrupt.

Typically, the poorest groups of society often suffer the most from inflation or deflation, as they have only limited possibilities to hedge against it. Stable prices thus help to maintain social cohesion and stability. As demonstrated at certain points throughout the 20th century, high rates of inflation often create social and political instability as those groups who lose out because of inflation feel cheated if (unexpected) inflation "taxes" away a large part of their savings.

… contribute to financial stability

Seventh, sudden revaluations of assets due to unexpected changes in inflation can undermine the soundness of a bank's balance sheet. For instance, let us assume that a bank provides long-term fixed interest loans which are financed by short-term time deposits. If there is an unexpected shift to high inflation, this will imply a fall in the real value of assets. Following this, the bank may face solvency problems that could cause adverse "chain effects". If monetary policy maintains price stability, inflationary or deflationary shocks to the real value of nominal assets are avoided and financial stability is therefore also enhanced.

By maintaining price stability, central banks contribute to broader economic goals

All of these arguments suggest that a central bank that maintains price stability contributes substantially to the achievement of broader economic goals, such as higher standards of living, high and more stable levels of economic activity and employment. This conclusion is supported by economic evidence which, for a wide variety of countries, methodologies and periods, demonstrates that in the long run, economies with lower inflation appear on average to grow more rapidly in real terms.

In the long run, economies with lower inflation appear, on average, to grow more rapidly in real terms.

Chapter 4
Factors determining price developments

This chapter provides detailed information to help answer questions such as what determines the general price level or what the factors are that drive inflation, how the central bank, or more precisely monetary policy, is able to ensure price stability, what the role of fiscal policy is, and whether monetary policy should focus directly on enhancing real growth or reducing unemployment, or in other words, what monetary policy can and cannot achieve.

Section 4.1
provides a brief overview of what monetary policy can and cannot do.

Section 4.2
deals with the question of how monetary policy can influence interest rates.

Section 4.3
illustrates the effects of interest rate changes on expenditure decisions taken by households and firms.

Section 4.4
reviews the factors driving price developments over shorter-term horizons.

Section 4.5
looks at the factors driving price developments over medium to longer-term horizons, and explains that over such horizons monetary policy has the appropriate instruments to influence prices. It is therefore responsible for trends in inflation.

In the previous sections we have looked at issues associated with measuring inflation and the advantages of price stability. However, we have not touched directly upon the causes that determine general price developments. In the following sections we will focus on the causes of inflation – the latter being defined as a general, or broadly-based, increase in the prices of goods and services which is equivalent to a loss in the purchasing power of money. Before going into details, we will provide a short overview of the role and effects of monetary policy. This will help to put other factors into perspective.

4.1 What monetary policy can and cannot do – an overview

How can monetary policy influence the price level? This question touches upon what economists generally describe as the so-called "transmission process", i.e. the process through which actions of the central bank are transmitted through the economy and, ultimately, to prices. While this process is in essence extremely complex, one that changes over time and is different in various economies, so much so that, even today, not all the details behind it are fully known, its basic features are well understood. The way in which monetary policy exerts its influence on the economy can be explained as follows: the central bank is the sole issuer of banknotes and bank reserves, i.e. it is the monopolistic supplier of the so-called "monetary base". By virtue of this monopoly, the central bank is able to influence money market conditions and steer short-term interest rates.

A monetary policy which credibly maintains price stability has an important positive impact on welfare.

In the short run, the central bank can influence real economic developments

In the short run, a change in money market (i.e. short-term) interest rates induced by the central bank sets a number of mechanisms in motion, mainly because this change has an impact on the spending and saving decisions taken by households and firms. For example, higher interest rates will, all things being equal, make it less attractive for households and firms to take out loans in order to finance their consumption or investment. They also make it more attractive for households to save their current income rather than spend it. Finally, changes in official interest rates may also affect the supply of credit. These developments, in turn, and with some delay, influence developments in real economic variables such as output.

In the long run, changes in the money supply will affect the general price level …

The dynamic processes outlined above involve a number of different mechanisms and actions taken by various economic agents at different stages of the process. Furthermore, the size and strength of the various effects can vary according to the state of the economy. As a result, monetary policy usually takes a considerable amount of time to affect price developments. However, in the economics profession, it is widely accepted that, in the long run, i.e. after all adjustments in the economy have worked through, a change in the quantity of money supplied by the central bank (all things being equal) will only be reflected in a change in the general level of prices and will not cause permanent changes in real variables such as real output or unemployment. A change in the quantity of money

in circulation brought about by the central bank is ultimately equivalent to a change in the unit of account (and thereby in the general price level), which leaves all other variables stable, in much the same way as changing the standard unit used to measure distance (e.g. switching from kilometres to miles) would not alter the actual distance between two locations.

… but not the level of real income or employment

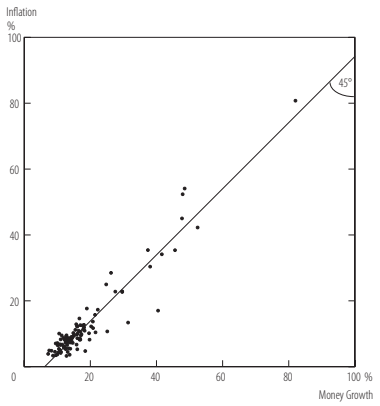
This general principle, referred to as the "long-run neutrality" of money, underlies all standard macroeconomic thinking and theoretical frameworks. As mentioned above, a monetary policy which credibly maintains price stability has a significant positive impact on welfare and real activity. Beyond this positive impact of price stability, real income or the level of employment in the economy are, in the long run, essentially determined by real (supply-side) factors, and cannot be enhanced by expansionary monetary policy.[8]

These main determinants of long-run employment and real income are technology, population growth and all aspects of the institutional framework of the economy (notably property rights, tax policy, welfare policies and other regulations determining the flexibility of markets and incentives to supply labour and capital and to invest in human resources).

Inflation is ultimately a monetary phenomenon

Inflation is ultimately a monetary phenomenon. As confirmed by a number of empirical studies, prolonged periods of high inflation are typically associated with high monetary growth (see Chart below). While other factors (such as variations in aggregate demand, technological changes or commodity price shocks) can influence price developments over shorter horizons, over time their effects can be offset by some degree of adjustment of monetary policy. In this sense, the longer-term trends of prices or inflation can be controlled by central banks.

Chart: Money and inflation



Average annual rates of growth in M2 and in consumer prices during 1960-90 in 110 countries.

Source: McCandless and Weber (1995).

[8] Supply-side factors are factors driving the supply of goods and services in an economy, in particular the amount and quality of capital and labour, as well as the technological progress and the design of structural policies.

In this short overview a number of points have been addressed which may require further explanation. As inflation is ultimately a monetary phenomenon, it seems necessary to explain in greater detail how monetary policy affects the economy and, ultimately, price developments. This is best addressed in three steps.

First, in Section 4.2, we discuss why and how monetary policy can influence interest rates. Second, in Section 4.3 we consider how changes in interest rates can affect expenditure decisions taken by consumers and firms. Finally, we analyse how these changes in aggregate demand affect price developments. In this context we also discuss other, i.e. non-monetary or real, factors which can affect price developments over the shorter term. It may be useful to understand the overall or aggregate supply and demand for goods in an economy (see Box 4.2) and to distinguish between short and long-run effects (Sections 4.4 and 4.5).

4.2 Money and interest rates – how can monetary policy influence interest rates?

A central bank can determine the short-term nominal interest rates which banks have to pay when they want to get credit from the central bank. And banks need to go to the central bank for credit as they need banknotes for their clients and need to fulfil minimum reserve requirements in the form of deposits with the central bank.

As central banks are the only institutions which can issue banknotes (and bank reserves), i.e. they are the monopolistic suppliers of base money, they can determine the policy rates, e.g. the short-term nominal interest rates on loans given to the banks. The expectations regarding the future development of policy rates in turn influence a wide range of longer-term bank and market interest rates.

Box 4.1 Why can central banks influence (ex ante) real interest rates? The role of "sticky" prices

As explained in more detail in Box 3.2, the ex ante real interest rate is the real return which a certain financial asset is expected to deliver. It is defined as the nominal interest rate minus expected inflation over the maturity for which the interest rate is fixed. The impact of monetary policy on short-term *real* interest rates is related to two issues: monetary policy controls the short-term nominal interest rate, and prices are sticky in the short run.

What is the meaning of "sticky prices"? Empirical evidence tells us that most prices are fixed for some time; very often firms do not instantly adjust the prices they charge in response to changes in supply or demand. In reality, some prices are adjusted very often (e.g. petrol prices), while other prices are adjusted only every month or once a year. There can be various reasons for this. First, prices are sometimes set by long-term contracts between firms and customers to reduce the uncertainties and costs associated with frequent negotiations. Second, firms may

hold prices steady in order not to annoy their regular customers with frequent price changes. Third, some prices are sticky because of the way markets are structured; once a firm has printed and distributed a catalogue or price list, it is costly to alter prices. Finally, the calculation of new prices is costly as well.

In the long run, however, prices adjust to new supply and demand conditions. Put another way, prices are fully flexible in the long run.[9]

Now assume that the central bank increases the supply of money. For example, it prints new money and buys government bonds. People are only prepared to hold a higher amount of money and reduce their holdings of bonds if the return on the bonds, i.e. the interest rate, falls. Thus, if the central bank increases the supply of money, the nominal interest rate must fall in order to induce people to hold a higher amount of money. And as prices are sticky in the short run, this implies that short-term inflation expectations remain largely unchanged. As a consequence, a change in short-term nominal interest rates translates into a change in the ex ante expected real interest rate (see also Box 3.2). Therefore, monetary policy can influence expected or ex ante real interest rates on short-term instruments.

4.3 How do changes in interest rates affect the expenditure decisions taken by consumers and firms?

From the perspective of an individual household, a higher real interest rate makes it more attractive to save, since the return on saving in terms of future consumption is higher. Therefore, higher real interest rates typically lead to a fall in current consumption and an increase in savings. From a firm's standpoint, a higher real interest rate will, provided all other variables remain the same, deter investment, because fewer of the available investment projects will offer a return sufficient to cover the higher cost of capital.

To sum up, an interest rate rise will make current consumption less desirable for households and discourage current investment by firms. The effects on individual households and firms show that an increase in real interest rates brought about by monetary policy will lead to a reduction in current expenditure in the economy as a whole (if the other variables remain constant). Economists say that such a policy change causes a drop in aggregate demand and is thus often referred to as a "tightening" of monetary policy.

It is important to understand that there are time lags in this process. It might easily take months for firms to put a new investment plan in place; investments involving the construction of new plants or the ordering of special equipment can even take years. Housing investment also takes some time to respond to changes in interest rates. Also,

[9] With the exception of administered prices, which can only be expected to change very rarely.

many consumers will not immediately change their consumption plans in response to changes in interest rates.

Indeed, it is generally agreed that the overall transmission process of monetary policy takes time. Monetary policy cannot, therefore, control the overall demand for goods and services in the short run. Expressed in another way, there is a significant time lag between a change in monetary policy and its effect on the economy.

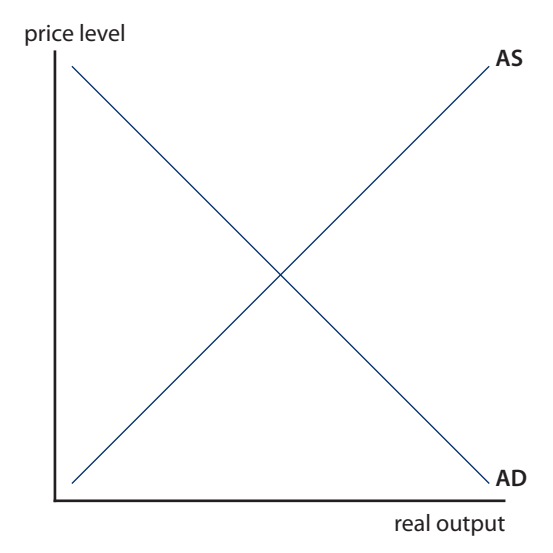
Box 4.2 How do changes in aggregate demand affect economic activity and price developments?

An easy way of illustrating how changes in aggregate demand affect price developments is to use a simple model focusing on aggregate supply and demand in the whole economy.

For the purposes of this exercise, we will keep the analysis fairly straightforward. At the same time, we will illustrate our arguments with charts. The model basically attempts to describe the relationship between the real quantity of goods and services supplied and demanded in an economy and the aggregate price level.

Aggregate supply and demand – the short-run equilibrium
The chart below illustrates aggregate supply (AS) and aggregate demand (AD), with the price level on the vertical axis and real output on the horizontal axis.

Chart 1: Aggregate demand and short-run aggregate supply



Aggregate demand and the price level
To understand the slope of aggregate demand, we have to analyse what happens to real expenditure decisions when the price level changes, assuming all other economic variables remain the same. It can be shown that the aggregate demand curve has a negative slope. One way to think about this is in terms of supply and

demand for real money balances. If prices are higher but the nominal supply of money is fixed, people will experience lower real money balances and this implies that they can only finance a lower amount of transactions. Conversely, if the price level is lower, real money balances are higher, which in turn allows for a higher volume of transactions, meaning that there will be a greater demand for real output.

Aggregate supply and the price level in the short run
As indicated by its name, aggregate supply deals with the supply of goods and services produced by firms. We first need to understand how the overall level of prices is related to the overall level of output in the short run, i.e. assuming that all other factors (production technology, nominal wages, etc.) remain the same. How does a change in the price level affect the real production or the real output of firms? In essence, if *nominal* wages are given, a higher price level will lead to a decline in real wages. With lower real wages it becomes more profitable for firms to hire more workers and to increase production. In other words, real wages are a key determinant of employment. With higher prices and all other factors, such as production technology and nominal wages, remaining unchanged, firms will thus raise employment and increase production. The short-run aggregate supply curve, therefore, is upward sloping.

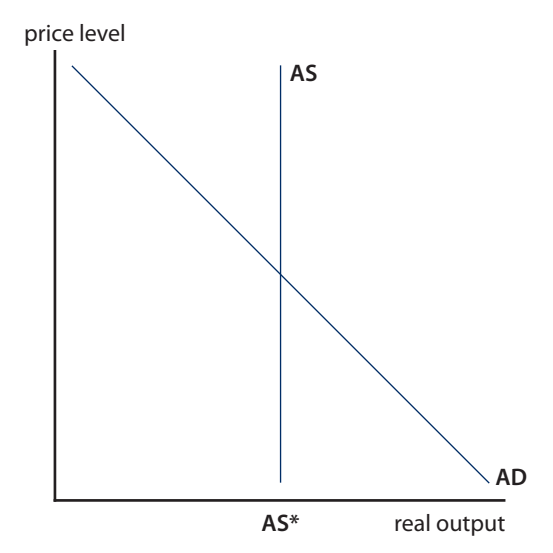
The intersection of the two curves determines what economists call the "equilibrium". The concept of equilibrium is crucial in economics. This is because, in such a situation, the wishes of both market sides coincide and, therefore, there is no tendency for further change. In this case, the equilibrium determines the price level and the level of real output prevailing in an economy at the same time.

What happens if the economy faces a state of disequilibrium? Suppose the economy faces a price level which is higher than the equilibrium level. In such a situation aggregate supply is too high and aggregate demand too low compared with equilibrium. What will happen now? If the price level is higher than in equilibrium, buyers want to buy less than producers want to sell. Therefore, some suppliers will lower their prices, which in turn leads to an increase in aggregate demand. At the same time, the lower prices will raise real wages (as nominal wages are fixed in the short run) and – as real wages represent a cost factor for firms – they will cut back production and tend to lower aggregate supply. This process will go on until an equilibrium situation is reached, i.e. a situation where the wishes and plans of buyers and sellers coincide at a certain price and output level.

Aggregate supply in the long run
Why do we speak above of the *short-run* supply curve? The positive impact of a higher price level on real output will only last as long as nominal and, therefore also real wages remain unchanged. In reality, nominal wages are normally fixed for about one year, and in some cases for up to two years. If workers or unions do not accept the lower real wages caused by higher inflation they will use the next wage negotiations to demand compensation in the form of higher wages. If real wages return to the level they were at before the increase in the price level (and if production technology is unchanged), firms will no longer find it profitable to maintain production and employment at the higher level and will thus make cuts. In other words, if real wages cannot be reduced by higher inflation in the long run, employment and production will also be independent of price developments in the long run. This means that the long-term aggregate supply curve will be vertical.

The long-run equilibrium

Chart 2: Aggregate demand and long-run aggregate supply



The intersection of the AS curve with the horizontal axis (see AS* in Chart 2) is what economists call the potential level of output. The potential level of output represents the value of final goods and service s produced when the economy's resources are fully employed, given the current state of technology and structural features of the economy (such as labour market regulations, welfare and tax systems, etc.).

So far we have discussed movements along the curves, with all other factors but prices and real output remaining unchanged. We now need to understand what happens if these other factors change. In essence, such changes *shift* the curves to the right or the left.

Factors affecting aggregate supply and aggregate demand
According to the simple model we have been using, the combination of prices and real income that an economy is experiencing is obviously determined by the interplay of aggregate supply and demand. This raises questions regarding the factors leading to shifts in the two curves.

The factors leading to an increase in aggregate demand (i.e. a shift in AD outwards or to the right) include an increase in government expenditure, a reduction in taxes a depreciation of the home currency, and an increase in real wealth (e.g. higher stock and land prices), which in turn lead to higher private consumption and investment expenditure.

Private consumption and investment may also be driven by expectations. For example, if firms expect higher future profits, they will tend to increase investment expenditures. And if households expect higher real income as a result of higher expected labour productivity, consumer expenditure will increase. For this reason, an improvement in consumer and investor confidence is normally related to an increase in aggregate demand.

With regard to the impact of monetary policy, we can observe that an increase in money supply and the related lower real interest rates will cause aggregate demand

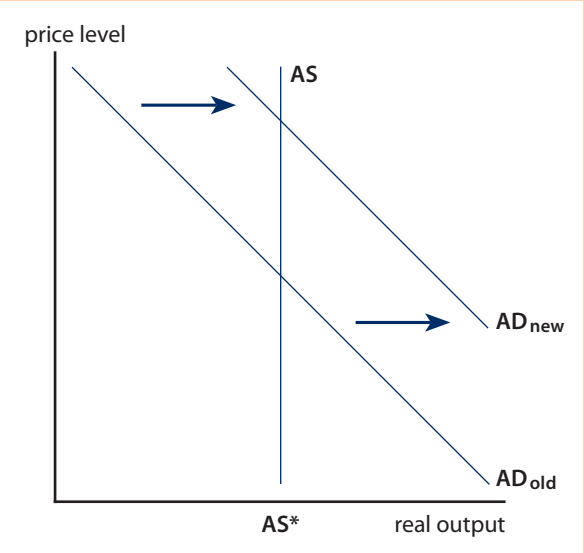
to increase, thus shifting the demand curve to the right.[10] If these variables change in the opposite direction, aggregate demand will fall (i.e. AD will shift to the left).

Regarding aggregate supply, we can see that increases in the prices of production factors, such as wages, or increases in oil prices will lead to a shift to the left in aggregate supply. On the other hand, technological progress or increases in productivity will shift aggregate supply to the right, as this allows for more production at the same cost with a given quantity of labour input.

This analysis shows that changes in the general price level can be brought about by shifts in either the supply curve or the demand curve or in both. For instance, if all other factors remain stable, a decline in aggregate supply (i.e. a shift of AS to the left) will be accompanied by a short-term fall in real output and an increase in prices, whereas an increase in demand (i.e. a shift of AD to the right) will manifest itself in higher short-term real activity and higher prices.

The long-run model illustrates that the behaviour of aggregate demand is crucial in determining the general price level an economy experiences in the long run. If the aggregate supply curve is vertical, changes in aggregate demand will affect prices but not output. If, for instance, money supply were to increase, the aggregate demand curve would shift to the right and the economy would thus, in the long run, shift to a new equilibrium where real production has remained the same but prices have risen.

Chart 3: Shifts in aggregate demand and long-run aggregate supply



Inflation was defined as a general, or broadly-based, increase in the prices of goods and services. Therefore, a process of inflation can only be brought about by a continuing increase in aggregate demand over time. This, in turn, is only possible if monetary policy accommodates such a development by keeping interest rates low and money growth high.

[10] Economists often express a decline in money demand in terms of an increase in the velocity of money. The latter variable can be defined as the speed with which money is transferred between different money holders and thus determines how much money is required for a particular level of transaction. In fact these two phenomena must be regarded as two different sides of the same coin. If people want to hold less money, the available stock of money will, given a constant money supply, have to change hands more often and so circulate more. This is equivalent to a higher velocity of money. We will return to this issue in later sections.

4.4 Factors driving price developments over shorter-term horizons

In the following, we will investigate some factors driving short-term price developments. As explained in more detail in Box 4.2, inflation (i.e. a sustained increase in the price level) could be caused in either one or two ways. Prices in general will rise if, on average, either aggregate demand increases or supply decreases. To put it differently, inflationary pressures can result if there are changes (economists often speak of "shocks" if there are unexpected changes in economic developments) which lead consumers to increase their expenditure or firms to reduce their production. The first instance, where demand increases, resulting in inflation, is often described as "demand-pull inflation" in the economic literature. The second instance, where costs increase and supply therefore decreases, thus also resulting in inflation, is often labelled as "cost-push inflation". The opposite happens, i.e. deflationary pressures emerge, if aggregate demand falls or aggregate supply increases. In general, monetary policy often has to respond to such developments in order to ensure price stability. In cases of inflationary pressure, the central bank would normally increase (real) interest rates to prevent that pressure from translating into more persistent deviations from price stability.

Price increases that arise because of an increase in aggregate demand may result from any individual factor that increases aggregate demand, but the most significant of these factors, besides monetary policy (increases in the money supply), are increases in government purchases, depreciation of the exchange rate and increased demand pressures for domestic goods from the rest of the world (exports). Changes in aggregate demand can also be caused by increased confidence. It is likely, for example, that firms will invest more if higher profits can be expected in the future. Changes in aggregate demand will normally increase the price level and, temporarily, aggregate production (see Box 4.2).

What precisely are the factors leading to a reduction in aggregate supply and thus to higher prices in the short run? The main sources of falling aggregate supply are decreases in productivity, increases in production costs (for instance, increases in real wages and in the prices of raw materials, notably oil), and higher corporate taxes imposed by governments. If all other factors remain the same, the higher the cost of production, the smaller the amount produced at the same price.

There are various reasons why the price of inputs rises – for instance if there is a rise in the worldwide demand for raw materials.

For a given price level, if wages or the costs of raw materials, such as oil, rise, firms are forced to reduce the number of people they employ and to cut production. As this is the result of supply-side effects, the resulting inflation is often referred to as "cost-push inflation".

Various circumstances could cause the price of inputs to rise, for instance, if the supply of raw materials such as oil falls short of expectations, or if the worldwide demand for raw materials rises. Increases in real wages (which are not matched by increased productivity) will also lead to a decline in aggregate supply and lower employment. Such wage increases may result from a decline in the labour supply, which in turn may have been caused by a government regulation which has the effect of reducing the incentives to work (e.g. higher taxes on labour income). An increase in the power of trade unions can also result in higher real wages.

If the factors described above work in the other direction, we will see an *increase in aggregate supply*. For example, an increase in productivity (e.g. based on new technologies) would, all things being equal, lead to lower prices and higher employment in the short run as it becomes more profitable to hire labour at given wages. However,

if real wages were to increase in line with productivity, employment would remain unchanged.

The role of expected inflation

When firms and employees negotiate wages and when firms set their prices, they often consider what the level of inflation may be in the period ahead, for example, over the following year. Expected inflation matters for current wage settlements as future price rises will reduce the quantity of goods and services that a given nominal wage can buy. So, if inflation is expected to be high, employees might demand a higher nominal wage increase during wage negotiations. Firms' costs increase if wage settlements are based on these expectations and these costs could be passed on to customers in the form of higher prices. A similar case can be made for price-setting on the part of firms. As many individual prices remain fixed for a particular period (for one month or one year, for example; see Box 4.1), firms which had planned to publish a new price list may increase their individual prices with immediate effect if they anticipate increases in the general price level or in wages in the future. So if people expect inflation in the future, their behaviour can already cause a rise in inflation today. This is another reason why it is very important for monetary policy to be credible in its objective of maintaining price stability – in order to stabilise longer-term inflation expectations at low levels, in line with price stability.

Taken together, a variety of factors and shocks can influence the price level in the short run. Among them are developments in aggregate demand and its various components, including developments in fiscal policy. Further changes could relate to changes in input prices, in costs and productivity, in developments in the exchange rate, and in the global economy. All these factors could affect real activity and prices over shorter-term horizons. But what about longer-term horizons?

This brings us to another important distinction in economics. Economists generally draw a distinction between the short run and the long run (see also Box 4.2).

4.5 Factors driving price developments over longer-term horizons

What is the relative importance of these factors on inflation over longer-term horizons? Or in other words: are they all of equal relevance as regards inflationary trends? The answer is clearly "no". We shall see that monetary policy plays a crucial role here.

As already mentioned in previous paragraphs, there is a time lag of about one to three years between changes in monetary policy and the impact on prices. This implies that monetary policy cannot prevent unexpected real economic developments or shocks from having some short-run impact on inflation. However, there is widespread agreement among economists that monetary policy can control price developments over the longer term and therefore also the "trend" of inflation, i.e. the change in the price level when the economy has fully incorporated short-term disturbances.

In the long run, prices are flexible and can respond fully to changes in supply and demand. However, in the short run many individual prices are sticky and will remain at their current levels for some time (see Box 4.1).

Increases in the external demand for export products could have an impact on current consumption and investment.

How does this distinction influence our results? Without going into too much detail, it can be argued that output does not depend on the price level in the long run. It is determined by the given stock of capital; by the labour force available and the quality of that labour force; by structural policies which influence incentives to work and to invest; and by any technological developments in the field of production. In other words, the long-term level of output depends on a number of real or supply-side factors. These factors determine the exact position of the aggregate supply curve.

The other curve that determines the state of equilibrium of the economy is the aggregate demand curve. As we have seen, a number of factors can lead to increases in aggregate demand. Among them are increases in government expenditures, in external demand for exports, and in improved expectations of future productivity developments which might have an impact on current consumption and investment. It is obvious, however, that although many of these factors can increase even for a protracted period, a sustained increase in the general price level can, in the long run, only be driven by a sustained and ongoing expansionary monetary policy. This point is often made in terms of the famous statement according to which "inflation is always and everywhere a monetary phenomenon". Indeed, a number of empirical studies have provided evidence in favour of this hypothesis. The ultimate reason for an inflationary process in the longer run is, therefore, a sustained increase in money supply which is equivalent to a sustained expansionary monetary policy. In a longer-term perspective, monetary policy actions thus determine whether inflation is allowed to rise or is kept low. In other words, a central bank that controls the money supply and the short-term interest rate has ultimate control over the rate of inflation over longer-term horizons. If the central bank keeps short-term interest rates too low and increases the money supply by too much, the price level will ultimately also increase. This basic result is illustrated by the fundamental economic concept which addresses in more detail the relationship between money and prices, namely the quantity theory of money (see Box 4.3 below).

Box 4.3 The quantity theory of money

According to an identity which is widely known as the quantity equation, the change in the money stock (ΔM) in an economy equals the change in nominal transactions (approximated by the change in real activity (ΔYR) plus the change in the price level (ΔP)), minus the change in velocity (ΔV). The latter variable can be defined as the speed with which money is transferred between different money holders and thus determines how much money is required to serve a particular level of nominal transactions.[11] In short:

$$\Delta M = \Delta YR + \Delta P - \Delta V$$

This relationship is a so-called identity, i.e. a relationship that can obviously not be falsified. It therefore does not provide any statements about causality. A sense of causality can only be inferred if further assumptions regarding the determinants of the variables are taken into account. In particular, the following two assumptions allow the quantity *equation* to be transformed into the quantity *theory*. First, output can, in the long run, be regarded as being determined by real-side factors like the productive opportunities of the community and its tastes and preferences. Second,

[11] This reflects the fact that the left-hand side of the equation sums up the amount of money used, whereas the right-hand side reflects the value of the transaction.

in the long run, velocity is regarded as being determined by payment practices, financial and economic arrangements for effecting transactions and costs of and returns from holding money instead of other assets. It then follows that the quantity of money supply – which is determined by the decisions taken by the monetary authorities – is, in the long run, linked to the price level. Put another way, over the longer-term horizons, the price level is determined directly by changes in the quantity of money and it moves proportionally to the latter.

One implication of this is that the institution which determines the supply of money, namely the central bank, is ultimately responsible for longer-term trends in inflation.

Chapter 5
The ECB's monetary policy

This chapter provides detailed information to help answer questions such as how EMU came about, which body is responsible for the single monetary policy in the euro area, what the primary objective of the Eurosystem is, and how it tries to achieve its mandate.

Section 5.1
gives a short historical overview.

Section 5.2
elaborates on the institutional framework.

Section 5.3
focuses on the ECB's monetary policy strategy.

Section 5.4
sheds some light on the Eurosystem's operational framework.

5.1 A short historical overview

History – the three stages of Economic and Monetary Union

The idea that Europe should have a single, unified and stable monetary system has its roots far back in history (see Box 5.1). After one unsuccessful attempt in the early 1970s, a decisive impetus to the integration process came about in June 1988, when the European Council reconfirmed the objective to gradually achieve economic and monetary union. A committee chaired by Jacques Delors, the then President of the European Commission, was set up to study and propose concrete stages leading to this union. The committee's report (the so-called "Delors Report"), presented in April 1989, proposed the introduction of an Economic and Monetary Union (EMU) in three discrete but evolutionary steps.

Box 5.1 The road to the single currency, the euro

1962	The European Commission makes its first proposal (*Marjolin-Memorandum*) for economic and monetary union.
May 1964	A Committee of Governors of central banks of the Member States of the European Economic Community (EEC) is formed to institutionalise cooperation among EEC central banks.
1970	The Werner Report sets out a plan to realise an economic and monetary union in the Community by 1980.
April 1972	A system (the "*snake*") for the progressive narrowing of the margins of fluctuation between the currencies of the Member States of the European Economic Community is established.
April 1973	The European Monetary Cooperation Fund (EMCF) is set up to ensure the proper operation of the snake.
March 1979	The European Monetary System (EMS) is created.
February 1986	The Single European Act (SEA) is signed.
June 1988	The European Council mandates a committee of experts under the chairmanship of Jacques Delors (the "*Delors Committee*") to make proposals for the realisation of EMU.
May 1989	The "*Delors Report*" is submitted to the European Council.
June 1989	The European Council agrees on the realisation of EMU in three stages.
July 1990	Stage One of EMU begins.
December 1990	An Intergovernmental Conference to prepare for Stages Two and Three of EMU is launched.
February 1992	The Treaty on European Union (the "*Maastricht Treaty*") is signed.
October 1993	Frankfurt am Main is chosen as the seat of the European Monetary Institute (EMI) and of the ECB, and a President of the EMI is nominated.
November 1993	The Treaty on European Union enters into force.
December 1993	Alexandre Lamfalussy is appointed President of the EMI, to be established on 1 January 1994.
January 1994	Stage Two of EMU begins and the EMI is established.
December 1995	The Madrid European Council decides on the name of the single currency and sets out the scenario for its adoption and the cash changeover.

December 1996	The EMI presents specimen banknotes to the European Council.
June 1997	The European Council agrees on the "Stability and Growth Pact".
May 1998	Belgium, Germany, Ireland, Spain, France, Italy, Luxembourg, the Netherlands, Austria, Portugal and Finland are considered as fulfilling the necessary conditions for the adoption of the euro as their single currency; the Members of the Executive Board of the ECB are appointed.
June 1998	The ECB and the ESCB are established.
October 1998	The ECB announces the strategy and the operational framework for the single monetary policy it will conduct from January 1999.
January 1999	Stage Three of EMU begins; the euro becomes the single currency of the euro area; conversion rates are fixed irrevocably for the former national currencies of the participating Member States; a single monetary policy is conducted for the euro area.
January 2001	Greece becomes the 12th Member State to join the euro area.
January 2002	The euro cash changeover: euro banknotes and coins are introduced and become sole legal tender in the euro area by the end of February 2002.
May 2004	The NCBs of the ten new EU Member States join the ESCB.
January 2007	Bulgaria and Romania bring the total number of EU Member States to 27 and join the ESCB at the same time. Slovenia becomes the 13th Member State to join the euro area.
January 2008	Cyprus and Malta join the euro area, thereby increasing the number of Member States to 15.
January 2009	Slovakia joins the euro area and increases the number of Member States to 16.
January 2011	Estonia joins the euro area, increasing the number of Member States to 17.

Stage One of EMU

Following the Delors Report, the European Council, in June 1989, decided that the first stage of EMU should be launched on 1 July 1990. At the same time, the Committee of Governors of the central banks of the Member States of the European Economic Community, which had played an increasingly important role in monetary co-operation since it was established in May 1964, was given additional responsibilities.

In order for Stages Two and Three to take place, the Treaty establishing the European Community (the so-called "Treaty of Rome") had to be revised so that the required institutional structure could be established. For this purpose, an Intergovernmental Conference on EMU was held in 1991 in parallel with the Intergovernmental Conference on political union. The Committee of Governors submitted the draft Statute of the ESCB and of the ECB to the Intergovernmental Conference. The negotiations resulted in the Treaty on European Union, which was agreed in December 1991 and signed in Maastricht on 7 February 1992. However, owing to delays in the ratification process, it did not come into force until 1 November 1993.

Stage Two of EMU: the establishment of the EMI and the ECB

The establishment of the European Monetary Institute (EMI) on 1 January 1994 marked the start of the second stage of EMU. Henceforth, the Committee of Governors ceased to exist. The EMI's transitory existence also mirrored the state of monetary integration

within the Community: the EMI had no responsibility for the conduct of monetary policy in the European Union (this remained the responsibility of the national authorities) nor had it any competence for carrying out foreign exchange intervention.

The two main tasks of the EMI were first to strengthen central bank cooperation and monetary policy coordination; and second to make the preparations required for the establishment of the ESCB, for the conduct of the single monetary policy and for the creation of a single currency in the third stage.

In December 1995, the European Council meeting in Madrid agreed on the name of the European currency unit to be introduced at the start of Stage Three, the "euro", and confirmed that Stage Three of EMU would start on 1 January 1999. A chronological sequence of events was pre-announced for the changeover to the euro. This scenario was based mainly on detailed proposals drawn up by the EMI. At the same time, the EMI was given the task of carrying out preparatory work on the future monetary and exchange rate relationships between the euro area and other EU countries. In December 1996 the EMI presented a report to the European Council which formed the basis of a Resolution of the European Council on the principles and fundamental elements of the new exchange rate mechanism (ERM II), which was adopted in June 1997.

In December 1996 the EMI also presented to the European Council, and subsequently to the public, the selected design series for the euro banknotes to be put into circulation on 1 January 2002.

In December 1996 the selected design series for the euro banknotes was presented.

In order to both complement and clarify the Treaty's provisions on EMU, in June 1997 the European Council adopted the Stability and Growth Pact to ensure budgetary discipline in respect of EMU. The Pact was supplemented and the respective commitments enhanced by a Declaration of the Council in May 1998.

On 2 May 1998 the Council of the European Union – in its composition of Heads of State or Government – decided that 11 Member States (Belgium, Germany, Ireland, Spain, France, Italy, Luxembourg, the Netherlands, Austria, Portugal and Finland) had fulfilled the conditions necessary for the adoption of the single currency on 1 January 1999.

At the same time, the finance ministers of the Member States adopting the single currency agreed, together with the governors of the NCBs, the European Commission and the EMI, that the ERM central rates of the currencies of the participating Member States would be used to determine the irrevocable conversion rates for the euro.

On 25 May 1998 the governments of the 11 participating Member States officially appointed the President, the Vice-President and the four other members of the Executive Board of the ECB. Their appointment came into effect on 1 June 1998 and marked the establishment of the ECB.

With this, the EMI had completed its tasks. In accordance with Article 123 of the Treaty establishing the European Community, the EMI went into liquidation. All the preparatory work entrusted to the EMI was concluded in good time and the ECB spent the rest of 1998 carrying out final tests of systems and procedures.

Stage Three of EMU, the irrevocable fixing of exchange rates

On 1 January 1999 the third and final stage of EMU began with the irrevocable fixing of the exchange rates of the currencies of the 11 Member States which had initially participated in monetary union and with the conduct of a single monetary policy under the responsibility of the ECB.

The number of participating Member States increased to 12 on 1 January 2001, when Greece entered the third stage of EMU. This followed on from a decision taken on 19 June 2000 by the EU Council – meeting in the composition of the Heads of State or Government – in which it was acknowledged that Greece fulfilled the convergence criteria.

On 1 January 2007 Slovenia joined the euro area after a decision by the EU Council of 11 July 2006 that it had fulfilled the convergence criteria.

On 1 January 2008 Cyprus and Malta joined the euro area after a decision by the EU Council of 10 July 2007 that they fulfilled the convergence criteria.

On 1 January 2009 Slovakia joined the euro area and became the 16th Member State to join the euro area, after a decision by the EU Council of 8 July 2008 that Slovakia fulfilled the convergence criteria.

On 1 January 2011 Estonia joined the euro area and became the 17th Member State to join, after a decision by the EU Council of 13 July 2010 that Estonia fulfilled the convergence criteria.

5.2 The institutional framework

The European System of Central Banks

The ECB was established on 1 June 1998 and is one of the world's youngest central banks. However, it has inherited the credibility and expertise of all euro area NCBs, which together with the ECB implement the monetary policy for the euro area.

The legal basis for the ECB and the European System of Central Banks (ESCB), is the Treaty establishing the European Community. According to this Treaty, the ESCB is composed of the ECB and the NCBs of all EU Member States (27 since 1 January 2007). The Statute of the ESCB and of the ECB is attached to the Treaty as a protocol.

Mandate of the ESCB

The Treaty states that "the primary objective of the ESCB shall be to maintain price stability" and that "without prejudice to the objective of price stability, the ESCB shall support the general economic policies in the Community with a view to contributing to the achievement of the objectives of the Community as laid down in Article 2". Article 2 of the Treaty mentions as objectives of the Community, inter alia, "a high level of employment (…), sustainable and non-inflationary growth, a high degree of competitiveness and convergence of economic performance". The Treaty thus establishes a clear hierarchy of objectives and assigns overriding importance to price stability. By focusing the monetary policy of the ECB on this primary objective, the Treaty makes it clear that ensuring price stability is the most important contribution that monetary policy can make to achieving a favourable economic environment and a high level of employment.

The Eurosystem

The NCBs in the euro area and the ECB together form the Eurosystem. This term was chosen by the Governing Council to describe the arrangement by which the ESCB carries out its tasks within the euro area. As long as there are EU Member States which have not yet adopted the euro, this distinction between the Eurosystem and the ESCB will

need to be made. The NCBs of the Member States that have not adopted the euro are not involved in decision-making regarding the single monetary policy for the euro area and continue to have their own national currencies and conduct their own monetary policies. An EU country can adopt the euro at a later stage but only once it has fulfilled the convergence criteria (see Box below for a more detailed description).

Box 5.2 Convergence criteria

The conditions for the adoption of the euro are laid down in Article 121 of the Treaty and the Protocol annexed to the Treaty on the convergence criteria referred to in Article 121. To assess whether a Member State has achieved a high degree of sustainable convergence, four criteria are used: price stability, a sound fiscal position, exchange rate stability and converging interest rates.

The first indent of Article 121(1) of the Treaty requires "the achievement of a high degree of price stability" and states that "this will be apparent from a rate of inflation which is close to that, at most, of the three best performing Member States in terms of price stability". Article 1 of the Protocol states in addition that "the criterion on price stability (…) shall mean that a Member State has a price performance that is sustainable and an average rate of inflation, observed over a period of one year before the examination, that does not exceed by more than 1½ percentage points that of, at most, the three best performing Member States in terms of price stability. Inflation shall be measured by means of the consumer price index on a comparable basis, taking into account differences in national definitions".

The second indent of Article 121(1) of the Treaty requires "the sustainability of the government's financial position" and states that "this will be apparent from having achieved a budgetary position without a deficit that is excessive as determined in accordance with Article 104(6)". Article 2 of the Protocol states in addition that this criterion "(…) shall mean that at the time of the examination the Member State is not the subject of a Council Decision under Article 104(6) of this Treaty that an excessive deficit exists". Under Article 104(1) of the Treaty, Member States "shall avoid excessive government deficits". The Commission examines compliance with budgetary discipline, based in particular on the following criteria:
"(a) whether the ratio of the planned or actual government deficit to gross domestic product exceeds a reference value (defined in the Protocol on the excessive deficit procedure as 3 % of GDP), unless:

- either the ratio has declined substantially and continuously and reached a level that comes close to the reference value,
- or, alternatively, the excess over the reference value is only exceptional and temporary and the ratio comes close to the reference value;

(b) whether the ratio of government debt to gross domestic product exceeds a reference value (defined in the Protocol on the excessive deficit procedure as 60 % of GDP), unless the ratio is significantly diminishing and approaching the reference value at a satisfactory pace".

The third indent of Article 121(1) of the Treaty requires "the observance of the normal fluctuation margins provided for by the exchange rate mechanism of the European Monetary System, for at least two years, without devaluing against the currency of any other Member State". Article 3 of the Protocol states in addition that "the criterion on participation in the exchange rate mechanism of the European Monetary System (…) shall mean that a Member State has respected the normal fluctuation margins

provided for by the exchange rate mechanism of the European Monetary System without severe tensions for at least two years before the examination. In particular, the Member State shall not have devalued its currency's bilateral central rate against any other Member State's currency on its own initiative for the same period".

The fourth indent of Article 121(1) of the Treaty requires "the durability of convergence achieved by the Member State and of its participation in the exchange rate mechanism of the European Monetary System being reflected in the long-term interest rate levels". Article 4 of the Protocol states in addition that "the criterion on the convergence of interest rates (…) shall mean that, observed over a period of one year before the examination, a Member State has had an average nominal long-term interest rate that does not exceed by more than 2 percentage points that of, at most, the three best performing Member States in terms of price stability. Interest rates shall be measured on the basis of long-term government bonds or comparable securities, taking into account differences in national definitions".

In addition to these economic requirements, the convergence criteria also require there to be legal convergence to ensure that national legislation, including the statutes of NCBs, is compatible with both the Treaty and the Statute of the ESCB and of the ECB. The Treaty requires the ECB and the Commission to report to the Council of the European Union at least once every two years or at the request of a Member State with a derogation, on the progress made by Member States in terms of their fulfilment of the convergence criteria. On the basis of the convergence reports submitted separately by the ECB and the Commission, and on the basis of a proposal by the Commission, the Council, having consulted the European Parliament and having met in the composition of Heads of State or Government, may decide on the fulfilment of the criteria by a Member State and allow it to join the euro area. Since the beginning of Stage Three, the ECB has prepared several convergence reports.

… and its basic tasks …

The basic tasks of the Eurosystem are to:

- define and implement the monetary policy for the euro area;
- conduct foreign exchange operations and to hold and manage the official foreign reserves of the euro area countries;
- promote the smooth operation of payment systems.

Further tasks are to:

- authorise the issue of banknotes in the euro area;
- give opinions and advice on draft Community acts and draft national legislation;
- collect the necessary statistical information either from national authorities or directly from economic agents, e.g. financial institutions;
- contribute to the smooth conduct of policies pursued by the authorities in charge of prudential supervision of credit institutions and the stability of the financial system.

The Governing Council

The highest decision-making body of the ECB is the Governing Council. It consists of the six members of the Executive Board and the governors of the NCBs of the euro area.

Both the Governing Council and the Executive Board are chaired by the President of the ECB (see also Chart below).

The key task of the Governing Council is to formulate the monetary policy for the euro area. Specifically, it has the power to determine the interest rates at which credit institutions may obtain liquidity (money) from the Eurosystem. Thus the Governing Council indirectly influences interest rates throughout the euro area economy, including the rates that credit institutions charge their customers for loans and those that savers earn on their deposits. The Governing Council fulfils its responsibilities by adopting guidelines and taking decisions.

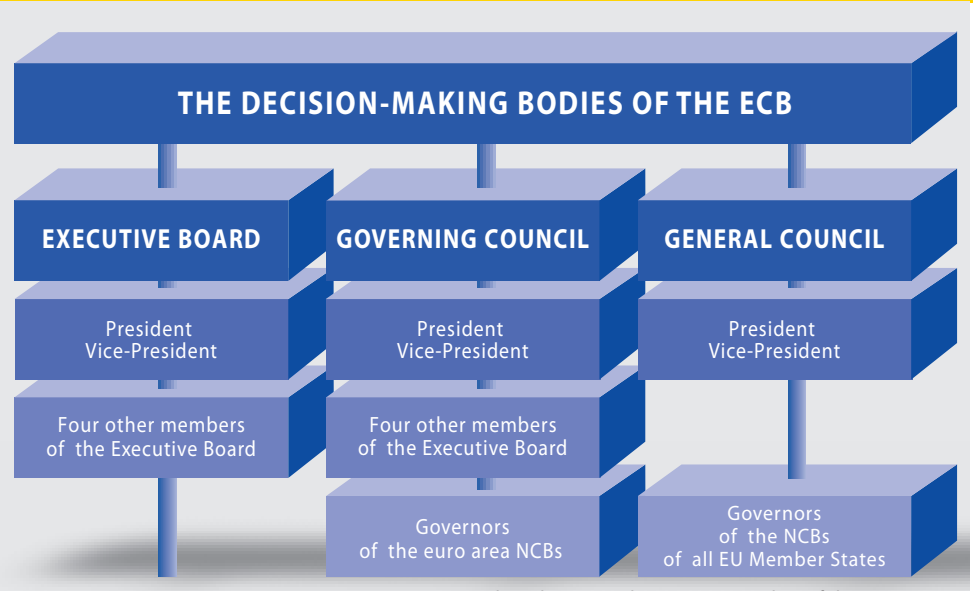
The Executive Board

The Executive Board of the ECB consists of the President, the Vice-President and four other members. All are appointed by common accord of the Heads of State or Government of the countries which form the euro area. The Executive Board is responsible for implementing the monetary policy as formulated by the Governing Council and gives the necessary instructions to the NCBs for this purpose. It also prepares the meetings of the Governing Council and manages the day-to-day business of the ECB.

The General Council

The third decision-making body of the ECB is the General Council. It comprises the President and the Vice-President of the ECB and the governors of all 27 NCBs of the EU Member States. The General Council has no responsibility for monetary policy decisions in the euro area. It contributes to the co-ordination of monetary policies of the Member States that have not yet adopted the euro and to the preparations for the possible enlargement of the euro area.

Chart: The decision-making bodies of the ECB



Source: European Central Bank (2004), The monetary policy of the ECB, p. 10.

Independence

There are good reasons to entrust the task of maintaining price stability to an independent central bank not subject to potential political pressures. In line with the provisions of the Treaty establishing the European Community, the Eurosystem enjoys full independence in performing its tasks: neither the ECB, nor the NCBs in the Eurosystem, nor any member of their decision-making bodies may seek or take instructions from any other body. The Community institutions and bodies and the governments of the Member States are bound to respect this principle and must not seek to influence the members of the decision-making bodies of the ECB or of the NCBs. Furthermore, the Eurosystem may not grant any loans to Community bodies or national government entities. This shields it further from political interference. The Eurosystem has all the instruments and competencies it needs to conduct an efficient monetary policy. The members of the ECB's decision-making bodies have long terms of office and can be dismissed only for serious misconduct or the inability to perform their duties. The ECB has its own budget, independent of that of the European Community. This keeps the administration of the ECB separate from the financial interests of the Community.

Capital of the ECB

The capital of the ECB does not come from the European Community but has been subscribed and paid up by the NCBs. The share of each Member State in the European Union's gross domestic product and population determines the amount of each NCB's subscription.

5.3 The ECB's monetary policy strategy

General principles

The mandate and task of monetary policy

As already mentioned, the Treaty establishing the European Community assigns to the Eurosystem the primary objective of maintaining price stability in the euro area. In particular it states that "the primary objective of the ESCB shall be to maintain price stability".

The challenge faced by the ECB can be stated as follows: the Governing Council of the ECB has to influence conditions in the money market, and thereby the level of short-term interest rates, to ensure that price stability is maintained over the medium term. Below some key principles of a successful monetary policy are explained.

Monetary policy should firmly anchor inflation expectations …

First, monetary policy is considerably more effective if it firmly anchors inflation expectations (see also Section 3.3). In this regard, central banks should specify their goals, elaborate them and stick to a consistent and systematic method for conducting monetary policy, as well as communicate clearly and openly. These are key elements for acquiring a high level of credibility, a necessary precondition for influencing the expectations of economic actors.

… must be forward-looking …

Second, owing to the lags in the transmission process (see Section 4.3), changes in monetary policy today will only affect the price level after a number of quarters or years. This means that central banks need to ascertain what policy stance is needed in order to maintain price stability in the future, once the transmission lags have unwound. In this sense, monetary policy must be forward-looking.

… focus on the medium term …

As the transmission lags make it impossible for monetary policy to offset unanticipated shocks to the price level (for example, those caused by changes in international commodity prices or indirect taxes) in the short run, some short-term volatility in inflation rates is inevitable (see also Section 4.4). In addition, owing to the complexity of the monetary policy transmission process, there is always a high degree of uncertainty surrounding the effects of economic shocks and monetary policy. For these reasons, monetary policy should have a medium-term orientation in order to avoid excessive activism and the introduction of unnecessary volatility into the real economy.

… and be broadly based

Finally, just like any other central bank, the ECB faces considerable uncertainty about the reliability of economic indicators, the structure of the euro area economy and the monetary policy transmission mechanism, among other things. A successful monetary policy therefore has to be broadly based, taking into account all relevant information in order to understand the factors driving economic developments, and cannot rely on a small set of indicators or a single model of the economy.

Monetary policy must be forward-looking …

The role of the strategy: a comprehensive framework for monetary policy decisions

The Governing Council of the ECB has adopted and announced a monetary policy strategy to ensure a consistent and systematic approach to monetary policy decisions. This monetary policy strategy embodies the above-mentioned general principles in order to meet the challenges facing the central bank. It aims to provide a comprehensive framework within which decisions on the appropriate level of short-term interest rates can be taken and communicated to the public.

The main elements of the ECB's monetary policy strategy

The first element of the ECB's monetary policy strategy is a quantitative definition of price stability. In addition, the strategy establishes a framework to ensure that the Governing Council assesses all the relevant information and analyses needed to take monetary policy decisions such that price stability over the medium term is maintained. The remaining sections of this chapter describe these elements in detail.

The quantitative definition of price stability

Primary objective

The primary objective of the Eurosystem is to maintain price stability in the euro area, thus protecting the purchasing power of the euro. As discussed earlier, ensuring stable prices is the most important contribution that monetary policy can make in order to achieve a favourable economic environment and a high level of employment. Both inflation and deflation can be very costly to society economically and socially speaking (see in particular Section 3.3). Without prejudice to its primary objective of price stability, the Eurosystem also supports the general economic policies in the European Community. Furthermore, the Eurosystem acts in accordance with the principles of an open market economy, as stipulated by the Treaty establishing the European Community.

The ECB has defined price stability in quantitative terms

While the Treaty clearly establishes the maintenance of price stability as the primary objective of the ECB, it does not give a precise definition. In order to specify this objective more precisely, the Governing Council of the ECB announced the following quantitative definition in 1998: "*Price stability shall be defined as a year-on-year increase in the Harmonised Index of Consumer Prices (HICP) for the euro area of below 2 %. Price stability is to be maintained over the medium term*". In 2003, the Governing Council further clarified that, within the definition, it aims to maintain inflation rates below but "*close to 2 % over the medium term*".

The definition both anchors inflation expectations and adds to the ECB's transparency and accountability

The Governing Council decided to publicly announce a quantitative definition of price stability for a number of reasons. First, by clarifying how the Governing Council interprets the goal it has been assigned by the Treaty, the definition helps to make the monetary policy framework easier to understand (i.e. it makes monetary policy more transparent). Second, the definition of price stability provides a clear and measurable yardstick against which the public can hold the ECB accountable. In case of deviations of price developments from the definition of price stability, the ECB would be required to provide an explanation for such deviations and to explain how it intends to re-establish price stability within an acceptable period of time. Finally, the definition gives guidance to the public, allowing it to form its own expectations regarding future price developments (see also Box 3.2).

The definition of price stability gives guidance to the public, allowing it to form its own expectations regarding future price developments.

Features of the definition: focus on the euro area as a whole

The definition of price stability has a number of noteworthy features. First, the ECB has a euro area-wide mandate. Accordingly, decisions regarding the single monetary

policy aim to achieve price stability in the euro area as a whole. This focus on the euro area as a whole is the natural consequence of the fact that, within a monetary union, monetary policy can only steer the *average* money market interest rate level in the area, i.e. it cannot set different interest rates for different regions of the euro area.

The HICP

The definition also identifies a specific price index – namely the HICP for the euro area – as that to be used for assessing whether price stability has been achieved. The use of a broad price index ensures the transparency of the ECB's commitment to full and effective protection against losses in the purchasing power of money (see also Section 3.2).

The HICP, which is released by EUROSTAT, the Statistical Office of the European Union, is the key measure for price developments in the euro area. This index has been harmonised across the various countries of the euro area with the aim of measuring price developments on a comparable basis. The HICP is the index that most closely allows one to approximate the changes over time in the price of a representative basket of consumer expenditures in the euro area (see Box 5.3).

Box 5.3 Construction and features of the HICP

The conceptual work related to the compilation of the HICP for the euro area is carried out by the European Commission (Eurostat) in close liaison with the national statistical institutes. As key users, the ECB and its forerunner, the EMI, have been closely involved in this work. The HICP data released by Eurostat are available from January 1995 onwards.

Based on the consumer expenditure weights applicable for 2010, goods account for 58% and services for 42% of the HICP (see Table below). A breakdown of the overall HICP into individual components makes it easier to see the various economic factors that have an impact on consumer price developments. For example, developments in the energy price component are closely related to oil price movements. Food prices are divided into processed and unprocessed foods, because prices for the latter are strongly influenced by factors such as weather conditions and seasonal patterns, while such factors have less of an impact on processed food prices. Services prices are subdivided into five components which, on account of different market conditions, typically show differences in their respective developments.

As a result of its harmonisation and statistical improvements aimed at enhancing its accuracy, reliability and timeliness, the HICP has become a high-quality, international-standard price index and a broadly comparable indicator across countries. Nevertheless, improvements are still being made in various fields.

Table: Weights of the main euro area HICP components applicable for 2010

Overall index	**100.0**
Goods prices	**58.0***
Unprocessed food	7.3
Processed food	11.9
Non-energy industrial goods	29.3
Energy	9.6
Services	**42.0**
Housing services	10.2
Transport	6.6
Communication	3.3
Recreation and personal services	14.9
Miscellaneous	7.1

* Figures may not add up due to rounding.

Source: Eurostat

Reasons for aiming at inflation rates of below but close to 2 %

By referring to *"an increase in the HICP of below 2 %"*, the definition makes it clear that both inflation above 2 % and deflation (i.e. declines in the price level) are inconsistent with price stability. In this respect, the explicit indication by the ECB to aim to maintain the inflation rate at a level below but close to 2 % signals its commitment to provide an adequate margin to avoid the risks of deflation (see Section 3.1 and also the Box below).

Box 5.4 A safety margin against deflation

Referring to an "increase in the HICP of below but close to 2 %" provides a safety margin against deflation.

While deflation implies similar costs for the economy as inflation, it is particularly important that deflation is avoided because, once it occurs, it may become entrenched as a result of the fact that nominal interest rates cannot fall below zero as normally, nobody would be willing to lend money to someone else when he expects less money to be returned to him after a certain period. In a deflationary environment monetary policy may therefore not be able to sufficiently stimulate aggregate demand by using its interest rate instrument. Any attempt to bring the nominal interest rate below zero would fail, as the public would prefer to have cash rather than to lend or hold deposits at a negative rate. Although some monetary policy actions can still be carried out even when nominal interest rates are at zero, the effectiveness of these alternative policies is not fully certain. It is thus preferable for monetary policy to have a safety margin against deflation.

By aiming at "an increase of the HICP of below but close to 2 %", a possible measurement bias in the HICP and the potential implications of inflation differentials in the euro area are also taken into account.

The medium-term orientation

Finally, a key aspect of the ECB's monetary policy is that it aims to pursue price stability "over the medium term". As outlined above, this reflects the consensus that monetary policy cannot, and therefore should not, aim to attempt to fine-tune developments in prices or inflation over short horizons of a few weeks or months (see also Section 4.4). Changes in monetary policy only affect prices with a time lag, and the magnitude of the eventual impact is uncertain. This implies that monetary policy cannot offset all unanticipated disturbances to the price level. Some short-term volatility in inflation is therefore inevitable.

Box 5.5 The medium-term orientation of the ECB's monetary policy

An economy is continuously subject to largely unforeseeable shocks that also affect price developments. At the same time, monetary policy can only affect price developments with significant time lags, which are variable and, like most economic relationships, highly uncertain. Against this background, it would be impossible for any central bank to keep inflation at a specific point target at all times or to bring it back to a desired level within a very short period of time. Consequently, monetary policy needs to act in a forward-looking manner and can only maintain price stability over longer periods of time. This is the reasoning that lies at the core of the ECB's medium-term orientation.

The "medium term" notion deliberately retains some flexibility with regard to an exact time frame. This reflects the fact that it is not advisable to specify ex ante a precise horizon for the conduct of monetary policy, since the transmission mechanism spans a variable, uncertain period of time. An excessively aggressive policy response to restore price stability within a very short time-span may, under these circumstances, risk incurring a significant cost in terms of output and employment volatility which, over a longer horizon, could also affect price developments. In these cases, it is widely recognised that a gradual response of monetary policy is appropriate both to avoid unnecessarily high volatility in real activity and to maintain price stability over a longer horizon. Thus, the medium-term orientation also gives the ECB the flexibility required to respond in an appropriate manner to the different economic shocks that might occur. At the same time, it should be clear that, from an ex post perspective, the ECB can be held accountable only for trends in inflation.

The two pillars of the ECB's monetary policy strategy

The two-pillar framework is a tool for organising information …

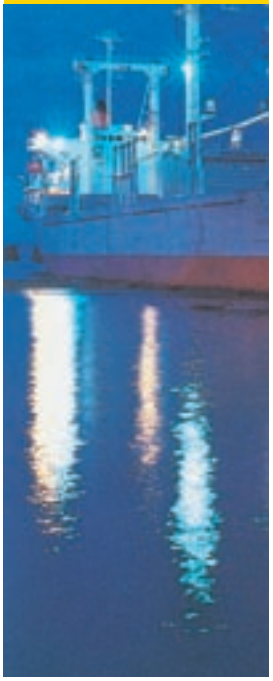
The ECB's approach to organising, evaluating and cross-checking the information relevant for assessing the risks to price stability is based on two analytical perspectives, referred to as the two "pillars".

… based on two analytical perspectives …

In the ECB's strategy, monetary policy decisions are based on a comprehensive analysis of the risks to price stability. This analysis is organised on the basis of two complementary perspectives on the determination of price developments. The first perspective is aimed at assessing the short to medium-term determinants of price developments, with a focus on real activity and financial conditions in the economy. It takes account of the fact that price developments over those horizons are influenced largely by the interplay of supply and demand in the goods, services and factor markets (see also Section 4.4). The ECB refers to this as the "economic analysis". The second perspective, referred to as the "monetary analysis", focuses on a longer-term horizon, exploiting the long-run link between money and prices (see also Section 4.5). The monetary analysis serves mainly as a means of cross-checking, from a medium to long-term perspective, the short to medium-term indications for monetary policy coming from the economic analysis.

… to ensure that no relevant information is lost

The two-pillar approach is designed to ensure that all relevant information is used in the assessment of the risks to price stability and that appropriate attention is paid to different perspectives and the cross-checking of information in order to come to an overall judgement of the risks to price stability. It represents, and conveys to the public, the notion of diversified analysis and ensures robust decision-making based on different analytical perspectives.



Price developments are influenced largely by the interplay of supply and demand in the goods, services and factor markets.

Economic analysis

Analysis of short to medium-term risks to price stability …

The economic analysis focuses mainly on the assessment of current economic and financial developments and the implied short to medium-term risks to price stability. The economic and financial variables that are the subject of this analysis include, for example, developments in overall output; aggregate demand and its components; fiscal policy; capital and labour market conditions; a broad range of price and cost indicators; developments in the exchange rate, the global economy and the balance

of payments; financial markets; and the balance sheet positions of euro area sectors. All these factors are helpful in assessing the dynamics of real activity and the likely development of prices from the perspective of the interplay between supply and demand in the goods, services and factor markets at shorter horizons (see also Section 4.4).

Box 5.6 Real economic and financial indicators

In the framework of its economic analysis, the ECB focuses mainly on the assessment of current economic and financial developments and the implied short to medium-term risks to price stability.

Regarding the analysis of real economy indicators, the ECB regularly reviews developments in overall output, demand and labour market conditions, a broad range of price and cost indicators, and fiscal policy, as well as the balance of payments for the euro area.

For instance, in terms of *price and cost* developments, alongside the HICP and its components, price developments in the industrial sector, as measured by producer prices, are analysed because changes in production costs may feed through to consumer prices. Labour costs, which are an important element of overall production costs, may have a significant impact on price formation. Labour cost statistics also provide information on the competitiveness of the euro area economy.

Second, indicators of *output and demand* (national accounts, short-term statistics on activity in industry and services, orders, and qualitative survey data) provide information on the cyclical position of the economy, which in turn is relevant for the analysis of prospects for price developments. Furthermore, *labour market* data (on employment, unemployment, vacancies and labour market participation) are important for monitoring conjunctural developments and assessing structural changes in the functioning of the euro area economy. Moreover, the government sector represents a substantial part of economic activity; information on both financial and non-financial *public sector* accounts is essential.

Third, *balance of payments statistics*, along with external trade statistics, provide information on developments in exports and imports which may affect inflationary pressures via their impact on demand conditions. These data also allow external trade prices – currently proxied by export and import unit value indices – to be monitored. These indices help to assess, in particular, the potential impact on import prices of movements in the exchange rate and changes in commodity prices (such as oil). In short, these indicators help to assess movements in aggregate demand, aggregate supply and the degree of capacity utilisation.

Developments in financial market indicators and asset prices are also closely monitored. Movements in asset prices may affect price developments via income and wealth effects. For example, as equity prices rise, share-owning households become wealthier and may choose to increase their consumption. This will add to consumer demand and may fuel domestic inflationary pressures. Conversely, when equity prices fall, households may well reduce consumption. An additional way

in which asset prices can have an impact on aggregate demand is via the value of collateral that allows borrowers to obtain more loans and/or to reduce the risk premia demanded by lenders/banks. Lending decisions are often influenced to a large extent by the amount of collateral. If the value of collateral falls, then loans will become more expensive and may even be difficult to obtain at all, with the result that spending and therefore demand will fall.

Asset prices and financial yields can also be analysed to derive information about the expectations of the financial markets, including expected future price developments. For example, when buying and selling bonds, financial market participants implicitly reveal their expectations about future developments in real interest rates and inflation (see also Box 3.2). Using a variety of techniques, the ECB can analyse financial prices to extract the markets' implicit expectations about future developments. Asset markets, and therefore asset prices, are by their very nature forward-looking. Changes in asset prices therefore largely reflect "news" – information about developments that the financial markets had not been expecting. In this sense, the monitoring of asset prices might help to identify shocks that are currently hitting the economy, in particular shocks to expectations about future economic developments. By analysing financial markets, statistical information on financial asset prices from various sources can also be assessed. In addition, the ECB collects certain statistical information itself.

Developments in the exchange rate are also closely assessed for their implications for price stability. Exchange rate movements have a direct effect on price developments through their impact on import prices. Although the euro area is a relatively closed economy compared with its individual member countries, import prices do affect domestic producer and consumer price developments. Changes in the exchange rate may also alter the price competitiveness of domestically produced goods on international markets, thereby influencing demand conditions and, potentially, the outlook for prices.

… helps to reveal the nature of shocks …

In this analysis, due attention is paid to the need to identify the origin and the nature of shocks hitting the economy, their effects on cost and pricing behaviour and the short to medium-term prospects for their propagation in the economy. For example, the appropriate monetary policy response to inflationary consequences of a temporary rise in the international price of oil might be different from the appropriate response to higher inflation resulting from the labour cost implications of wage increases not matched by productivity growth. The former is likely to result in a transient and short-lived increase in inflation which may quickly reverse. As such, if this shock does not lead to higher inflation expectations, it may pose little threat to price stability over the medium term. In the case of excessive wage increases, there is the danger that a self-sustaining spiral of higher costs, higher prices and higher wage demands may be created. To prevent such a spiral from occurring, a strong monetary policy action to reaffirm the central bank's commitment to the maintenance of price stability, thereby helping to stabilise inflation expectations, may be the best response.

To take appropriate decisions, the Governing Council needs to have a comprehensive understanding of the prevailing economic situation and must be aware of the specific nature and magnitude of any economic disturbances threatening price stability.

… and includes macroeconomic projections

In the context of the economic analysis, the Eurosystem's staff macroeconomic projection exercises play an important role. The projections, which are produced by the staff, help to structure and summarise a large amount of economic data and ensure consistency across different sources of economic evidence. In this respect, they are a key element in sharpening the assessment of economic prospects and the short to medium-term fluctuations of inflation around its trend.

Box 5.7 Euro area macroeconomic projections

The word "projection" is used in order to emphasise that the published projections are the results of a scenario based on a set of underlying technical assumptions, one of which, prior to June 2006, was that short-term market interest rates remain constant over the projection horizon. This approach has changed; the assumption now is that short-term market interest rates move in line with market expectations. Forecasts are produced on this basis in many central banks in order to best inform monetary policy decision-makers about what could happen if policy rates remained unchanged. In view of this, it should be clear that the projection will not, in general, be the best predictor of future outcomes, in particular at somewhat longer horizons. In fact, it represents a scenario that is unlikely to materialise in practice, since monetary policy will always act to address any threats to price stability. Therefore, the macroeconomic projections of inflation by Eurosystem staff should not, under any circumstances, be seen as questioning the commitment of the Governing Council to maintaining price stability over the medium term. Wage and price-setters (i. e. the government, firms and households) should rely on the ECB's quantitative definition of price stability and especially the aim to keep inflation below, but close to, 2 % as the best prediction of medium and long-term price developments.

Although they play a useful role, the staff macroeconomic projections have their limitations. First, the final projection depends to a considerable extent on the underlying conceptual framework and the techniques employed. Any such framework is bound to be a simplification of reality and may, on occasions, neglect the key issues that are relevant for monetary policy. Second, economic projections can only provide a summary description of the economy and thus do not incorporate all relevant information. In particular, important information, such as that contained in monetary aggregates, is not easily integrated into the framework used to produce the projections, or information may change after the projections are finalised. Third, expert views are inevitably incorporated into projections, and there can be good reasons not to agree with particular views. Fourth, projections are always based on specific assumptions – such as those concerning oil prices or exchange rates – which can change rapidly, making the projections outdated.

For all these reasons, staff macroeconomic projections play an important but not all-encompassing role in the ECB's monetary policy strategy. The Governing Council evaluates them together with many other pieces of information and forms of analysis organised within the two-pillar framework. These include monetary

analysis and analyses of financial prices, individual indicators and the forecasts of other institutions. The Governing Council neither assumes responsibility for the projections nor does it use the staff projections as its only tool for organising and communicating its assessment.

Monetary analysis

Money provides a nominal anchor

The ECB singles out money from within the set of selected key indicators that it monitors and studies closely. This decision was made in recognition of the fact that monetary growth and inflation are closely related in the medium to long run (see also Section 4.5). This widely accepted relationship provides monetary policy with a firm and reliable nominal anchor beyond the horizons conventionally adopted to construct inflation forecasts. Therefore, assigning money a prominent role in the strategy was also a tool to underpin its medium-term orientation. Indeed, taking policy decisions and evaluating their consequences not only on the basis of the short-term indications stemming from the analysis of economic and financial conditions but also on the basis of monetary and liquidity considerations allows a central bank to see beyond the transient impact of the various shocks and not to be tempted to take an overly activist course.

Box 5.8 Monetary aggregates

Given that many different financial assets are close substitutes, and that the nature and characteristics of financial assets, transactions and means of payment are changing over time, it is not always clear how money should be defined and which financial assets belong to which definition of money. Central banks usually define and monitor several monetary aggregates.

The ECB's definitions of euro area monetary aggregates are based on harmonised definitions of the money-issuing sector and the money-holding sector as well as of categories of monetary financial institution (MFI) liabilities. The money-issuing sector comprises MFIs resident in the euro area. The money-holding sector includes all non-MFIs resident in the euro area excluding the central government sector.

Based on conceptual considerations and empirical studies, and in line with international practice, the Eurosystem has defined a narrow (M1), an "intermediate" (M2) and a broad monetary aggregate (M3). These aggregates differ with regard to the degree of liquidity of the assets they include.

M1 includes currency, i.e. banknotes and coins, as well as balances that can immediately be converted into currency or used for cashless payments, such as overnight deposits.

M2 comprises M1 and, in addition, deposits with an agreed maturity of up to two years or redeemable at a period of notice of up to three months. These deposits can be converted into components of narrow money, but some restrictions may apply, such as the need for advance notification, penalties and fees.

M3 comprises M2 and certain marketable instruments issued by the resident MFI sector. These marketable instruments are repurchase agreements, money market fund shares/units and debt securities with a maturity of up to two years (including money market paper). A high degree of liquidity and price certainty make these instruments close substitutes for deposits. As a result of their inclusion, broad money is less affected by substitution between various liquid asset categories than narrower definitions of money, and is more stable.

Holdings by euro area residents of liquid assets denominated in foreign currencies can be close substitutes for euro-denominated assets. Therefore, the monetary aggregates include such assets if they are held with MFIs located in the euro area.

The reference value for monetary growth

In order to signal its commitment to monetary analysis and to provide a benchmark for the assessment of monetary developments, the ECB announced a reference value for the broad monetary aggregate M3 (see Box 5.9).

This reference value (which was set to a value of 4½ % in 1998) refers to the annual rate of M3 growth that is deemed to be compatible with price stability over the medium term. The reference value therefore represents a benchmark for analysing the information content of monetary developments in the euro area. Owing to the medium to long-term nature of the monetary perspective, however, there is no direct link between short-term monetary developments and monetary policy decisions. Monetary policy does not therefore react mechanically to deviations of M3 growth from the reference value.

Box 5.9 The ECB's reference value for monetary growth

The prominent role assigned to money in the ECB's strategy is signalled by the announcement of a reference value for the growth of the broad monetary aggregate M3. The choice of M3 is based on the evidence, supported by several empirical studies, that this aggregate possesses the desired properties of a stable money demand and leading indicator properties for future price developments in the euro area. The reference value for the growth of M3 has been derived so as to be consistent with the achievement of price stability. Substantial or prolonged deviations of monetary growth from the reference value would, under normal circumstances, signal risks to price stability over the medium term.

The derivation of the reference value is based on the relationship between (changes in) monetary growth (ΔM), inflation (ΔP), real GDP growth (ΔYR) and velocity (ΔV). According to this identity, which is widely known as the "quantity equation", the change in money in an economy equals the change in nominal transactions (approximated by the change in real GDP plus the change in inflation) minus the change in velocity (see also Box 4.3). The latter variable can be defined as the

speed with which money is transferred between different money holders and thus determines how much money is required to service a particular level of nominal transactions.

$\Delta M = \Delta YR + \Delta P - \Delta V$

The reference value embodies the definition of price stability as an increase in the HICP for the euro area of below 2 % per annum. Furthermore, the derivation of the reference value has been based on medium-term assumptions regarding potential output growth and the trend in the velocity of circulation of M3. In 1998, an assumption of 2 %–2½ % per annum was made for the medium-term trend in real potential GDP growth for the euro area, reflecting estimates from both international organisations and the ECB. Various approaches were employed to derive the assumption for velocity of circulation, taking into account simple (univariate) trends as well as information available from more complex money demand models. Taken together, the results of these approaches pointed to a decline of M3 velocity in the range of ½ %–1 % per annum. On the basis of these assumptions, the ECB's reference value was set at 4½ % per annum by the Governing Council in December 1998, and has not changed since. The Governing Council monitors the validity of the conditions and assumptions underlying the reference value and communicates any changes to the underlying assumptions as soon as they become necessary.

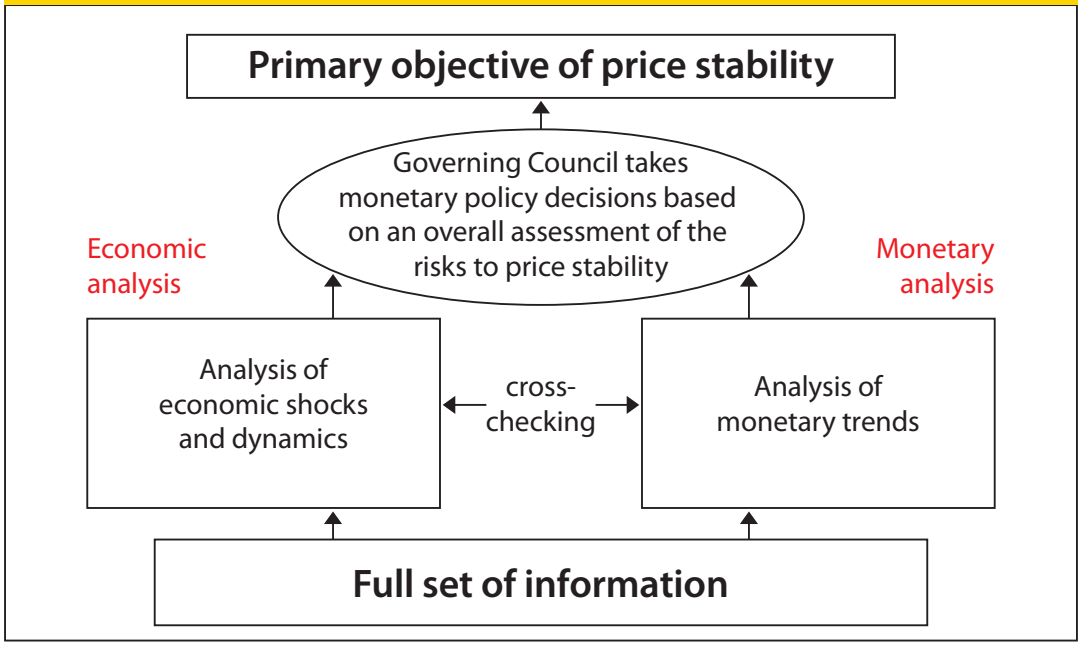
Analysis of special factors

One reason for this is that, at times, monetary developments may also be influenced by "special" factors caused by institutional changes, such as modifications to the tax treatment of interest income or capital gains. These special factors can cause changes in money holdings since households and firms will respond to changes in the attractiveness of bank deposits included in the definition of the monetary aggregate M3 relative to alternative financial instruments. However, monetary developments caused by these special factors may not be very informative about longer-term price developments. Consequently, monetary analysis at the ECB tries to focus on underlying monetary trends by including a detailed assessment of special factors and other shocks influencing money demand.

Cross-checking information from the two pillars

Regarding the Governing Council's decisions on the appropriate stance of monetary policy, the two-pillar approach provides a cross-check of the indications that stem from the shorter-term economic analysis with those from the longer-term oriented monetary analysis. As explained in more detail above, this cross-check ensures that monetary policy does not overlook important information relevant for assessing future price trends. All complementarities between the two pillars are exploited, as this is the best way to ensure that all the relevant information for assessing price prospects is used in a consistent and efficient manner, facilitating both the decision-making process and its communication (see Chart below). This approach reduces the risk of policy error caused by the over-reliance on a single indicator, forecast or model. By taking a diversified approach to the interpretation of economic conditions, the ECB's strategy aims at adopting a robust monetary policy in an uncertain environment.

Chart: The stability-oriented monetary policy strategy of the ECB



Source: European Central Bank (2004), The monetary policy of the ECB, p. 66.

Transparency and accountability

Reporting requirements imposed by the Treaty

To maintain its credibility, an independent central bank must be open and clear about the reasons for its actions. It must also be accountable to democratic institutions. Without encroaching on the ECB's independence, the Treaty establishing the European Community imposes precise reporting obligations on the ECB.

The ECB has to draw up an Annual Report on its activities and on the monetary policy of the previous and current year and present it to the European Parliament, the EU Council, the European Commission and the European Council. The European Parliament may then hold a general debate on the Annual Report of the ECB. The President of the ECB and the other members of the Executive Board may, at the request of the European Parliament or on their own initiative, present their views to the competent committees of the European Parliament. Such hearings generally take place each quarter.

Furthermore, the ECB must publish reports on the activities of the ESCB at least once every quarter. Finally, the ECB has to publish a consolidated weekly financial statement of the Eurosystem, which reflects the monetary and financial transactions of the Eurosystem during the preceding week.

Communication activities of the ECB

In fact, the ECB has committed itself to going beyond the reporting requirements specified in the Treaty. One example of this far-reaching commitment is that the President explains the reasoning behind the Governing Council's decisions in a press conference which is held immediately after the first meeting of the Governing Council every month. Further details of the Governing Council's views on the economic situation and the outlook for price developments are published in the ECB's Monthly Bulletin.[12]

Relationship with EU bodies

A member of the European Commission has the right to take part in the meetings of the Governing Council and the General Council, but not to vote. As a rule, the Commission is represented by the Commissioner responsible for economic and financial matters.

The ECB has a reciprocal relationship with the EU Council. On the one hand, the President of the EU Council is invited to the meetings of the Governing Council and the General Council of the ECB. He may put forward a motion to be discussed in the Governing Council, but may not vote. On the other hand, the President of the ECB is invited to the meetings of the EU Council when the Council is discussing matters relating to the objectives and tasks of the ESCB. Apart from the official and informal meetings of the ECOFIN Council (which brings together the EU ministers for economic affairs and finance), the President also takes part in meetings of the Eurogroup (meetings of the ministers for economic affairs and finance in the euro area countries). The ECB is also represented on the Economic and Financial Committee, a consultative Community body which deals with a broad range of European economic policy issues.

The ECB has committed itself to going beyond the reporting requirements specified in the Treaty.

5.4 Overview of the Eurosystem's operational framework

Operational framework

As mentioned before, the Governing Council decides on the level of key ECB interest rates. For these interest rates to feed through to firms and consumers, the ECB relies on the intermediation of the banking system. When the ECB changes the conditions at which it borrows from and lends to the banks, the conditions set by the banks for their customers, i.e. firms and consumers, are also likely to change. The set of Eurosystem instruments and procedures for transacting with the banking system, thereby initiating the process by which these conditions are transmitted to households and firms, is called the *operational framework*.

Main categories of instruments

Broadly speaking, the euro area banking system – partly due to its need for banknotes but partly also because the ECB asks it to hold some minimum reserves on accounts with

[12] The publications of the ECB are available free of charge on request and may also be viewed on the ECB's website (www.ecb.europa.eu), which also provides links to the websites of the EU national central banks.

the NCBs – has a need for liquidity and is reliant on refinancing from the Eurosystem. In this context, the Eurosystem acts as liquidity supplier and – via its operational framework – helps the banks to meet their liquidity needs in a smooth and well-organised manner.

The operational framework of the Eurosystem comprises three main elements. First, the ECB manages reserve conditions in the money market and steers money market interest rates by providing reserves to the banks to meet their liquidity needs through *open market operations*. Second, two *standing facilities*, a marginal lending facility and a deposit facility, are offered to banks to allow overnight loans or deposits in exceptional circumstances. The facilities are available to banks as and when they require, although borrowing at the marginal lending facility must be against eligible collateral. Third, *reserve requirements* increase the liquidity needs of banks. In addition, since they can be averaged over a period of one month, they can also act as a buffer against temporary liquidity shocks in the money market and thereby reduce the volatility of short-term interest rates.

Open market operations

Open market operations – the first element of the operational framework – are conducted in a decentralised manner. While the ECB co-ordinates the operations, the transactions are carried out by the NCBs. The weekly main refinancing operation is a key element in the implementation of the ECB's monetary policy. The official interest rate set for these operations signals the stance of the monetary policy decided by the Governing Council of the ECB. The longer-term refinancing operations are also liquidity-providing transactions, but are conducted monthly and have a maturity of three months. Fine-tuning operations are executed on an ad hoc basis to smooth the effects on interest rates of unexpected liquidity fluctuations or extraordinary events.

When the ECB changes its conditions for banks, the conditions for firms and consumers are also likely to change.

The criteria for counterparty eligibility in the Eurosystem's operations are very broad: in principle, all credit institutions located in the euro area are potentially eligible. Any bank may choose to become a counterparty if it is subject to the Eurosystem's reserve requirements, is financially sound, and fulfils specific operational criteria enabling it to transact with the Eurosystem. Both the broad counterparty criteria and the decentralised operations are formulated to ensure equal treatment for all institutions across the euro area – so they may participate in the operations carried out by the Eurosystem – and are conducive to an integrated primary money market.

The open market operations of the Eurosystem are conducted as repurchase agreements ("repos") or as collateralised loans. In both cases, short-term loans from the Eurosystem are granted against sufficient collateral. The range of eligible collateral in the operations is very wide, including public and private sector debt securities, to ensure an abundant collateral base for counterparties across euro area countries. Moreover, eligible assets can be used across borders. The open market operations of the Eurosystem are organised as auctions to ensure a transparent and efficient distribution of liquidity in the primary market.

An overriding feature of the operational framework is the reliance on a self-regulating market, with the infrequent presence of the central bank. The money market interventions of the central bank are generally limited to the main refinancing operations which take place once a week and the much smaller longer-term refinancing operations which take place once a month. Fine-tuning operations have been rather infrequent in the first years of the ECB.

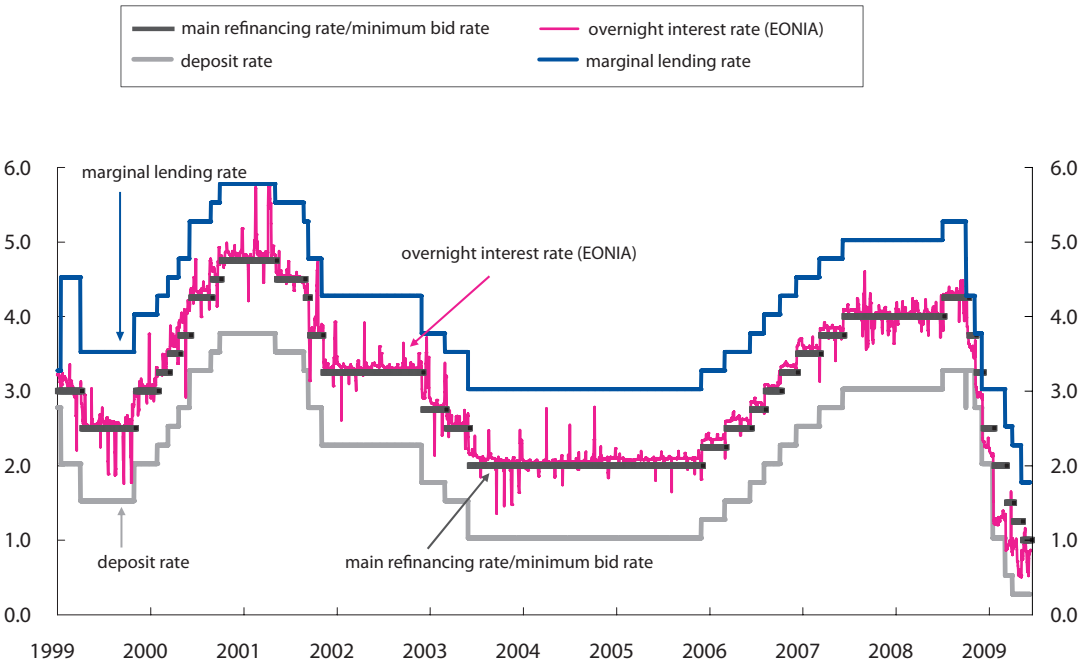
Standing facilities and reserve requirements

The two major instruments complementing the open market operations – the standing facilities and the reserve requirements – are applied mainly to contain volatility in short-term money market rates.

The rates on the standing facilities are usually significantly less attractive than the interbank market rates (+/- one percentage point from the main refinancing rate). This gives banks an important incentive to transact in the market and only use standing facilities when other market alternatives have been exhausted. Since banks always have access to standing facilities, the rates on the two standing facilities provide a ceiling and a floor by market arbitrage for the overnight market interest rate (the so-called "EONIA"). The two rates therefore determine the corridor in which the EONIA can fluctuate. In this context, the width of the corridor should encourage the use of the market. This adds an important structure to the money market which limits the volatility of very short-term market rates (see Chart below).

A major feature of the framework is the reliance on a self-regulating market, with the infrequent presence of the central bank.

Chart: ECB interest rates and money market rates



Source: ECB. Last observation: 16 June 2009.

A bank's reserve requirements are determined as a fraction of its reserve base, a set of liabilities on its balance sheet (deposits, debt securities and money market papers with a maturity of less than two years).

The reserve requirement system specifies banks' required minimum current account holdings with their NCB. Compliance is determined on the basis of the average of the daily balances over a period of around one month (called the "maintenance period"). The

averaging mechanism provides inter-temporal flexibility to banks in terms of managing reserves across the reserve maintenance period. Temporary liquidity imbalances do not need to be covered immediately and, consequently, some volatility in the overnight interest rate can be smoothed out. (If, for instance, the overnight rate is higher than the expected rate later in the reserve maintenance period, banks can make an expected profit from lending in the market and postponing the fulfilment of required reserve holdings until later in the period ("inter-temporal substitution"). This adjustment of the daily demand for reserves helps to stabilise interest rates.)

The holdings of required reserves are remunerated at the average tender rate in the main refinancing operations over a maintenance period. This rate is virtually identical to the average interbank market rate at the same maturity. Reserves held at the banks' current accounts in excess of the monthly requirement are not remunerated. This gives banks an incentive to manage their reserves actively in the market. At the same time, the remuneration of required reserves avoids the risk of the reserve requirement being a burden on banks or hampering the efficient allocation of financial resources.

The required reserves act as a buffer against liquidity shocks. Fluctuations in reserves around the required level can absorb liquidity shocks with little impact on market interest rates. Therefore, there is little need for extraordinary intervention by the central bank in the money market to stabilise market rates.

Glossary

Barter
The mutual exchange of goods and services for other goods and services without using money as a medium of exchange. It generally requires a mutual need for the items being traded.

Consumer Price Index
Compiled once a month using what is called a "shopping basket". For the euro area, the Harmonised Index of Consumer Prices (HICP) is used, with a statistical methodology that has been harmonised across countries.

Deflation
A sustained decline in the general price level, e.g. in the consumer price index, over an extended period.

Euro area
The area that is made up of those Member States of the European Union in which the euro has been adopted as the single currency.

European Central Bank (ECB)
Established on 1 June 1998 and located in Frankfurt am Main, Germany. The ECB is at the heart of the Eurosystem.

European System of Central Banks (ESCB)
The ECB and the NCBs of all EU Member States, regardless of whether or not they have adopted the euro.

Eurosystem
The ECB and the NCBs of those Member States that have already adopted the euro.

Executive Board
One of the decision-making bodies of the ECB. It comprises the President and the Vice-President of the ECB and four other members appointed by common accord by the Heads of State or Government of the Member States that have adopted the euro.

General Council
One of the decision-making bodies of the ECB. It comprises the President and the Vice-President of the ECB and the governors of all EU NCBs.

Governing Council
The supreme decision-making body of the ECB. It comprises all the members of the Executive Board of the ECB and the governors of the NCBs of the countries that have adopted the euro.

Inflation
An increase in the general price level, e.g. in the consumer price index, over an extended period.

Interest rate
The percentage of extra money you get back if you lend your money to someone else (or keep it in the bank) or the percentage of extra money you have to pay back if you borrow money (in addition to the loan received).

Monetary base
In the euro area, it consists of currency (banknotes and coins) in circulation, the reserves held by counterparties with the Eurosystem and the funds deposited with the Eurosystem's deposit facility. These items are liabilities on the Eurosystem's balance sheet. Reserves can be broken down further into required and excess reserves. In the Eurosystem's minimum reserve system counterparties are obliged to hold required reserves with the NCBs. In addition to these required reserves, credit institutions usually hold only a small amount of voluntary excess reserves with the Eurosystem.

Monetary policy strategy
The general approach to the conduct of monetary policy. The key features of the monetary policy strategy of the ECB are a quantitative definition of the primary objective of price stability and an analytical framework based on two pillars – economic analysis and monetary analysis. Moreover, the strategy includes general principles for the conduct of monetary policy, such as the medium-term orientation. The strategy forms the basis of the Governing Council's overall assessment of the risks to price stability and of its monetary policy decisions. It also provides the framework for explaining monetary policy decisions to the public.

Monetary policy transmission mechanism
The process through which monetary policy decisions affect the economy in general and the price level in particular.

Price stability
Maintaining price stability is the primary objective of the Eurosystem. The Governing Council of the ECB has defined price stability as a year-on-year increase in the HICP for the euro area of below 2 %. It has further clarified that within this definition it aims to maintain the annual inflation rate at below but close to 2 % over the medium term.

Annex 1

The impact of inflation – some quantitative illustrations

The inflation table below gives a quantitative impression of how the price of items costing EUR 10 today will change over time.

The formula to be used for the calculations is:

Price after n years = € 10 × $(1 + \pi)^n$

where π and n denote the assumed inflation rate (in decimals) and the number of years respectively.

If, for instance, the assumed inflation rate is 30 % and the number of years 10 (see lower right-hand cell in the table below), the price is calculated as follows:

Price after 10 years = € 10 × $(1 + 0.30)^{10}$ = € 137.86

Inflation table

The impact of inflation on the price of two CD singles costing EUR 10 today (after n years)

Annual inflation rate:	1 %	2 %	5 %	10 %	30 %
	Stable prices		Inflationary environment		
1 year later	10.10	10.20	10.50	11.00	13.00
2 years later	10.20	10.40	11.03	12.10	16.90
3 years later	10.30	10.61	11.58	13.31	21.97
4 years later	10.41	10.82	12.16	14.64	28.56
5 years later	10.51	11.04	12.76	16.11	37.13
6 years later	10.62	11.26	13.40	17.72	48.27
7 years later	10.72	11.49	14.07	19.49	62.75
8 years later	10.83	11.72	14.77	21.44	81.57
9 years later	10.94	11.95	15.51	23.58	106.04
10 years later	11.05	12.19	16.29	25.94	137.86

The impact of inflation on the purchasing power of money
(base year = 100, after *n* years at a given inflation rate, in percentages)

Annual inflation rate:	1 %	2 %	5 %	10 %	30 %
	Stable prices		Inflationary environment		
1 year later	99.0	98.0	95.2	90.9	76.9
2 years later	98.0	96.1	90.7	82.6	59.2
3 years later	97.1	94.2	86.4	75.1	45.5
4 years later	96.1	92.4	82.3	68.3	35.0
5 years later	95.1	90.6	78.4	62.1	26.9
6 years later	94.2	88.8	74.6	56.4	20.7
7 years later	93.3	87.1	71.1	51.3	15.9
8 years later	92.3	85.3	67.7	46.7	12.3
9 years later	91.4	83.7	64.5	42.4	9.4
10 years later	90.5	82.0	61.4	38.6	7.3

Annex 2

Exercises

Exercises for Chapter 2

1. What are the basic functions of money?

2. Which general forms of money do you know?

Solutions for Chapter 2

1. Money fulfils the functions of a medium of exchange, a unit of account and a store of value.

2. The general forms are commodity money, metallic money, paper money, liquid deposits (liabilities of banks), liquid short-term securities and electronic money.

Exercises for Chapter 3

1. How would you define the term "inflation"?
   What is the relationship between inflation and the purchasing power of money?

2. What is the meaning of "deflation"?

3. How can inflation be measured?

4. Suppose for the sake of simplicity that a representative market basket contains 50 sandwiches and two pairs of trainers. In 2003, the price of a sandwich is EUR 1 and the price of a pair of trainers is EUR 80. In 2004, the price of a sandwich is 1.20 and the price of a pair of trainers is EUR 85. By how much has the price of this market basket increased?

5. Illustrate the measurement problems related to the measurement of the overall change in prices by giving an example.

6. Name some benefits of sustained price stability.

Solutions for Chapter 3

1. Basically, inflation is defined as a general, or broadly-based, increase in prices of goods and services over a protracted period, consequently leading to a decline in the value of money and thus its purchasing power.

2. Deflation is often defined as the opposite of inflation, namely as a situation where the overall price level falls over an extended period.

3. Inflation is generally measured by the change in the index of consumer prices. For this purpose, the purchasing patterns of consumers are analysed to determine those goods and services bought which can be considered somehow representative of the consumers in an economy. Putting together this "shopping list" of items and weighting them according to their importance in consumer expenditure then leads

Inflation is generally measured by the change in the index of consumer prices.

to what is referred to as a "market basket". Each month, a host of "price surveyors" checks on the prices of these items in various outlets. Following this, the costs of the basket are then compared over time, so producing a series for the price index. The annual rate of inflation can then be calculated by expressing the change in the costs of the market basket today as a percentage of the cost of an identical basket in the previous year.

4. In 2003: (50 × 1.00) + (2 × 80) = EUR 210. In 2004: (50 × 1.20) + (2 × 85.00) = 230. In absolute terms, the price of the market basket has risen by EUR 20. In relative terms, it has risen by ((230 – 210)/210) × 100 = around 9.5 %.

5. For instance, changes of quality are sometimes difficult to incorporate into the CPI. If the quality of a product becomes better over time and the price also rises, some part of the change in price is due to the improved quality. Price increases which are due to quality changes cannot be considered as giving rise to inflation, as they do not reduce the purchasing power of money. For this reason, statistical offices try to allow for quality changes. If, for instance, the increase in prices is measured at around 3 % but the price increase due to quality changes is estimated to be around 2 %, then this figure will be deducted from the overall price increase, thus leaving a "corrected" overall price increase of around 1 %. Changes in quality are rather common over long periods of time.

6. Price stability supports higher living standards by helping to reduce uncertainty about general price developments and thereby improving the transparency of relative prices, by reducing inflation risk premia in interest rates, by avoiding unnecessary hedging activities, by reducing distortions of tax systems and social security systems, by increasing the benefits of holding cash and by preventing the arbitrary distribution of wealth and income. In other words, by maintaining price stability, central banks help to achieve broader economic goals.

Changes in quality are common over long periods of time.

Exercises for Chapter 4

1. What is the meaning of the phrase "transmission process" in terms of monetary policy?

2. How can central banks influence interest rates?

3. What is the real interest rate? What is the difference between the ex ante and the ex post real interest rate?

4. Assume an investor buys a bond with a maturity of ten years and a fixed nominal coupon of 4 %. In addition, the investor expects an average inflation of 1.8 % over the next ten years. What is the average ex ante (or expected) real return of his investment?

5. What would the real ex post return be if, after the investor has bought the bond, the authorities decided to implement an inflationary policy, resulting in average inflation of 5 % over the maturity of the bond?

6. What would the real ex ante and ex post returns after taxes be if nominal returns were subject to income tax at a rate of 25 %?

7. What are the effects of changes in interest rates on household and company expenditure? How much time will these effects take?

8. What are the factors driving inflation over the short term?

9. What are the factors driving inflation over the longer term?

Solutions for Chapter 4

1. The process through which actions by the central bank are "transmitted" through the economy and ultimately to prices is generally described as the "transmission process".

2. As the central bank is the only institution which can issue banknotes (and bank reserves), in other words it is the only supplier of base money, it can determine the nominal interest rate on its short-term loans given to banks. The current and expected interest rate banks have to pay to central banks in turn influences a wide range of other bank and market interest rates.

3. Economists call the interest rate that the bank (or a normal bond) pays the *nominal* interest rate. The real interest rate is defined as the increase in the purchasing power that one achieves with the overall return on an investment, or in other words the difference between the nominal interest rate and the rate of inflation.
   In this respect, it is also important to distinguish between two concepts of the real interest rate: the real interest rate the borrower and lender expect when the loan is made is called the *ex ante* real interest rate, and the real interest rate actually realised is called the *ex post* interest rate.

4. The average real *ex ante* expected return would be approximately
   4.0 % – 1.8 % = 2.2 % or ((1.04/1.018)-1) × 100 = 2.2 %.

5. Following these assumptions, the real ex post return would change to approximately 4.0 % – 5.0 % = – 1.0 %. In other words: the *ex-post* return would be negative.

6. An income tax of 25 % would change the real (after-tax) *ex ante* return to
   4.0 – 1.0 % – 1.8 % = 1.2 %. The real (after-tax) ex post return would, in the case of the inflationary policy, change to 4.0 % – 1.0 % – 5.0 % = – 2.0 %.

7. From the perspective of an individual household a higher real interest rate makes it more attractive to save, since the return on saving in terms of future consumption is higher. Therefore, higher real interest rates typically reduce current consumption and raise savings. From the perspective of an individual firm, a higher real interest rate will, all things being equal, discourage investment, because fewer of the available investment projects will offer a return sufficient to cover the higher cost of capital.
   It is important to understand that there are time lags in this process. It could easily take months for firms to introduce a new investment plan; investments involving the construction of new plants or the ordering of special equipment can even take years. Housing investment also takes some time to respond to changes in interest rates. Furthermore, many consumers may not immediately change their consumption plans. In sum, higher interest rates will tend to reduce the current expenditures of firms and households, but the effects may take some time to manifest themselves.

8. A variety of factors and shocks can influence the price level over the short term. Among them are developments in aggregate demand and its various components, including developments in fiscal policy. Further changes could relate to changes in input prices, costs and productivity, the exchange rate and the global economy. All of these factors could affect real activity and prices over the short term.

Higher real interest rates typically reduce current consumption and raise savings.

9. A sustained increase in the general price level can – in the long run – only be driven by a sustained and ongoing expansionary monetary policy. This point is often reinforced by the statement "inflation is always and everywhere a monetary phenomenon".

Exercises for Chapter 5

1. Have a look at the ECB's website and find the name of the President of the ECB.

2. Have a look at your NCB's website and find the name of the Governor of your NCB.

3. How is the Governing Council of the ECB formed? What are its main tasks?

4. How is the Executive Board of the ECB formed? What are its main tasks?

5. How is the General Council of the ECB formed? What are its main tasks?

6. Summarise the ECB's definition of price stability.

7. What were the reasons behind the Governing Council's announcement of a quantitative definition of price stability?

8. Describe briefly the two perspectives used by the Eurosystem to discuss the risks to price stability. What are the relevant time horizons?

9. Describe briefly the main elements of the Eurosystem's operational framework. What are their main features?

10. Imagine that the ECB announces a fixed interest rate tender and decides to allot EUR 100 million. In the course of the process, the banks submit the bids shown below. How will the ECB distribute the EUR 100 million to the banks?

	Bid	Allotment
Bank 1	30	?
Bank 2	30	?
Bank 3	50	?
Bank 4	40	?
Bank 5	50	?
Total	200	100

Solutions for Chapter 5

1. Jean-Claude Trichet.

2. The answer depends, of course, on the country.

3. The Governing Council is the highest decision-making body of the ECB. It consists of the six members of the Executive Board and the governors of the NCBs of the euro area. It is chaired by the President of the ECB. The key task of the Governing Council is to formulate the monetary policy for the euro area. More

specifically, it has the power to determine the interest rates at which commercial banks may obtain liquidity (money) from their central bank. Thus the Governing Council indirectly influences interest rates throughout the euro area economy, including the rates that commercial banks charge their customers for loans and those that savers earn on their deposits.

4. The Executive Board of the ECB consists of the President, Vice-President and four other members. All are appointed by common accord of the Heads of State or Government of the countries which form the euro area. The Executive Board is responsible for implementing the monetary policy as formulated by the Governing Council and gives the necessary instructions to the NCBs for this purpose. It also prepares the meetings of the Governing Council and manages the day-to-day business of the ECB.

5. The General Council is the third decision-making body of the ECB. It comprises the President and Vice-President of the ECB and the governors of all NCBs of the EU Member States. The General Council has no responsibility for monetary policy decisions in the euro area, but contributes to the co-ordination of monetary policies of the Member States that have not yet adopted the euro and to the preparations for the possible enlargement of the euro area.

6. While the Treaty clearly establishes the maintenance of price stability as the primary objective of the ECB, it does not give a precise definition of price stability. In order to specify this objective more precisely, the Governing Council of the ECB announced the following quantitative definition in 1998: "*Price stability shall be defined as a year-on-year increase in the Harmonised Index of Consumer Prices (HICP) for the euro area of below 2 %. Price stability is to be maintained over the medium term*". Following a thorough evaluation of its monetary policy strategy in 2003, the Governing Council confirmed this definition and further clarified that, within the definition, it aims to maintain inflation rates below but "*close to 2 % over the medium term*".

7. The Governing Council decided to publicly announce a quantitative definition of price stability for a number of reasons. First, by clarifying how the Governing Council interprets the task it has been assigned by the Treaty, the definition helps to make the monetary policy framework easier to understand (i. e. it makes monetary policy more transparent), thus providing guidance to the public to allow it to form its own expectations vis-à-vis future price developments. Second, the definition of price stability provides a clear and measurable yardstick against which the public can hold the ECB accountable. Deviations of price developments from the definition of price stability can be identified, and the ECB would then be required to provide an explanation for such deviations and to explain how it intends to re-establish price stability within an acceptable period of time.

8. Within the ECB's strategy, monetary policy decisions are based on a comprehensive analysis of the risks to price stability. This analysis is carried out on the basis of two complementary perspectives for determining price developments. The first perspective is aimed at assessing the short to medium-term determinants of price developments, with a focus on real activity and financial conditions in the economy. It takes account of the fact that price developments over these horizons are influenced largely by the interplay of supply and demand in the goods, services and factor markets. The ECB refers to this as the "economic analysis". The second perspective, referred to as the "monetary analysis", focuses on a longer-term horizon, exploiting the long-term link between money and prices. The monetary analysis serves mainly as a means of cross-checking, from a medium to long-term perspective, the short to medium-term indications for monetary policy coming from the economic analysis.

The primary objective of the ECB is the maintenance of price stability.

9. The operational framework of the Eurosystem includes three main elements. The first element is reserve requirements, with averaging provisions over a so-called maintenance period of around one month. These are obligations for credit institutions to hold minimum reserves on their current account with their NCBs. This instrument has the important function of creating additional demand for central bank liquidity from the banking system and building up a buffer against temporary liquidity shocks in the money market to reduce the volatility of short-term interest rates. This makes it easier for the ECB to implement its monetary policy. Second, the Eurosystem can manage reserve conditions in the money market and steer money market interest rates by providing regular refinancing to the banks through open market operations. The regular refinancing helps banks meet their liquidity needs. The weekly main refinancing operation, with a maturity of one week, is a key element in the monetary policy implementation of the ECB. The rate attached to the main refinancing operation (MRO) signals the stance of the monetary policy decided by the Governing Council of the ECB. The MRO also provides the bulk of the refinancing needs to the banking system. The longer-term refinancing operations are also liquidity-providing transactions, but are conducted monthly and have a maturity of three months. Fine-tuning operations are executed on an ad hoc basis to smooth the effects on interest rates of unexpected liquidity fluctuations or extraordinary events. Third, two standing facilities, a marginal lending and a deposit facility, are offered to banks to allow overnight loans or deposits with their central bank to manage their liquidity needs. The facilities are available to banks at their discretion.

10. The total allotment is 50 % of the total of bids. So each bank gets 50 % of its bid.

	Bid	Allotment
Bank 1	30	15
Bank 2	30	15
Bank 3	50	25
Bank 4	40	20
Bank 5	50	25
Total	200	100

Further exercises

1. Suppose that a central bank drops a certain amount of "helicopter money" (i. e. money distributed evenly to everyone), thus increasing the quantity of money in circulation in the economy. What would be the consequences in the short run? What would be the long-term effects?

2. If the consumer price index increases, the purchasing power of money
   - decreases?
   - remains the same?
   - increases?

3. A leftward shift in aggregate supply can be due to
   - an increase in real wages (assuming a given productivity)?
   - a decrease in productivity?
   - an increase in money demand?

Solutions

1. In the short run, people may feel wealthier and thus increase their spending. Therefore, real growth may increase in the short run but return to its original level after some time. In the long run, a one-to-one increase in the price level will materialise.

2. If the consumer price index increases, the purchasing power of money will decrease.

3. A leftward shift in aggregate supply can be due to an increase in real wages or a decrease in productivity.

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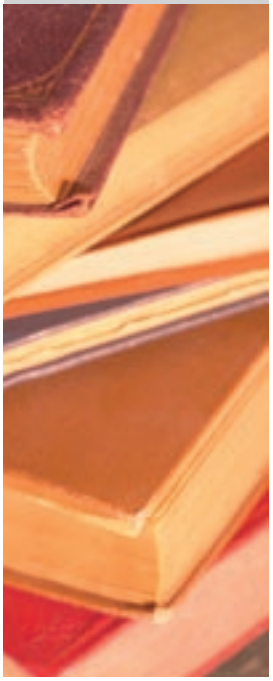

European Central Bank
Kaiserstrasse 29
60311 Frankfurt am Main
Germany
www.ecb.europa.eu EN