

## Globalisation and monetary policy

Recently, the significance of the globalisation process for monetary policy has come increasingly under the spotlight. There are two issues at play here: the influence of global factors on price developments – and thus on the monetary policy target – as well as the implications of globalisation for the transmission of monetary policy.

This article provides an overview of the current status of the debate. It comes to the conclusion that the globalisation process neither lessens the need for a stability-oriented monetary policy nor fundamentally calls into question the ability of an independent central bank to guarantee price stability over the medium term. However, it may be assumed that the growing interlinkages between the goods and financial markets have altered the price dynamics and the monetary transmission process. The relative strength of the potential changes and thus their net impact on the monetary policy data set are very difficult to quantify, though. Increasing globalisation ultimately raises the degree of uncertainty with which monetary policy decisions are taken. This concern is addressed by means of a broad analysis of economic indicators.

## Significance of globalisation for central banks

*Globalisation and maintenance of price stability*

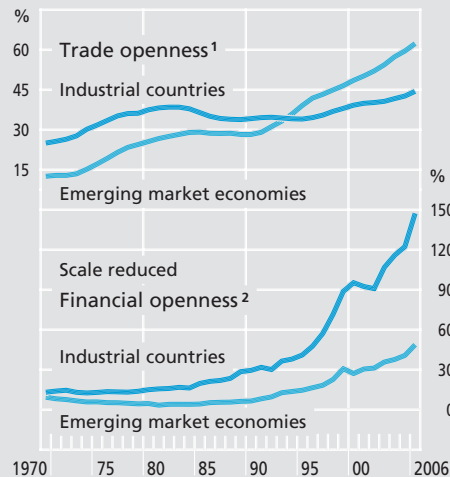
The phenomenon of globalisation and its social, political and economic dimensions have attracted a lot of attention in the past few years. This article addresses the implications of globalisation for price developments and monetary policy.<sup>1</sup> The main task of the Eurosystem as well as of most other central banks is to maintain price stability. From a monetary policy perspective, therefore, the question of whether and how globalisation affects the fulfilment of this task is a core issue. There are two aspects of particular interest here. First, it must be examined whether and in what form, if at all, globalisation affects macroeconomic price developments. In this connection, there are many who claim, for instance, that greater world economic integration has dampened inflation rates in the developed world. Second, it must be examined whether globalisation – as some observers have asserted – has altered the channels of influence of monetary policy measures. Any evidence of such changes must accordingly be taken into account in the monetary policy analysis and the decision-making process.

### Globalisation – definition and key variables

*Measures of the degree of globalisation*

In economic terms, globalisation denotes the process of a progressively greater international division of labour, as a consequence of which goods, financial and labour markets, once primarily national in their scope, are becoming increasingly integrated.<sup>2</sup> To pin down

### Trade and financial openness



Source: IMF. Definition of country aggregates: see World Economic Outlook, April 2006, p 101. — 1 Sum of exports and imports as a percentage of GDP (five-year moving average). — 2 Sum of the stocks of external assets and liabilities of foreign direct investment and portfolio investment as a percentage of GDP.

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the term, reference is often made to the worldwide integration of markets, the internationalisation of production, the integration of economic activities or the increasing mutual interdependency of the world's economies. The extent to which a national economy or economic zone is exposed to the globalisation process can accordingly be measured using indicators such as the degree of financial and trade openness of the country concerned.

The degree of trade openness – defined as the sum of the exports and imports of goods

*Degree of trade openness*

<sup>1</sup> For more on the significance of greater world economic integration for the German economy, see Deutsche Bundesbank, Germany in the globalisation process, Monthly Report, December 2006, pp 17-34.

<sup>2</sup> See IMF (2006), How has globalization affected inflation?, World Economic Outlook, April 2006, pp 97-134.

and services divided by gross domestic product (GDP) – has risen distinctly in many countries over the past few decades. This process already surged visibly in the 1970s and has been doing so again with renewed vigour since the mid-1990s. The recent trend has been spurred, in particular, by falling communication and transport costs as well as the opening up of the markets in China, India and central and eastern Europe.

*Degree of financial openness*

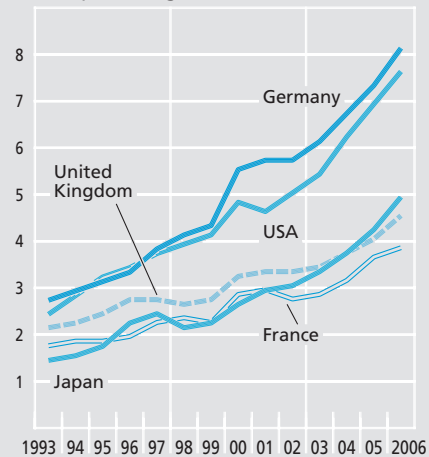
Financial integration has grown at an even more visibly accelerated pace. In many countries, including Germany, both cross-border portfolio investment and foreign direct investment (FDI) have skyrocketed since the beginning of the 1990s. Accordingly, these countries' degree of financial openness – defined as the sum of external assets and liabilities divided by GDP – has increased much more sharply than the degree of trade openness since the beginning of the 1990s.

*Drivers of globalisation*

Technological progress, especially in information and communications technology, the opening up of markets in many countries and the deregulation of the product and labour markets as well as of the financial sector, have all been drivers of the increasing division of labour in the world economy. These developments, which also affect the conditions under which monetary policy operates, are, however, not detached from the degree of international integration and the extent of international competition. Consequently, any attempt to empirically estimate globalisation's isolated contribution to changes in national price formation processes or monetary policy

### Share of imports from low-cost countries\*

As a percentage of GDP



Sources: IMF and Bundesbank calculations. — \* Definition of the group of countries: new EU member states (since 2004); Croatia, Serbia and Montenegro, Turkey and Ukraine; Russia; Algeria, Egypt, Morocco and Tunisia; China, India, Indonesia, Malaysia, Pakistan, the Philippines, Thailand and Vietnam; Argentina, Brazil, Chile and Mexico.

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transmission is fraught with considerable uncertainty.

### The significance of globalisation for the worldwide decline in inflation rates

In parallel with the acceleration of globalisation since the beginning of the 1990s, a distinct decline in inflation rates has also been recorded. This trend first appeared in the developed world. The emerging market economies (EMEs) then followed suit, with a certain time lag. The variability of inflation rates declined at the same time. It is largely agreed that the main reason for this positive trend lies in the greater orientation and focusing of monetary policy towards safeguarding price stability. The institutional foundations were

*Monetary policy reorientation as the main reason for global disinflation*



created by giving more and more central banks independence, legally enshrining the goal of price stability and adopting a variety of transparency-enhancing measures, such as introducing quantitative targets. Some observers, however, also emphasise the fact that globalisation has fostered the process of disinflation, thus alleviating the work of central banks.<sup>3</sup>

### Possible channels of influence

In principle, there are various ways in which globalisation may have contributed to lower rates of inflation. A possible channel could be that globalisation itself has strengthened the monetary authorities' orientation towards price stability. In that vein, there are several theoretical arguments in support of the con-

tention that central banks' awareness of the need for price stability increases in line with the degree of openness, for instance, because greater capital mobility enhances the incentive for monetary policy discipline.<sup>4</sup> However, it must also be noted that the disinflation process had begun not only in Germany but also in other European countries as well as the United States as early as the beginning of the 1980s, ie long before the most recent acceleration of the pace of globalisation.<sup>5</sup>

Another line of argument asserts that consumer price developments in the industrial countries have been dampened by the availability of cheap imports of finished goods from Asia as well as central and eastern Europe in two ways: directly, through the effect that falling import prices for these products has on domestic prices (import price channel), and indirectly, through greater pressure on the prices and wages in those sectors of the domestic economy which are particularly exposed to foreign competition (competition channel).

What is correct here is that many of the goods contained in the consumer price index are tradable goods whose prices are increas-

*Import price and competition channels*

*Both price-dampening and price-increasing effects of globalisation ...*

*Globalisation as a reason for monetary policy reorientation?*

<sup>3</sup> Examples include K Rogoff (2003), Globalization and Global Disinflation, Jackson Hole 2003 Symposium Proceedings, Federal Reserve Bank of Kansas City, and BIS (2006), 76th Annual Report, pp 82-89.

<sup>4</sup> For more details, see E Gnan and M T Valderrama (2006), Globalization, inflation and monetary policy, Monetary Policy and the Economy Q4/06, Oesterreichische Nationalbank, pp 37-54.

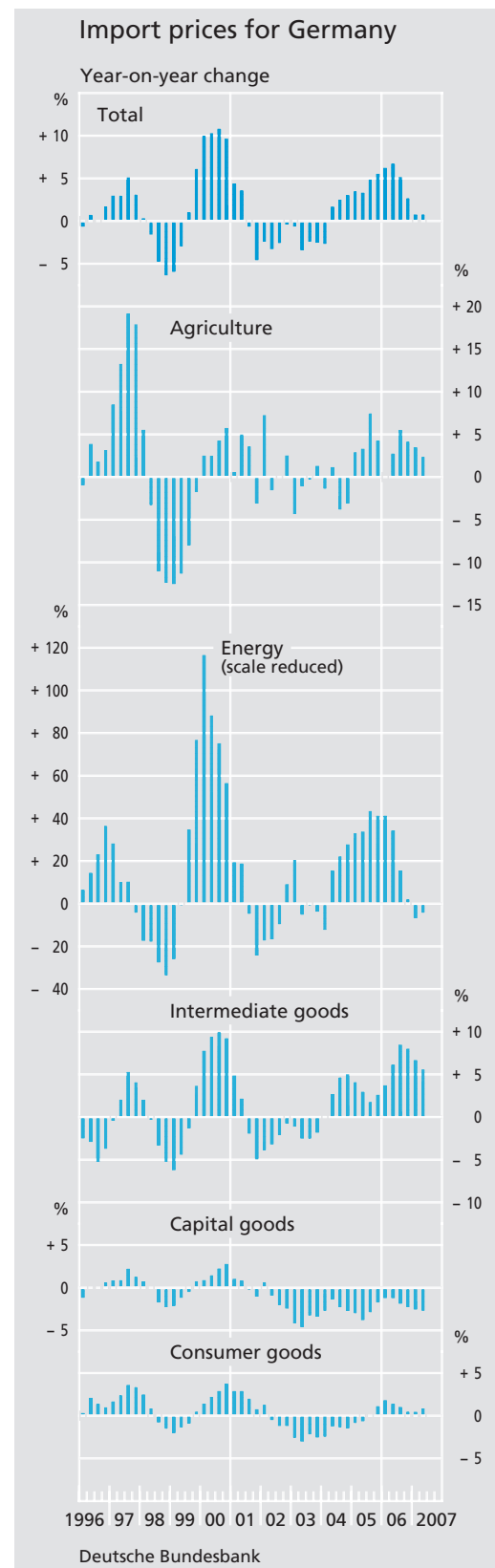
<sup>5</sup> See IMF (2006), loc cit, p 123.

ingly being set on international markets.<sup>6</sup> The consequence of this is that market developments, even in geographically distant countries, can be felt by domestic consumers (and the domestic producers of these goods). The impact of globalisation, however, can fundamentally be double-edged, ie it can dampen as well as increase prices. The recent rise in the consumer prices for milk products in Germany, reflecting a tighter supply situation and growing demand in international markets, is a topical example of globalisation's possible price-increasing effects. This example clearly shows that the overall effect of greater market integration on consumer prices in the industrial countries is initially indeterminate. For instance, over the past few years, the prices of many manufactured goods have risen only very weakly or even fallen, probably also as a consequence of the growing international division of labour. However, strong global demand for raw materials has driven up prices, especially energy prices, and this development is also associated with the fast pace of growth of major EMEs, such as China.

*... but overall effect is unclear*

Generally, the rapid industrialisation of relatively energy-inefficient EMEs means that the prices of certain non-renewable resources will probably tend to rise faster than on average. This effect of globalisation on prices in the in-

<sup>6</sup> Local distribution costs, which weaken the international price relationship, also need to be included. See, in particular, A Burstein, J Neves and S Rebelo (2003), Distribution costs and real exchange rate dynamics during exchange-rate-based stabilizations, *Journal of Monetary Economics*, Vol 50, pp 1189-1214; J Anderson and E van Wincoop (2004), Trade Costs, *Journal of Economic Literature*, Vol 42, September 2004, pp 691-751; L Goldberg and J Campa (2006), Distribution margins, imported inputs, and the sensitivity of the CPI to exchange rates, NBER Working Paper 12121.



## Globalisation and sectoral relative prices

This box examines the relationship between the openness of selected sectors of the manufacturing industry (relative to the average degree of openness of all the sectors considered) and sectoral inflationary pressure (relative to the average rate of inflation of the sectors considered) in Germany. The sectoral perspective complements the aggregate perspective and can foster greater understanding of the relationship between globalisation and price developments. Sectoral data can be used, in particular, to check the validity of the argument that the increased supply of finished goods from abroad has had a dampening effect on the prices of domestically manufactured competing products. This "global competition hypothesis" implies a negative correlation between the (relative) degree of globalisation of a sector and sector-specific inflationary pressures.<sup>1</sup> However, this does not mean that varying intensities in the pace of globalisation are the only or the main reason for diverging sectoral price developments. Different productivity trends – which can themselves however be the result of varying degrees of openness – are also likely to play a significant role. Sectoral differences in the capital and commodities intensity of production can also have a significant impact on relative prices.

In order to test the global competition hypothesis, the trends in the producer prices of selected sectors of the German manufacturing industry are compared with the respective industry-specific significance of imports. The latter is determined as a share of real imports<sup>2</sup> in the net output of each sector. The underlying monthly data in the representation for the period from 1976 to April 2007 relate to ten consolidated sectors of the manufacturing industry. Consolidation became necessary following the changeover in 1995 from the GP<sup>3</sup> 1989 to the GP 2002, which resulted in the fundamental reclassification of the manufacturing industry's sectors. Some categories of goods were assigned to new sectors, others were no longer recorded at all and some new categories of goods were added. In order to avoid a break in the time series of prices, output and foreign trade values, 21 (West German) sectors covering the period up to 1994 and

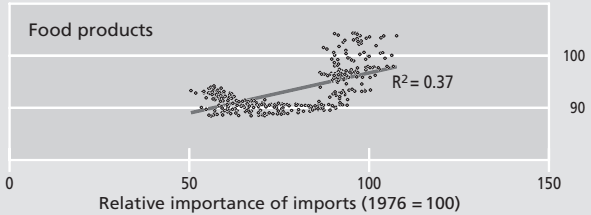
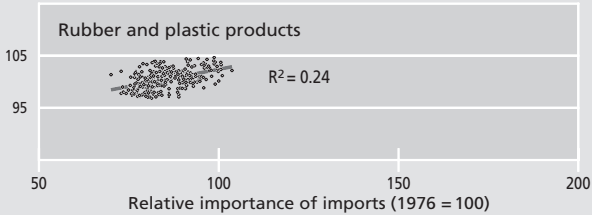
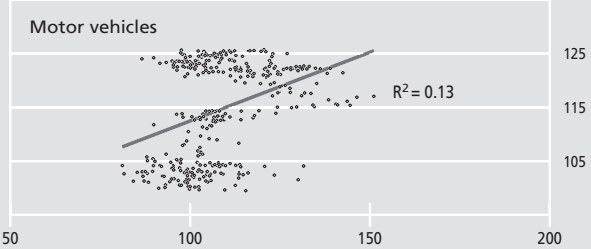
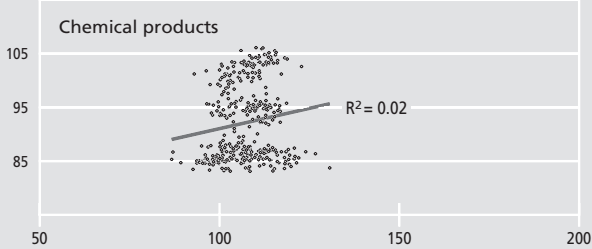
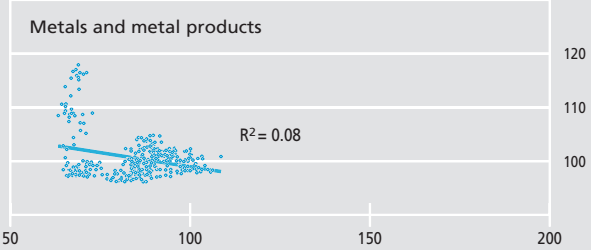
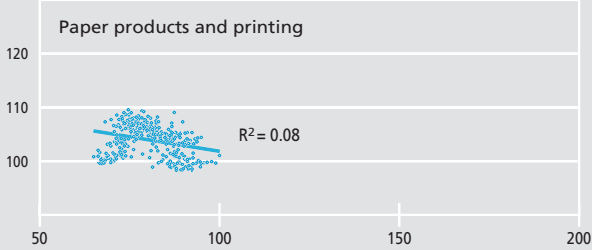
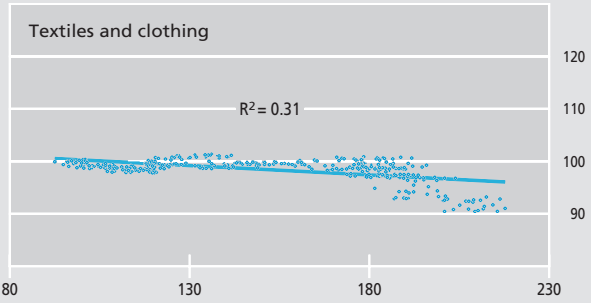
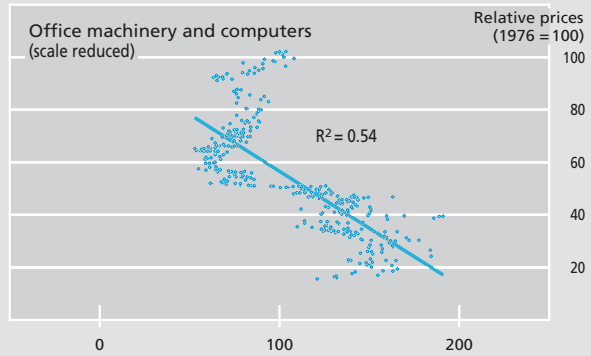
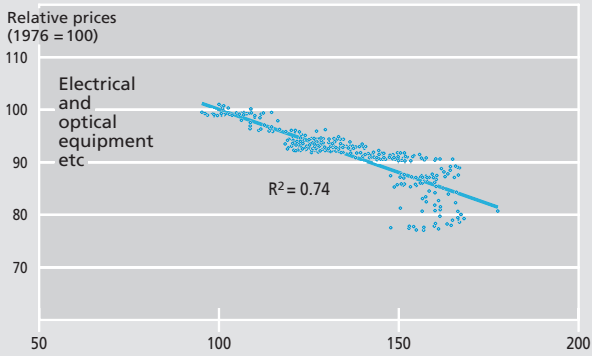
16 sectors (for Germany as a whole) covering the period as of 1995 were consolidated into ten comparable sectors and then linked.<sup>4</sup> Measured in terms of net output, these groups make up around 75% of the manufacturing industry. All of the sectoral data are taken from the monthly reports for the manufacturing industry compiled by the Federal Statistical Office; these data were seasonally adjusted prior to being consolidated and linked.

The sectoral developments in both prices and foreign trade links are compared with the weighted average of all the manufacturing industry sectors considered here (see chart on page 21). A high correlation between developments in the relative significance of imports and the relative price trend over time is apparent for the following sectors: food products, textiles, plastic products, machinery, office machinery and computers, and electrical equipment. The blue dots indicate an expected negative correlation and the black dots indicate an unexpected positive correlation between international economic integration and price developments. Overall, the negative indicators are predominant. This means that an increase in the share of imports normally leads to a decline in relative inflationary pressures. If the sectors with only a weak correlation are also taken into consideration, then two further economic sectors with negative indicators (paper and metal products) and two with positive indicators (chemical products and motor vehicles) are added. Strong positive correlations are apparent only in the food products and the rubber and plastic products sectors. However, when assessing those sectors with a positive correlation, special factors should also be taken into consideration. For example, in the past, food prices were influenced by the EU agricultural market regulation to a greater extent than they are today. In the chemicals industry, the downward pressure on prices owing to increasing competition is likely, at times, to have been obscured by oil price changes. On the whole, it can therefore be seen that the price trend was generally more moderate in sectors with relatively stronger growth in import penetration.

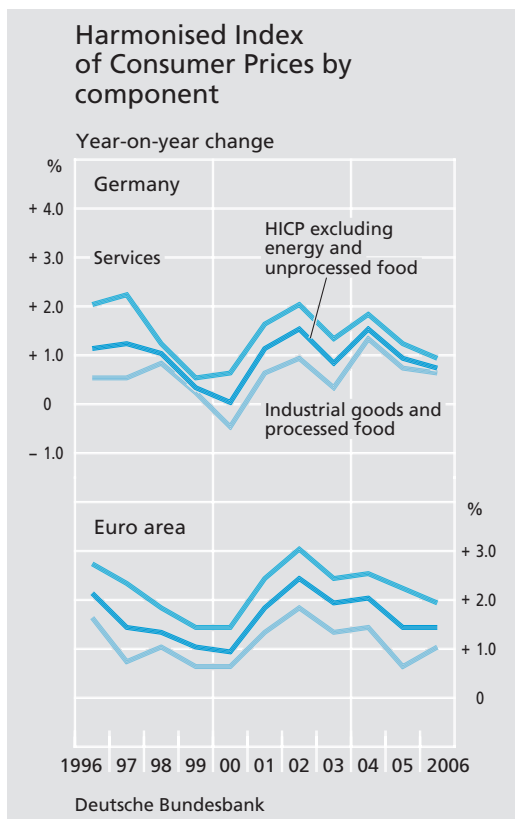
<sup>1</sup> See IMF (2006), How has globalization affected inflation?, World Economic Outlook, April 2006, p 111 ff. — <sup>2</sup> Import values deflated by import prices. — <sup>3</sup> German product classification for production statistics. — <sup>4</sup> The selection of product groups is based to a large extent on K Stahn, Has the export pricing behaviour of German enterprises changed? Empirical evidence from German sectoral export prices, Research Centre, Deutsche Bundesbank, Discussion Paper, Series 1, Economic Studies, No 37/2006, Table 1, p 8. Deviations: tobacco products were counted here as food; wood pulp, cellulose, and paper and pulp

(55) were added to the product group "paper products and printing" in accordance with GP 1989; refined petroleum products were excluded. — <sup>5</sup> Globalisation is defined as the ratio of imports (import values deflated by import prices) to net output; blue = negative correlation, black = positive correlation; sectors in which  $R^2 > 0.2$  are shaded in dark grey. Data source: Bundesbank calculations based on data from the Federal Statistical Office. — <sup>6</sup> In each case relating to the weighted average of the ten sectors considered here.

Relative prices and globalisation<sup>5</sup> (1976 to 2007<sup>6</sup>)







dustrial countries counteracts the price-dampening influence of cheap imports of finished goods from low-cost countries, which shows once again that the overall effect on domestic prices is not definite *a priori*.

In principle, the influence of such external price movements on the rate of change in domestic prices is, in many cases, merely temporary. In a regime of flexible exchange rates, the trend rate of inflation ultimately hinges on the increase in the general price level supported by the central bank. If the central bank is pursuing a clearly defined goal of price stability, it will counteract downward or upward pressure on the overall inflation rate resulting from changes in relative prices by pursuing a correspondingly expansionary or restrictive monetary policy. Both external and

domestic price impulses will then ultimately be reflected merely in changes in relative prices but not in the overall price trend.

In the adjustment stages, (temporary) effects on consumer prices may very well occur in these cases, too. Thus, for instance, the sequence of negative price shocks, especially oil price shocks, since 1999 has caused actual inflation rates in the euro area to overshoot the price stability target and inflation expectations time and again (see chart on page 23).

In addition, the knowledge that, over the medium to long term, the rate of change of the general price level is determined by monetary policy does not mean that monetary policy makers can afford to ignore globalisation's influence on price formation. On the contrary: any influence on the determinants of the price formation process is highly relevant to a stability-oriented monetary policy.

### Existing empirical evidence

Empirical studies largely find that globalisation has slightly dampened worldwide inflation. For instance, a 2006 OECD study estimates that the direct effect of cheaper imports of finished goods from China and other dynamic Asian countries has been to reduce inflation in the euro area by an average of 0.3 percentage point per year in the 2000 to 2005 period and 0.1 percentage point per year in the United States (1996 to 2005).<sup>7</sup> An ECB study published in 2007 places the direct

*Although effects of external price impulses are fundamentally only temporary, ...*

*... they are still important for a stability-oriented monetary policy*

*Price-dampening effects of rising imports from low-cost countries*

*Inflation rate determined by monetary policy over the longer term*

<sup>7</sup> See N Pain, I Koske and M Sollie (2006), Globalisation and inflation in the OECD economies, OECD Working Paper 2006/524.



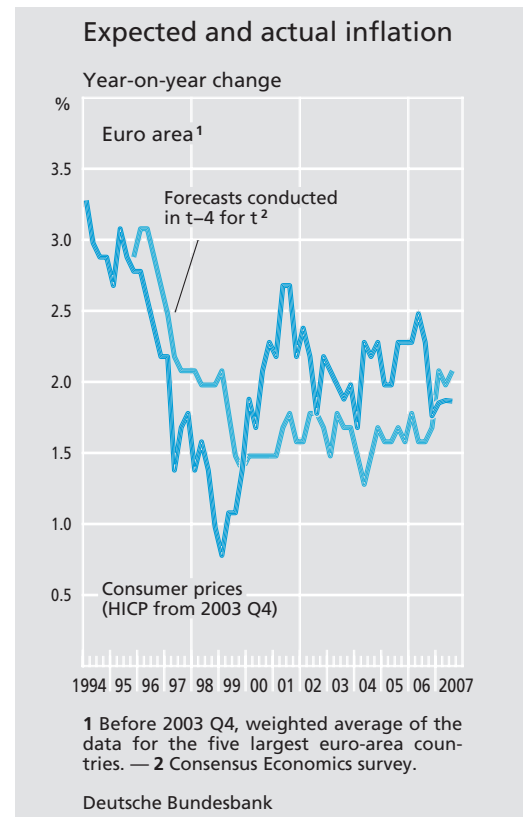
effect of rising shares of imports from low-cost countries (industrial goods excluding energy) on euro-area consumer prices at -0.05 percentage point per year and the sum of direct and indirect effects in a range from -0.1 to -0.2 percentage point (in the 1995 to 2004 period).<sup>8</sup> In some cases, however, these studies are subject to the caveat that they derive the price effects of the greater international division of labour from unit values and their trends, which are not directly comparable with standard price indices.

*Counterbalancing effect of rising commodity prices*

The aforementioned figures, in addition, overstate the actual effects because they fail to take account of the (counterbalancing) effects of globalisation on commodity prices. The OECD study therefore attempts to quantify globalisation's contribution to recent commodity price trends, too. It finds that the fast growth of the non-OECD countries could have increased real oil prices by between 20% and 40% in the 2000 to 2005 period (relative to a scenario in which the non-OECD countries' share in world trade and global GDP is kept constant). This assessment leads the authors to adjust the inflation-dampening effect of falling import prices for non-commodities by a "commodity factor" which, for example for Germany, would be in an average range of 0.05 to 0.15 percentage point per year.

*Overall effect, at most, is to dampen prices slightly*

Taking into account the price-increasing and price-dampening effects of globalisation calculated in this manner, the OECD study concludes that the net effect on consumer prices for OECD countries could have ranged from 0 to -0.25 percentage point per year (for the



1995 to 2005 period). An IMF study reaches very similar conclusions. It also finds that the impact of unexpected import price changes (which deviate from the longer-term trend) is potentially quite perceptible at the beginning, but diminishes relatively quickly over time.<sup>9</sup>

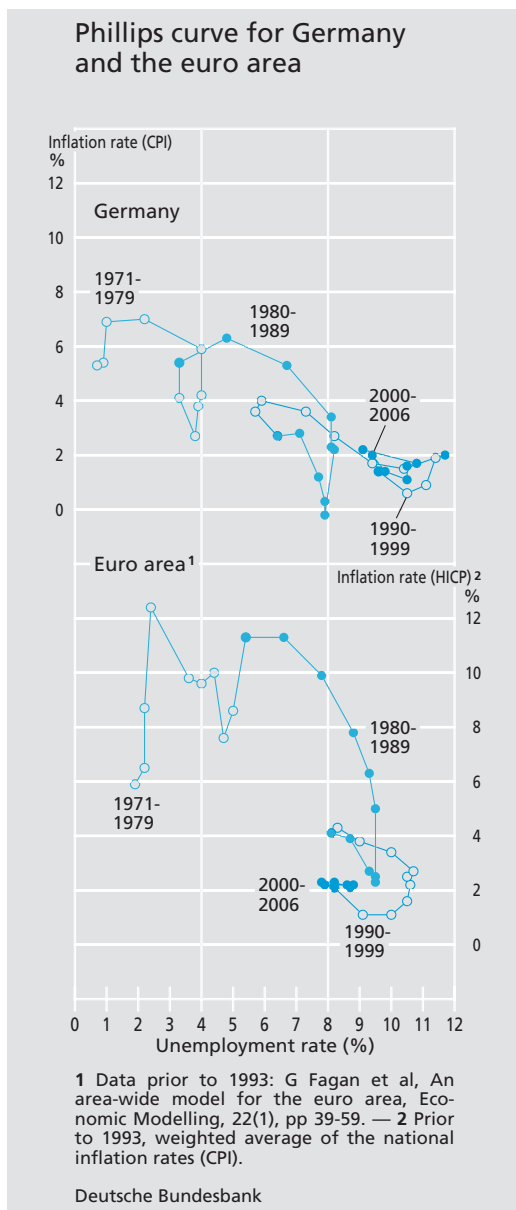
### Globalisation and the Phillips curve relationship

Another question that presents itself concerns the influence that increasing international integration may have on the relation-

*Flattening of the Phillips curve observable in many countries*

<sup>8</sup> See G Pula and F Skudelny (2007), The impact of rising imports from low-cost countries on euro area prices and labour markets, paper presented at the ECB conference on "Globalisation and the Macroeconomy" in Frankfurt am Main, Germany, 23-24 July 2007.

<sup>9</sup> See IMF (2006), loc cit, p 108 ff.



ship between price developments and domestic economic activity (the “Phillips curve”). The short-term trade-off between the inflation rate and economic activity – measured in terms of the (cyclical) unemployment rate or the output gap – has recently flattened distinctly in many countries, including Germany and the euro area. As the above chart indicates, the Phillips curve was almost vertical in Germany in the 1970s but became

increasingly flatter in the 1980s and 1990s. Since the mid-1990s, the relationship seems to be virtually horizontal.

This weakening of the Phillips curve relationship may have been influenced by the process of globalisation. Free foreign trade means that buyers are no longer dependent on a domestic supply of goods. In a regime with free movement of capital, the value of imports can also exceed that of exports (and vice versa). This weakens the link between domestic demand and domestic output and reduces the influence which the domestic output gap has on the rate of inflation. At the same time, increased openness makes prices more vulnerable to changes in capacity utilisation in the rest of the world.<sup>10</sup>

*Possible causes:  
increasing trade  
and capital  
flows ...*

In addition, growing competitive pressure owing to low-cost countries may have weakened the link between prices and production costs and/or between costs and the output gap. Stiffer competition may have forced companies in industrial countries to reduce their margins in order to offset rising costs because they were unable to effect any price increases. However, this is more likely to be a temporary rather than a lasting effect. In principle, the impact of reduced market power on the Phillips curve relationship should be limited to the period of falling profit margins. Once they have fallen to a sufficiently low level – in an extreme case, to zero – com-

*... as well as  
stiffer inter-  
national com-  
petition*

<sup>10</sup> See A Razin and C W Yuen (2002), The “New Keynesian” Phillips curve: closed economy vs. open economy, *Economics Letters*, Vol 75, May, pp 1-9, as well as J Gali and T Monacelli (2005), Monetary policy and exchange rate volatility in a small open economy, *Review of Economic Studies*, Vol 72, pp 707-734.

panies will, sooner or later, be forced to pass on increased costs, which will cause prices to be more flexible and the Phillips curves to steepen again.<sup>11</sup> In addition, on average, margins have increased – not decreased – over the past few years.<sup>12</sup>

*Production relocation and immigration*

In addition, globalisation may have also weakened the link between production costs and capacity utilisation. Companies' improved opportunities for relocating jobs to low-cost countries is likely in general to have had a moderating effect on the wage demands of the domestic labour force, thus weakening the link between the domestic labour market situation and wage developments. Another factor which may have watered down the impact of activity shifts on unit labour costs is the greater international mobility of labour, which has led to immigration by workers from low-cost countries.

*Globalisation as a possible reason for an increase in potential output*

The greater opening up of labour markets, as well as immigration, may not only have caused the Phillips curve to flatten but could also have had a positive impact on industrial countries' potential output. The efficiency gains associated with the greater international division of labour and the intensification of competition are likely to be having a similar effect.<sup>13</sup> An increase in potential output would lead to a downward shift of the Phillips curve, which may possibly be very difficult to distinguish empirically from a flattening of the curve. However, in order to harness these positive effects successfully, firms and workers in the economies concerned have to be willing to undertake a process of structural change and adjustment.<sup>14</sup>

On the whole, however, it must also be noted that, in many countries, the period of accelerating globalisation saw a simultaneous increase in the orientation of monetary policy towards monetary stability. The concomitant stronger anchoring of inflation expectations has probably reduced the cyclical variability of inflation rates and their sensitivity to shocks.<sup>15</sup> An empirically observable flattening of the Phillips curve is therefore not necessarily attributable to the increasing division of labour in the world economy.

*Role of monetary policy*

### Empirical evidence

The theory that globalisation has made prices less dependent on the domestic output gap yet at the same time more vulnerable to changes in capacity utilisation in the rest of the world has recently been subjected to empirical review from various quarters. A BIS study finds that, for 16 selected OECD countries, on the whole, the global output gap makes a significant contribution to explaining

*Studies bear out negative influence of openness on rising Phillips curve*

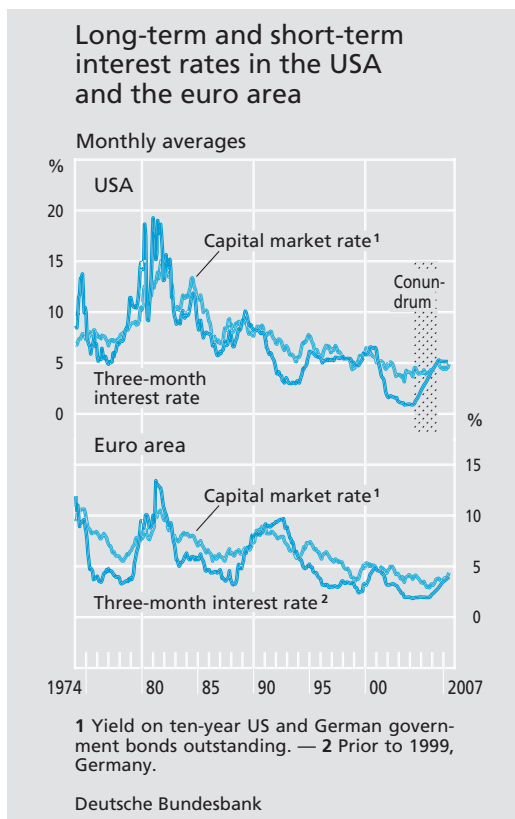
11 See J Boeckx (2006), *Globalisation and Monetary Policy*, Economic Review, September 2006, National Bank of Belgium.

12 Thus, the GDP deflator to unit labour cost ratio, a standard macroeconomic measure of the overall profit margin, has widened distinctly in the past few years.

13 In addition, the globalisation-related improvement in the terms of trade is likely to increase the industrial countries' potential output and reduce the non-accelerating inflation rate of unemployment (NAIRU). See K Rogoff (2006), *Impact of Globalization on Monetary Policy*, Jackson Hole 2006 Symposium Proceedings, Federal Reserve Bank of Kansas City.

14 The process whereby Germany's potential output has been adjusting to the changed environment is described in the article "Advances in strengthening the economy's growth potential" in this Monthly Report on pages 35-45.

15 This is because, in the (extended) Phillips curve model, the inflation rate is dependent not only on capacity utilisation but also on expectations. If a central bank succeeds in firmly anchoring inflation expectations at a low level, this dampens, in isolation, the extent of shock-induced deviations from the longer-term price trend.



price movements and reduces the influence of domestic variables on price movements.<sup>16</sup> By contrast, Ihrig et al (2007), using a somewhat different specification for the estimation equation, find no evidence of any such developments.<sup>17</sup> Gadzinski and Hoffmann (2007) study the influence of trade integration on the slope of the Phillips curve in the G7 countries using a non-linear model in which the slope is time-varying and depends on the degree of openness. Although the results of this study bear out the imputed negative correlation between openness and the slope of the Phillips curve, it is impossible to identify a significant positive impact of the global output gap.<sup>18</sup>

A fundamental problem afflicting this analysis and similar analyses is that the estimated Phil-

lips curves do not capture any real structural relationships. Consequently, an observed flattening of the Phillips curve in a country can reflect not only a “real” change in the structural relationship between the output gap and the price trend but also, for instance, a change in the behaviour of monetary policy makers (with all other structures remaining unaltered) which has loosened the empirical link between the output gap and price developments.<sup>19</sup> In order to gauge the significance of the increased stability orientation of monetary policy and the associated stabilisation of inflation expectations in relation to the influence of globalisation, the IMF study includes measures of trade openness and monetary policy credibility in the estimation equation.<sup>20</sup> The estimation results indicate that greater openness and the increased stability orientation of monetary policy are each roughly 50% responsible for the fall in the slope of the Phillips curve.

*Stabilisation of inflation expectations likewise significant*

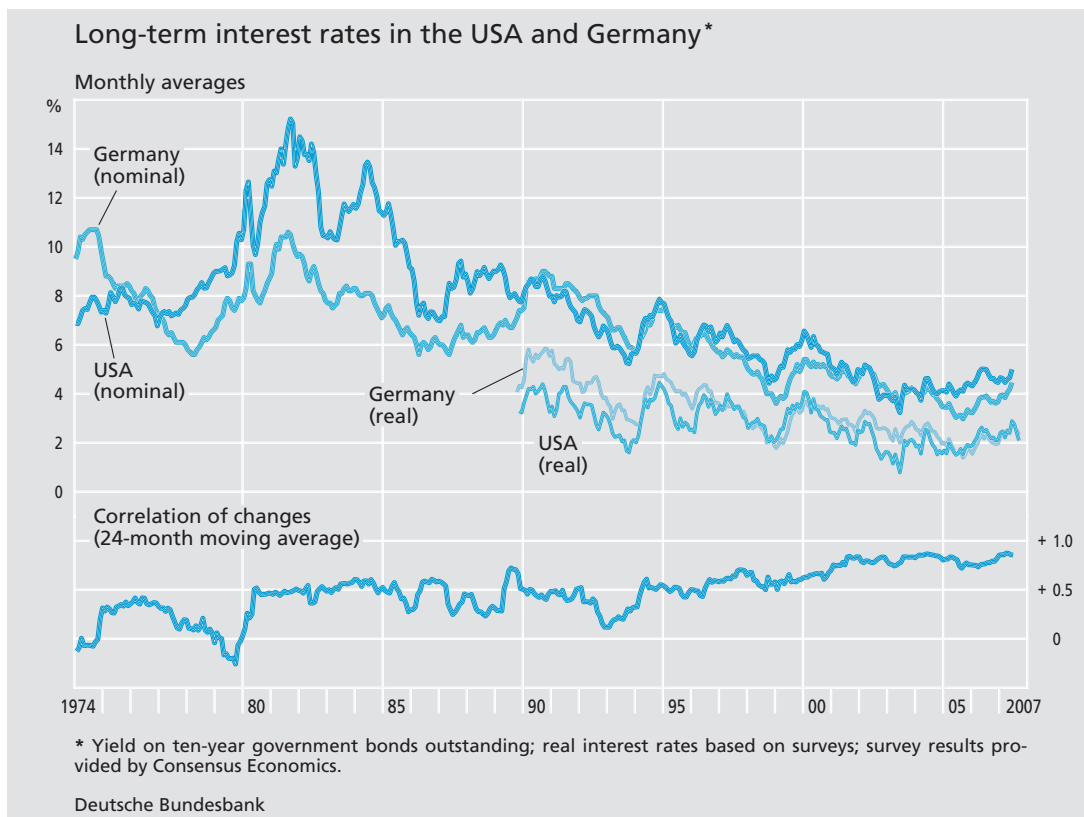
<sup>16</sup> See C Borio and A Filardo (2007), Globalisation and inflation: New cross-country evidence on the global determinants of domestic inflation, BIS Working Paper No 227. The authors detect hardly any effects for the euro area, however.

<sup>17</sup> See J Ihrig et al (2007), Some Simple Tests of the Globalization and Inflation Hypothesis, Board of Governors of the Federal Reserve System, International Finance Discussion Paper No 891.

<sup>18</sup> See G Gadzinski and M Hoffmann (2007), Trade Integration and the Phillips Curve, unpublished manuscript, forthcoming as a Deutsche Bundesbank discussion paper. Gnan and Valderrama obtain similar results for the euro area. See E Gnan and M T Valderrama (2006), loc cit, pp 37-54.

<sup>19</sup> For instance, Roberts finds that a higher weighting of the inflation gap in the monetary policy reaction function explains most of the flattening of the Phillips curve relationship for the USA observed since the early 1980s. See J Roberts (2006), Monetary Policy and Inflation Dynamics, International Journal of Central Banking, Vol 2, pp 193-230.

<sup>20</sup> See IMF (2006), loc cit, p 106 ff.



## Globalisation, monetary policy and financial markets

*Increasing integration of capital markets ...*

Up to now, this article has focused on the impact of growing trade linkages on price developments in the industrial countries. The increasing integration of capital markets is another key aspect of globalisation. As mentioned earlier, the financial openness of many economies has increased even more strongly than their degree of trade openness over the past few years. Growing stocks of cross-border financial assets have brought with them greater potential for extensive and (possibly) volatile capital movements.

## Globalisation and capital market rates

These developments may have far-reaching implications for both financial stability and monetary policy. Risks to financial stability can arise, for instance, from the existence of persistent imbalances in trade and capital flows as well as from the increased danger of contagion effects.<sup>21</sup> The degree to which financial market globalisation has changed the extent and manner in which monetary policy measures can take effect requires examination from a monetary policy perspective. The key question in this respect is whether growing financial market integration – as some observers fear – has impaired or even completely undermined monetary policy makers' influ-

*... calls into question the influence of national monetary policy on domestic capital market rates*

<sup>21</sup> See Deutsche Bundesbank, Financial Stability Review, November 2006, p 16 ff.

## International linkage of interest rates and the national term structure

This box will firstly examine the co-movement of the yields on ten-year German and US government bonds. The existence of international linkages between interest rates is based on the theoretical concept of uncovered interest parity (UIP).<sup>1</sup> In order to take into account the risk aversion among investors observed in practice, a risk premium is added to the UIP for the purposes of empirical testing. If both the expected exchange rate changes and the risk premium are stationary, this implies the existence of a cointegration relationship between the two long-term interest rates.

As a rule, studies on German-US interest rate linkages that start before 1985 cannot prove the existence of a cointegration relationship.<sup>2</sup> An analysis of the total estimation period available (1974 to 2007) confirms this finding. However, if the estimation period begins at a later date, from the mid-1980s the Johansen test statistic provides the first indications of a stable long-term relationship; from 1990 onwards, ie the period of dynamic financial market globalisation, it is possible to speak of a stable cointegration relationship, which also continues to exist with slight variations in estimation periods and lag lengths.

Johansen test statistic for the cointegration of nominal US and German long-term interest rate yields<sup>3</sup>

Period	Eigenvalue	Trace test	P-value	Number of cointegration vectors
1985 to 2007 (lag 1)	0.0556	18.58	0.084	None*
1990 to 2007 (lag 1)	0.0115	3.13	0.556	At least 1
1990 to 2007 (lag 1)	0.0964	24.54	0.012	None**
1990 to 2007 (lag 1)	0.0153	3.25	0.536	At least 1

An analysis of the adjustment coefficients and the impulse-response functions within the framework of a bivariate vector error correction model (VECM) confirms the overall picture painted by earlier studies, namely that the German long-term interest rate is characterised by a high dependency on the US interest rate.<sup>4</sup> Thus the question arises – particu-

larly from a European perspective – as to the remaining significance of domestic determinants for the level of long-term interest rates.

Therefore, in a second step, the respective national short-term interest rates (measured in terms of the three-month interest rates) are included in the analysis.<sup>5</sup> A link between national interest rates of different maturities can be derived from the expectations hypothesis of the term structure (EHT), which assumes an arbitrage relationship between short-term and long-term interest rates.<sup>6</sup> According to this method, the long-term interest rate is the average of the current and the expected future short-term interest rates. A risk premium which is assumed to be stationary is also added to this equation for the purposes of empirical testing. In order to test the influence of domestic factors (as predicted by the EHT) while at the same time taking account of the international co-movement of interest rates, a VECM is estimated whose variables are the two long-term interest rates as well as the three-month interest rates for the USA and Germany/the euro area.<sup>7</sup> With a lag length of three (as required by the Akaike Information Criterion), the Johansen cointegration test at the 10% level produces the three theoretically expected cointegration vectors which result from the UIP between the two markets and the EHT for the US market and the German/European market. The expected constraints on the relationships between the differing interest rates are also not rejected empirically (LR test statistic: 3.58; p-value: 0.31).

The analysis of the adjustment to the long-term equilibrium shows that the VEC system is driven by a long-term trend which is determined by the US short-term interest rate.<sup>8</sup> The chart on page 29 depicts the reaction of the long-term domestic interest rate to relevant shocks in the individual variables. An impulse in US short-term interest rates induces a permanent effect on German/European long-term interest rate yields, while the effect of a shock in the US long-term interest rate is only transitory. A shock in the German/European short-term interest rates brings about a significant impulse lasting over four months. Even taking into account the international co-movement of interest rates, the short-term domestic interest rate thus has a significant influence on the capital market rate.

1 For more details, see Deutsche Bundesbank, Covered and uncovered interest rate parity, Monthly Report, July 2005, p 29. — 2 See M Kremer (1999), Die Kapitalmarktzinsen in Deutschland und den USA: Wie eng ist der Zinsverbund? Eine Anwendung der multivariaten Kointegrationsanalyse, Deutsche Bundesbank, Discussion paper, No 02/1999. — 3 In the cointegration tests, a constant is permitted, but a trend is not. P-values according to MacKinnon/Haug/Michelis (1999); \* significant at the 10% level; \*\* significant at the 5% level. — 4 See, for example, F A Den Butter and P W Jansen (2004), An Empirical Analysis of the German Long-Term Interest Rate, Applied Financial Economics 14, pp 731-741. — 5 See R Brüggemann and H Lütkepohl (2005), Uncovered Interest Rate Parity and the Expectations Hypothesis of the Term Structure: Empirical Results for the U.S. and Europe, Applied Economics Quarterly 51, pp 143-

154. — 6 For more details, see Deutsche Bundesbank, Determinants of the term structure of interest rates – approaches to combining arbitrage-free models and monetary macroeconomics, Monthly Report, April 2006, pp 15-28. — 7 The underlying data are based on the monthly averages from January 1985 to July 2007. Up to 1998, German data are used for Germany/the euro area; from 1999 onwards, the ten-year government bond yields for the euro area calculated by the ECB and the three-month EURIBOR are used. — 8 One possible explanation for this is that the US economic cycle had a lead over the European economic cycle during the period of analysis; another is that US monetary policy reacts more quickly and aggressively to synchronised shocks. See L Christiano et al (2007), Shocks, Structures or Monetary Policies?, ECB Working Paper No 774.



ence on national capital market rates. This issue is of particular interest because capital market rates are one of the main channels through which monetary policy makers can exert an influence on decisions in the real economy and therefore also on price developments.

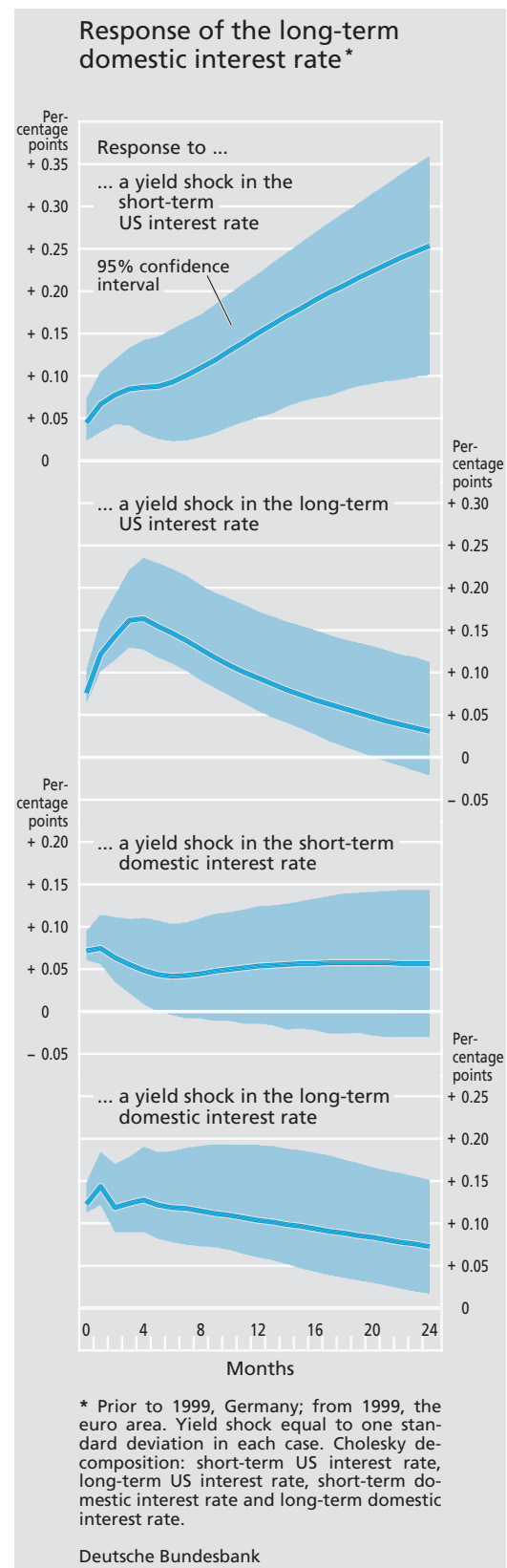
*“Conundrum”*

The apparent breakdown in the conventional relationship between the fed funds target rate and the long-term US capital market rates during the latest period of interest rate hikes is a recent addition to the debate. As the chart on page 26 shows, the increase in the fed funds target rate of 4.25 percentage points from June 2004 to June 2006 initially did not have any visible impact on the long-term interest rate, which even fell by around  $\frac{3}{4}$  percentage point up until June 2005. The stark contrast between this pattern and the hitherto prevailing positive relationship between short-term and long-term interest rates led then-Federal Reserve chairman, Alan Greenspan, to speak of a “conundrum”.<sup>22</sup>

*Significance of external factors for the level of long-term interest rates*

Against the background of the exceptionally high inflows of capital into the United States, it seemed appropriate to examine the greater influence of external factors on US capital market rates as a possible explanation for their unusually low level. The theory that the level of long-term (real) interest rates in globalised financial markets is increasingly being determined by global factors also offers an explanation as to why long-term interest rates have fallen not only in the United States

<sup>22</sup> See A Greenspan, Testimony before the Committee on Banking, Housing, and Urban Affairs of the United States Senate on 16 February 2005.





over the past few years but in other parts of the world as well (see chart on page 27). Some observers believe that this sustained decline is due to a surplus of available worldwide savings in excess of worldwide demand for funds, also known as the “global saving glut”.<sup>23</sup> Other factors are also being discussed in this context, such as the increase in monetary policy and real stability (“the Great Moderation”) and a decrease in risk aversion that has lasted for many years.<sup>24</sup>

### Empirical evidence

Empirical studies confirm the significance of global factors for the level of long-term real interest rates. However, this is not necessarily a new phenomenon, but was already demonstrated to have been true for the 1958 to 1989 period, ie prior to the latest surge of globalisation.<sup>25</sup> The high degree of synchronisation between movements in the long-term nominal interest rates of key industrial countries, however, is much more recent. US and German capital market rates have converged significantly since the beginning of the 1990s and are very highly correlated at the current end.<sup>26</sup>

However, the high correlation between movements in national interest rates does not necessarily imply that central banks no longer have any influence on capital market rates. Rather, the greater co-movement of long-term interest rates could also reflect a more frequent occurrence of global shocks – ie affecting countries equally – as well as similar monetary policy reactions to these shocks. The question of whether the influence of

monetary policy stimuli on national long-term interest rates has diminished significantly therefore needs to be studied separately. Simple correlation analyses indicate that, in the euro area and selected OECD countries, the link between long-term nominal interest rates and short-term interest rates has loosened recently.<sup>27</sup> However, this result does not constitute any clear-cut evidence that monetary policy has lost influence, but might instead also reflect more stable inflation expectations against the background of increased monetary policy credibility. Simply looking at changes in actual short-term interest rates is insufficient to examine the influence of changes in key interest rates on long-term interest rates insofar as it disregards the potential impact of changes in expectations about the future path of money market interest rates (“the expectations component”) on capital market rates. Studies which focus on the impact of unexpected changes in short-term interest rates or of “monetary policy

*Increasing convergence of long-term nominal interest rates*

*No clear-cut signs that monetary policy has lost influence*

<sup>23</sup> See B Bernanke, The Global Saving Glut and the US Current Account Deficit, speech delivered in Richmond, Virginia, USA on 10 March 2005.

<sup>24</sup> One of the first articles written on this topic is O Blanchard and J Simon (2001), The long and large decline in US output volatility, *Brookings Papers on Economic Activity*, pp 135-164. See also T Wu (2006), Globalization's Effect on Interest Rates and the Yield Curve, *Economic Letter Vol 1 No 9*, Federal Reserve Bank of Dallas, pp 1-7.

<sup>25</sup> See R Barro and X Sala-i-Martin (1990), *World Real Interest Rates*, NBER Working Paper 3317, as well as C Upper and A Worms (2003), Real long-term interest rates and monetary policy: a cross-country perspective, *BIS Papers No 19*, Monetary Policy in a Changing Environment.

<sup>26</sup> See R Brüggemann and H Lütkepohl (2005), Uncovered Interest Rate Parity and the Expectations Hypothesis of the Term Structure: Empirical Results for the US and Europe, *Applied Economics Quarterly* 51, pp 143-154.

<sup>27</sup> See, for example, L Reichlin (2006), Panel remarks at the Thirteenth International Conference on “Financial Markets and the Real Economy in a Low Interest Rate Environment”, Tokyo, Bank of Japan.

news", at any rate, find no evidence that either the Eurosystem's or the US Federal Reserve's monetary policy influence on long-term interest rates has diminished.<sup>28</sup>

### Conclusions – consequences for monetary policy decision-making

*Uncertainty regarding sign and extent of future price effects of globalisation*

Although increasing trade and financial openness neither impair an independent central bank's ability to fundamentally safeguard medium-term price stability, nor relieve it of its obligation to be stability-oriented, the globalisation process presents monetary policy with a series of challenges. Firstly, central banks must expect the growing interlinkages between national economies to also involve more major shifts in relative prices in future, yet there is considerable uncertainty *a priori* surrounding the sign and the extent of the effects. For instance, experience over the past few years has shown that the internationalisation of markets can generate not only price-dampening but also price-increasing effects.

*Tolerating the impact of temporary price shocks*

Given well-anchored inflation expectations, the efficient monetary policy reaction to such relative price shocks would be to tolerate their first-round effects and to change the direction of monetary policy only if signs of second-round effects appear or if the price movements prove to be persistent, thus jeop-

ardising the central bank's stability objective. Such a strategy has also been successfully applied by the Eurosystem in the past few years. In this context, it is important that the central bank reacts symmetrically to negative and positive price shocks. After all, if it were only to tolerate the first-round effects of negative (inflation-raising) price shocks but loosen interest rate policy immediately at the first sign of positive (inflation-dampening) shocks, the resultant monetary policy would, on average, be too expansionary.

Moreover, the above considerations have shown that globalisation may well have lessened the influence of national cyclical swings on general price movements. An advantage of such a loosening would be that inflation rates would react less strongly to demand shocks and policy errors (for instance, owing to a flawed assessment of the output gap). However, at the same time, it would make it more difficult for monetary policy makers to influence price developments via the traditional (goods) demand channel. Although the same factors which weaken the (structural) link between price developments and the output gap may be expected to also dampen the effects of supply-side price shocks on consumer prices, it could be more difficult to realign the inflation rate once inflation expectations have begun to diverge from the definition of price stability. To that extent, the potential weakening of the link between price developments and domestic economic activity provides a further reason for a forward-looking monetary policy which is also oriented towards the stabilisation of inflation expectations. This is all the more so as

*Possible loosening of the Phillips curve relationship reinforces the significance of stable inflation expectations*

<sup>28</sup> This is demonstrated, for instance, by the studies published by M Ehrmann et al (2005), Stocks, Bonds, Money Markets and Exchange Rates, ECB Working Paper No 452, and C Brand et al (2006), The Impact of ECB Monetary Policy Decisions and Communication on the Yield Curve, ECB Working Paper No 657.

the empirically observed diminished sensitivity of inflation to cyclical fluctuations – as mentioned earlier – may at least partly be precisely the result of a stability-oriented policy. If this is the case, a lagged monetary policy reaction to risks to price stability, motivated by the supposedly high real economic costs of reducing inflation owing to what is assumed to be a flatter Phillips curve relationship, would jeopardise the foundations of its own success and contribute to the destabilisation of inflation expectations.

*Considerable problems regarding the measurement of global output gaps*

It has hitherto not been possible to demonstrate unequivocally that measures of the global output gap have a significant influence on the (shorter-term) price developments in the euro area and other key industrial countries. However, even if this were the case, it should still be borne in mind that estimates of global potential output and the global output gap are fraught with even greater uncertainty than estimates of national output gaps. Consequently, the usefulness of such measures for gauging future inflationary pressures is likely to be rather limited in practice.

*Long-term interest rates still also dependent on monetary policy*

Finally, the possibility that the international integration of capital markets has diminished the influence of monetary policy on long-term market interest rates cannot be ruled out. This does not mean, however, that monetary policy has fundamentally become ineffective. For one thing, it can be assumed that the level of longer-term interest rates will continue to depend not only on global factors but also on the private sector's expectations about the future direction of monetary policy and future inflation. Transparency, communi-

cation and monetary policy credibility take on a position of decisive importance here. For another, mainstream open economy models state that, as capital mobility increases, changes in interest rates trigger sharper exchange rate changes and that the impact of these exchange rate movements on domestic prices more than offset the diminishing opportunities to influence interest rates. On balance, globalisation might thus weaken some transmission channels while reinforcing others.

The empirical evidence available for the euro area does not clearly answer the question of whether and how globalisation has actually altered the transmission channels of monetary policy impulses. On the one hand, this result may mean that the greater degree of openness has so far not been of any major significance for monetary policy transmission. On the other hand, it may also be attributable to the fact that these are relatively new developments whose impact cannot yet be pinned down empirically, or that these developments have hitherto been eclipsed by other factors, such as the change of monetary regime with the introduction of the euro, which has had an even greater influence on structural relationships.

All in all, therefore, the globalisation process is heightening the already considerable level of data, parameter and model uncertainty under which monetary policy decisions need to be taken. One important consequence is surely that the database as well as the methods and models of analysis used need to be constantly reviewed and continuously im-

*Hitherto no clear-cut signs of changes in the transmission process*

*Increased uncertainty requires a broadly based monetary policy strategy*

proved.<sup>29</sup> Owing to the problem of model uncertainty, it is generally advisable, when assessing the outlook for prices, not to focus on a single model but to pursue a broadly based approach for analysing information which takes into account different specifications of the channels of the monetary transmission mechanism. The Eurosystem addresses these

requirements by means of a broad analytical framework which, in particular, cross-checks the results obtained through the (real) economic analysis with those of the monetary analysis.

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<sup>29</sup> See Deutsche Bundesbank, Monetary policy under uncertainty, Monthly Report, June 2004, pp 15-27.