€

ECB Observer

www.ecb-observer.com

Analyses of the monetary policy of the European System of Central Banks

Towards a "more neutral" monetary policy

No 7

16 September 2004

Ansgar Belke

Wim Kösters

Martin Leschke

Thorsten Polleit

ECB OBSERVER

www.ecb-observer.com

Analyses of the monetary policy of the European System of Central Banks

Towards a “more neutral” monetary policy

No 7

16 September 2004

Prof. Dr. Ansgar Belke
Universität Hohenheim
belke@uni-hohenheim.de

Prof. Dr. Wim Kösters
Ruhr-Universität Bochum
wim.koesters@ruhr-uni-bochum.de

Prof. Dr. Martin Leschke
Universität Bayreuth
martin.leschke@uni-bayreuth.de

Honorary Prof. Dr. Thorsten Polleit[1]
Barclays Capital, Frankfurt and
Hochschule für Bankwirtschaft, Frankfurt
thorsten.polleit@barcap.com

[1] **NOTE:** Thorsten Polleit works in the European economics department of Barclays Capital. His contribution to this document represents his personal views, which do not necessarily correspond to the views of the firm.

CONTENT

SUMMARY

Part 1: A critical look at Eurosystem staff inflation projections

Eurosystem staff inflation projections seem to have become increasingly important in European Central Bank (ECB) monetary policy-making. We believe this development should be viewed with caution. From a conceptual point of view it is doubtful whether inflation projections meet the requirements of an "intermediate target". Moreover, inflation projections, based on economic analysis ("second strategy pillar"), systematically ignore the valuable information supplied by monetary analysis ("first strategy pillar"). As a result, an increasing focus on inflation projections could lead to frequent deviations from envisaged inflation and undesirable policy-induced cyclical swings of the economy. Given strong theoretical and empirical support for monetary analysis ("price gap"), it is hard to see the rationale behind an increasing use of staff inflation projections in ECB policy-making.

Part 2: Asset price inflation – a cause of concern for policy makers

Since the early 1980s, the movements of (financial) asset prices have remained a source of concern in the formulation of monetary policy. It is fair to say that so far no definite answer has emerged as to how central banks should best deal with this issue. However, there should be little doubt that "asset price inflation" may entail severe costs, just like "traditional" consumer price inflation. So if it is the objective of central banks to preserve the purchasing power of money – as the latter is a crucial ingredient in fostering growth and employment – they cannot ignore asset price developments going forward. In fact, a focus on asset prices would actually be warranted if consumer prices and asset prices were to not move in parallel over time, that is, if they are not "cointegrated". We would argue that price stability can only be maintained if the economy's total price level – that is the price level consisting of prices for goods and services of the current production and asset prices – does not rise over time (at unacceptable rates). Whether this is the actually case is still an unanswered question in most economies, largely due to the lack of available data. That said, a first step in the right direction would be to start stepping up efforts aimed at improving the availability and quality of price data regarding the economy's stock of wealth and incorporate these data into monetary policy considerations.

Part 3: Impact of short-term rates on stock market returns

Is a central bank able to influence stock market returns? In order to answer this question, we test for cointegration between stock market returns and central bank interest rates in Germany. We cannot empirically reject the view that, by letting short-term rates deviate from a certain level of equilibrium, the Bundesbank – and then the ECB – have had a significant short-run impact on asset prices. One of the main findings of the section is that – at least for the selected error-correction model – the relation between monetary policy and stock market returns is one-way, from the first to the latter. However, the results are confined to a single stock market return measure, namely dividend growth. Thus, empirical evidence suggests that it would be much too early to draw policy-relevant conclusions at this stage. There is still too little known as to whether the central bank is able to exert a systematic influence on the stock market. However, from the perspective of sound monetary policy, an answer to this question is key. Increased research efforts are therefore needed in this field.

Part 4: ECB rate and euro inflation outlook

"Global liquidity" remains very high: money holdings in the western industrialised world in relation to real income have increased strongly since around the end of 1996. The consequences of global "excess liquidity" are as yet unclear. In the euro area, excess liquidity, measured in the form of the "price gap", is exceptionally high. This is accompanied by fairly robust bank loan growth and real short-term interest rates at record lows. Moreover, market inflation expectations seem to have moved above the ECB's upper 2.0% ceiling, potentially signalling market agents' doubts about the bank's commitment to keeping inflation on its intended course. According to our model, the annual rise in the HICP should average 2.1% in 2004, rising further to 2.2% in 2005. That said, the ECB will have to move rates towards a somewhat "more neutral" level of 3.0% until the middle of 2005 to keep inflation below 2.0% in the coming years.

Zusammenfassung

Teil 1: Ein kritischer Blick auf die Inflationsprojektionen der EZB

In der Geldpolitik der Europäischen Zentralbank (EZB) scheinen Inflationsprojektionen, die die Volkswirte aus dem Eurosystem anfertigen, eine zunehmend wichtigere Rolle einzunehmen. Dies ist kritisch zu sehen. Aus konzeptioneller Sicht ist höchst fraglich, ob EZB-Inflationsprojektionen eine geldpolitische „Zwischenzielfunktion" übernehmen können, wie sie ihnen in der Praxis de facto zugewiesen wird; auch blenden Inflationsprojektionen den Informationsgehalt der monetären Säule gänzlich aus. Die Folgen einer solchen Politikorientierung könnten unerwünschte Inflationsziel-Verfehlungen und verstärkte Konjunkturschwankungen sein. Inflationsprojektionen sollten daher nur ganz spärlich und ergänzend eingesetzt werden. Sie sollten den Analyseergebnissen der monetären Säule (in Form der „Preislücke"), die durch ein theoretisches und empirisches Fundament gestützt werden, nicht übergeordnet werden.

Teil 2: "Asset Price Inflation" – Grund zur Sorge für die Geldpolitik

Bislang gibt es keinen Konsens, wie die Geldpolitik auf Vermögenspreisbewegungen („Asset Prices") reagieren bzw. diese in ihr Handeln einbeziehen soll. Wenn es aber das Ziel der Geldpolitik ist, den Geldwert zu erhalten, kann sie die Entwicklung der Vermögenspreise künftig nicht (mehr) vernachlässigen. Denn Preisstabilität ist nur gewährleistet, wenn das gesamtwirtschaftliche Preisniveau – die Preise für Vermögensgüter eingeschlossen – im Zeitablauf stabil bleibt. – Leider liegen nach wie vor keine umfassenden Daten über die Preise des gesamtwirtschaftlichen Vermögens vor, um das gesamtwirtschaftliche Preisniveau abzubilden. Daher wäre ein erster Schritt, wenn die Anstrengungen verstärkt würden, um eine entsprechende Datengrundlage zu schaffen und – darauf aufbauend – diese in die geldpolitischen Überlegungen systematisch einfließen zu lassen. – Wenn die Konsumgüterpreisinflation und die Inflation der Vermögenspreise sich unterschiedlich im Zeitablauf verhalten (d. h., wenn sie nicht „kointegriert" sind), ist die Forderung an die Geldpolitik zu erheben, Vermögenspreise in die Zielgröße einzubeziehen. Denn Vermögenspreis-Inflation („Asset Price Inflation") kann mit erheblichen Kosten verbunden sein: ganz so wie die „gewöhnliche" Konsumgüterpreisinflation auch.

Teil 3: Einfluss der Kurzfristzinsen auf die Aktienmarkt-Performance

Können Notenbanken Aktienkurse systematisch beeinflussen? Um der Klärung dieser Frage näher zu kommen, testen wir die „Kointegrationsbeziehung" zwischen Notenbankzins und verschiedenen Messgrößen für die Aktienmarkperformance in Deutschland seit Beginn der 70er Jahre. Wir können die These nicht verwerfen, dass die Bundesbank, und später die EZB, einen signifikanten Einfluss auf die Aktienkurse hatte. Darüber hinaus zeigt sich im Rahmen von „Fehlerkorrekturmodellen", dass sich die Wirkungskette von den Notenbankzinsen auf die Aktienkursperformance erstreckte, nicht aber umgekehrt. Allerdings sind die Ergebnisse auf eine Performance-Messgröße beschränkt: das Dividendenwachstum. Auf Basis der empirischen Befunde wäre es daher voreilig, geldpolitisch relevante Schlussfolgerungen zu ziehen; dazu ist das vorhandene Wissen noch zu gering und unsicher. Aus Sicht der Geldpolitik ist das jedoch ein nicht zufrieden stellendes Ergebnis angesichts des Phänomens der „Asset Price"-Inflation. Es ist daher notwendig, die Forschungsanstrengungen in diesem Gebiet zu verstärken.

Teil 4: EZB-Geldpolitik und Inflationsausblick

Die "Globale Liquidität" befindet sich nach wie vor auf sehr hohem Niveau: In den großen Industrieländern (USA, Euroraum, Japan, UK und Kanada) hat sich die Geldhaltung im Verhältnis zum Einkommen seit Ende 1996 markant erhöht. Es ist nach wie vor ungewiss, welche Konsequenzen dies für die Inflation haben wird. – Im Euroraum ist die Überschussliquidität – gemessen anhand der „Preislücke" – auf das höchste Niveau seit Beginn der 80er Jahre angestiegen. Dies wird begleitet von nach wie vor robusten Wachstumsraten der Bankkredite. Gleichzeitig befinden sich die kurzfristigen Realzinsen auf dem niedrigsten Niveau seit mehr als 20 Jahren. Besorgt muss stimmen, dass die Inflationserwartungen, gemessen anhand der „Break-Even"-Inflation, über die 2,0-Prozentmarke geklettert sind: Dies könnte Zweifel der Marktakteure signalisieren, dass die künftige Inflation im Durchschnitt auf dem von der EZB versprochenen Niveau verbleibt. Unsere Modellrechnungen signalisieren eine jahresdurchschnittliche Inflation von 2,1% in 2004 und 2,2% in 2005. Die EZB wird die Zinsen auf ein „neutrales" Niveau von etwa 3,0% anziehen müssen, damit die Inflation in den kommenden Jahren unter 2,0% verbleibt.

Part 1: A critical look at the role of Eurosystem staff inflation projections

CONTENT: *1.1 Monetary and non-monetary variables in the ECB strategy. – 1.2 Problems of using staff inflation projections in policy-making. – 1.3 Summary and conclusions.*

SUMMARY: *Eurosystem staff inflation projections seem to have become increasingly important in European Central Bank (ECB) monetary policy-making. We believe this development should be viewed with caution. From a conceptual point of view it is doubtful whether inflation projections meet the requirements of an "intermediate target". Moreover, inflation projections, based on economic analysis ("second strategy pillar"), systematically ignore the valuable information supplied by monetary analysis ("first strategy pillar"). As a result, an increasing focus on inflation projections could lead to frequent deviations from envisaged inflation and undesirable policy-induced cyclical swings of the economy. Given strong theoretical and empirical support for monetary analysis ("price gap"), it is hard to see the rationale behind an increasing use of staff inflation projections in ECB policy-making.*

1.1 Monetary and non-monetary variables in the ECB strategy

On 3 June 2004 the President of the European Central Bank (ECB), Jean-Claude Trichet, announced that the ECB's Governing Council had decided to publish its staff projections for economic growth and inflation on a quarterly rather than semi-annual basis.[2] So in addition to the June and December projections, the bank's interim projection updates for March and September will be made public as from September 2004. The ECB President stressed, however, that publishing these interim projections would in no way change their role as one, among many, of the inputs into the Council's deliberations. The bank would continue to base its monetary policy decisions on a comprehensive economic analysis, which is "cross-checked" with the monetary analysis.

In this article we argue that central bank interest rate decisions based on Eurosystem staff inflation projections would be problematic. First, it is hard to see how staff inflation projections qualify as an "intermediate target" for monetary policy. Second, it is not clear at all what role inflation projections play in determining actual future inflation. We see the risk that attaching growing importance to inflation projections will make ECB monetary policy increasingly "short-sighted", leading to frequent deviations from envisaged inflation, and potentially inducing unfavourable cyclical swings to the economy.

This article has been structured as follows. In (II.) we outline the role of money and other variables, including inflation projections, in ECB monetary policy strategy and decision-making. Thereafter, in (III.) we discuss the problems of using staff inflation projections and market agents' inflation expectations in monetary policy-making. Finally, in (IV.) we summarize our findings and draw conclusions.

In autumn 1998, the ECB Governing Council put forward the basic elements of its so-called "stability oriented monetary policy strategy", comprising two "pillars". The first of these ("monetary analysis") assigns a prominent role to money, as evidenced by the pre-announcement of a reference value against which money supply growth should be assessed.

[2] See the Introductory Statement to the Press Conference, Jean-Claude Trichet, President of the ECB, Lucas Papademos, Vice President of the ECB, 3 June 2004 (www.ecb.int). Also, see European Central Bank, A Guide to Eurosystem Staff Macroeconomic Projection Exercise, June 2001 (www.ecb.int). The projections were published for the first time in December 2000.

Persistent deviations in money growth from the reference value would indicate risks for future price stability. The second pillar ("economic analysis") encompasses a broadly based assessment of real economic and financial variables to identify inflation risks. After the strategy revision, the ECB Governing Council announced on 8 May 2003 that it would present the results of the economic analysis first, which would then be cross-checked against the results of the monetary analysis.[3]

The ECB's two pillar approach is, de facto, a compromise between the two concepts, that is "inflation targeting" (IT) and "monetary targeting" (MT).[4] Conceptually, however, IT and MT are much more closely aligned than most discussions would suggest. Both concepts aim to keep (future) inflation in check; both favour a pre-emptive stance for monetary policy; and both favour policy-making on the basis of inflation forecasts. MT proponents would argue for using money supply as the central inflation indicator, whereas those in favour of IT recommend a central bank's "self-made" inflation forecast as the main guideline for policy-making. That said, MT and IT would be identical if money supply were used as the inflation forecast variable. The only difference remaining in such a case would be that MT has an explicitly announced money growth target and an implicit inflation goal, whereas IT has an explicit inflation target and an implicit money growth goal. In view of the above, it is fair to say that IT could be characterised as an "umbrella strategy" under which money supply and other variables can be analysed in order to identify risks to future price stability.

Despite the ECB's conceptual explanations, staff projections have lately gained in prominence (the inflation projection history is shown in Figure 1.1). Financial markets tend to expect ECB interest rate changes only if such a decision is supported by changes to the staff (inflation) projections, usually irrespective of the signals provided by monetary data. Staff projections seem to have become a somewhat binding restriction for the central bank's rate-setting decision. Given a potentially increasing influence of staff inflation projections it is of interest to highlight the potential consequences for the ECB's policy-making and contrast the results with a policy based on money supply signals.

Figure 1.1. – ECB staff inflation projections in percent (mid-points)

	2000	2001	2002	2003	2004	2005
Actual HICP inflation	**2.1**	**2.3**	**2.3**	**2.1**	...	...
Forecasts in:						
December 2000	2.4	2.3	1.9	...	...	...
June 2001		2.5	1.8	...	...	...
December 2001		2.7	1.6	1.5	...	...
June 2002			2.3	1.9	...	...
December 2002			2.2	1.8	1.6	...
June 2003				2.0	1.3	...
December 2003				2.1	1.8	1.6
June 2004					2.1	1.7
September 2004					2.2	1.8

Source: ECB Monthly Bulletins; own calculations.

3 It may therefore come as a surprise that so far the "two pillar structure" has not been officially changed: In the ECB Bulletin, the monetary analysis still precedes the economic analysis. The "innovation" since 8 May 2003 was merely the insertion of a section on "the external environment of the euro area", with which the analyses in the Monthly Bulletins start.

4 For an insightful comparison between MT and IT see, for instance, Baltensperger, E., Die Europäische Zentralbank und ihre Geldpolitik, in: Swiss National Central Bank, Quarterly Bulletin 1/2000, pp. 49 – 73.

To start with, a pre-emptive, forward-looking monetary policy takes action if and when there is a divergence between expected, or projected, (π_t^e) and envisaged ($\hat{\pi}_t$) inflation. The policy recommendation could be described as follows:

(1) $\Delta i = \lambda^{\pi} f(\pi_t^e - \hat{\pi}_t)$.

The bank would have to increase (decrease) the interest rate, i, that is $\Delta i > 0$ ($\Delta i < 0$), if expected future inflation exceeds target inflation; $\lambda^{\pi} > 0$ shows the intensity with which rates are changed in response to the expected deviation from target inflation.

From the point of view of monetary policy, it seems advisable to analyse risks to price stability by taking into account both monetary and non-monetary variables. Such an analysis would combine Milton Friedman’s famous dictum that “inflation is always and everywhere a monetary phenomenon” with the fact that consumer prices are also temporarily influenced by “cost push” variables such as, for instance, variations in the output gap, the oil price, the wage level, and the exchange rate. The ECB’s staff inflation projections, however, are calculated solely on the basis of variables contained in the second strategy pillar, thereby completely disregarding the signals of the monetary pillar. Staff inflation projections therefore give an “incomplete” or “unbalanced” assessment of future inflation.

As far as monetary analysis is concerned, the so-called “price gap” or, equivalently, “real money gap”, has become a central concept of the ECB for analysing the information content of money.[5] To outline the inflation indicator quality of the price gap, let us make use of the well-known “Fisher equation”. The actual price level can be written as:

(1) $p_t = m_t + v_t - y_t$,

where p = price level, m = money M3, v = income velocity of money, and y = output (all variables represent logarithms). The long-run price level can be defined as:

(2) $p_t^* = m_t + v_t^* - y_t^*$,

where the asterisks mark long-run equilibrium levels. The difference between the equilibrium and the actual price level is:

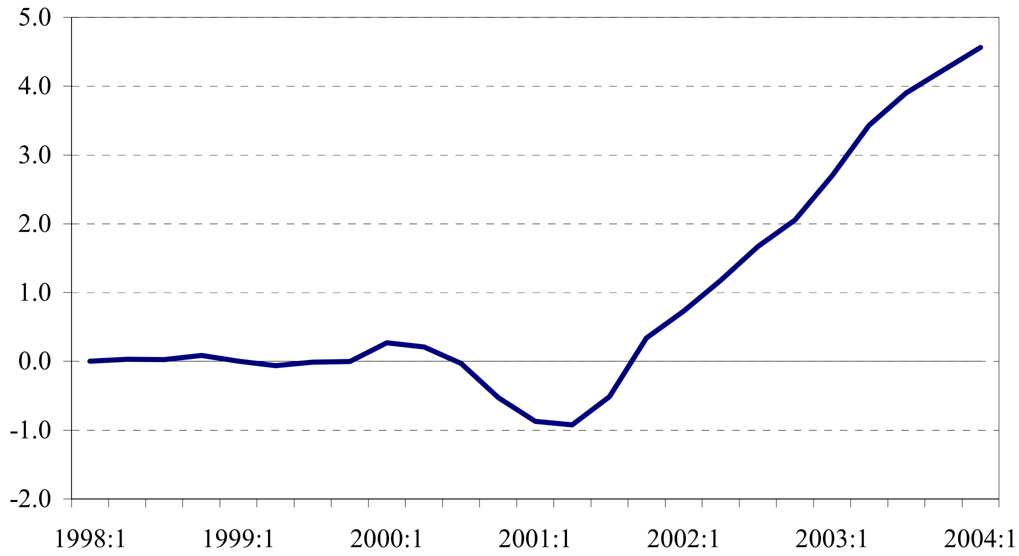
(3a) $(p_t^* - p_t) = (y_t - y_t^*) + (v_t^* - v_t)$, which is equivalent to:

(3b) $(p_t^* - p_t) = (m_t + v_t^* - p_t) - y_t^*$.

According to equation (3a), the price gap is a function of the “output gap”, that is the difference between actual and potential GDP, and the “liquidity gap”, defined as the difference between the equilibrium velocity of money and its actual value. It is important to note that an increase in real output (y) will not cause a change in the price gap, because in such a case v would decrease as y increases. Equation (3b) shows that the price gap is independent from the output gap: it is simply the difference between real money (adjusted by the trend velocity) and real potential output.

5 This concept is actually closely linked to the well-known “P-star model” of J. Hallman, R. Porter and D. Small (1991) and was recently put forward by Svensson, L. E. O, Gerlach, S., Money and inflation in the Euro Area: A case for monetary indicators?, Bank for International Settlement, Working Papers No. 98, January 2001. To our knowledge, the ECB introduced the real money gap in its June 2001 Bulletin, pp. 8. See also Masuch, K., Pill, H., Willeke, C., Framework and tools of monetary analysis, in: European Central Bank, Seminar on Monetary Analysis: Tools and Applications, 20 – 21 November 2000, Frankfurt, pp. 155 – 186.

Figure 1.2. – M3 price gap in the euro area in percent



Data source: ECB, Bloomberg, own calculation; the real money gap is defined as the real money plus trend velocity minus potential GDP (smoothed over four quarters).

The price gap indicates the inflation potential. A positive (negative) price gap caused by an increase (decline) in money supply would indicate upward (downward) pressure on the euro area price level. So once money growth has been "too strong (weak)", upward (downward) pressure on inflation in the future can be expected, especially when the output gap rises. Figure 2 shows the development of the price gap in the euro area from Q1 1998 to Q1 2004, indicating rising pressure on (future) inflation driven by very strong money supply growth which set in around the middle of 2001. Using the price gap as an inflation indicator, the central bank's reaction function would be:

(4) $$\Delta i = \lambda^{pg} f(p_t^* - p_t),$$

where $\lambda^{pg} > 0$ shows the intensity with which rates are changed in response to the price gap. The policy recommendation can be summarised as follows: (a) If the price gap indicates high (low) liquidity in the euro area, accompanied by an improvement (deterioration) in real economic indicators, an interest rate hike (cut) would be required (that is $\Delta i > 0$ ($\Delta i < 0$)). (b) If the price gap indicates a high (low) liquidity build-up, with the real economy still growing under potential, a less aggressive policy tightening (easing) would be the appropriate policy response.[6]

1.2. Problems of using staff inflation projections in policy-making

An ECB monetary policy based on staff inflation projections, which rest solely on the information of second pillar variables, suffers from serious shortcomings. In the following, we will focus on three critical issues: the relationship (i) between staff inflation projections, inflation expectations and future inflation; (ii) inflation expectations and central bank credibility; and using (iii) market inflation expectations as an indicator for monetary policy.

6 For instance, in the situation prevailing in July 2004 – that is, a very high price gap, accompanied by a tightening output gap and strongly rising commodity prices – the policy recommendation from the price gap would be for higher ECB rates, especially so given record low (real) central bank interest rates.

Re (i): Staff inflation projections, inflation expectations and future inflation

It is often argued that the publication of ECB staff inflation projections would keep market agents' inflation expectations in line with the central bank's price stability promise, thereby keeping future inflation at the envisaged level. Even though intellectually appealing, there is next to no empirical evidence supporting such a hypothesis. Moreover, the "traditional" form of IT does not outline any specific transmission mechanism of monetary policy. In addition, there is no evidence that could inspire confidence in inflation expectations playing the important role of determining future inflation. The well-known phenomenon of "surprise inflation" – that is, actual inflation in excess of market agents' originally expected inflation – attests to this. Given these serious theoretical and empirical deficiencies, it is hard to see how staff inflation projections could serve as a solid basis ("intermediate target") for practical monetary policy-making.

The ECB's inflation projections are based on the assumption that interest rates remain constant throughout the forecast period. That said, the bank's projections would coincide with actual future inflation only if projected inflation equals the envisaged inflation. In all other cases – that is when projected inflation is either higher or lower than envisaged inflation – the bank would have to take action to bring about the desired result. As a result, the bank's inflation projection does not provide the public at large with any information about actual future inflation. It is just an instrument to show what level of inflation emerges in the future if, and only if, the central bank does not do a proper job.

To put increasing weight on inflation projections produced by Eurosystem staff at the expense of the signals provided by money supply seems hard to justify. Empirical evidence clearly suggests that the price gap is a strong determinant of the future price level in the euro area. In this context it should also be noted that the central bank, as a monopolist of base money, is in a position to control money growth: It may not be able to control it perfectly in the short-run, but certainly over the medium- to long-term. So as long as the long-run demand for money remains stable – and so far there is no indication that the ECB has abandoned this hypothesis – the price gap provides a highly reliable inflation indicator in the euro area.[7]

Re (ii): Inflation expectations and central bank credibility

To the outside world, Eurosystem staff inflation projections are rather opaque: it is not known which variables are included in the projection model; nor is it known how much weight is assigned to each of the variables. So the public's confidence in the accuracy of the inflation projections – and the appropriateness of its policy recommendations – can be assumed to hinge de facto on the bank's credibility, that is the bank's perceived willingness and ability to deliver on its price stability promise. It therefore seems questionable whether inflation projections themselves further monetary policy transparency and build up central bank credibility. It seems to work more the other way round: Inflation projections (or forecasts) are only reliable if central bank credibility is already in place.[8]

There is also the issue of a potential "optimism bias" in inflation projections, which could potentially undermine central bank credibility. Staff projections might be subject to a (non-negligible) degree of discretion and vulnerable to "theory fads". In particular, forecasters might have a preference for projecting future inflation that does not deviate too much from

[7] For the latest research on the stability of the demand for money in the euro area see Bruggeman, A., Donati, P., Warne, A., Is the demand for euro area M3 stable?, ECB Working Paper No. 255, September 2003.

[8] On the determinants of central bank credibility see ECB Observer, Inflationsperspektiven, 17 April 2001 (www.ecb-observer.com).

"market consensus", or for publishing forecasts that are more or less in line with the bank's price stability promise. This, in turn, might lead to target deviations if the need for policy action is not properly indicated. An optimism bias might occur especially in a period when future inflation is at risk of deviating strongly from the target due to, for instance, unfavourable "price shocks". Under such circumstances, the bank could opt for publishing a more "optimistic" projection in order to prevent market agents from becoming too concerned about the inflation outlook.

Further, inflation projections could induce an overly activist policy with unfavourable effects on growth and inflation. As is widely accepted, monetary policy works with long and variable lags; money supply overhangs take more than a year to spill over into prices. Inflation projections, however, are made for the coming two years, and the projection for the second year is more uncertain than that for the first. In periods of temporarily low inflation the central bank might come under political pressure to pursue an expansionary monetary policy if the short-horizon inflation projection (for the first year) remains favourable. Such a policy could easily lead to target deviations in the coming years and, in addition, cause unwanted swings in the business cycle. There might also be periods in which the narrow focus on inflation projections, which disregard the long-run indications of monetary analysis, would recommend an expansionary policy, which then unintentionally fuels an undesirable "asset price inflation".

Re (iii): Market inflation expectations as an indicator for monetary policy

One could perhaps imagine recommending that monetary policy decisions be based directly on market agents' inflation expectations.[9] For instance, if market inflation expectations exceed (fall below) the bank's envisaged inflation, monetary policy would hike (cut) rates. However, such a concept would face a number of serious difficulties. First, market inflation expectations are "conditional", that is they reflect, at any given point in time, the expectation of the monetary policy stance in the future. Monetary policy-makers, however, might – due to a lack of knowledge – not be able to identify on which policy stance such expectations rest, that is whether a given inflation expectation is based on an expected interest rate change or not. As a result, policy-makers would find it hard to identify the kind of policy required to bring, e.g. keep, market inflation expectations in line with the envisaged rate.

Second, by linking monetary policy decisions to market inflation expectations, the central bank could easily slide into a "vicious circle". This is because policy instability and thus inflation instability can emerge if monetary policy relies not on external anchoring but on market expectations, which themselves are a function of the expected monetary policy decisions.[10] Also, a sudden shift to putting more weight on market expectations could be interpreted as a shift in the monetary policy regime. This, in turn, would make it difficult for policy-makers to assess the stance of policy because market expectations might become less reliable ("Lucas Critique"). The anchoring of inflation expectations can probably best be achieved by a strong and credible commitment to price stability. The medium- to long-term inflation objective is then given heavy emphasis in the central bank's decisions on policy, which economic agents in turn tend use in making their decisions.

[9] In this context one could think of "breakeven inflation" rates, which can be calculated from market traded nominal and inflation-indexed bonds.

[10] See Woodford, M. (1994), Nonstandard indicators for monetary policy: can their usefulness be judged from forecasting regressions?, in: Mankiw, N. G. (ed.), Monetary Policy, NBER Studies in Business Cycles, Vol. 29, University of Chicago Press, pp. 95 – 115.

1.3. Summary and conclusions

It is frequently argued that Eurosystem staff inflation projections help identify risks for future price stability and anchor market agents’ inflation expectations. As a result, inflation projections actually shall de facto serve as the intermediate target of monetary policy. To qualify as an intermediate variable for monetary policy, however, a variable must have a reliable and predictable (and, most importantly, leading) influence on future inflation. In addition, an intermediate target must be controllable through monetary policy. ECB staff inflation projections, however, do not satisfy these requirements. These projections emerge from a “black box”, exclude the information content of the monetary analysis and are hardly set to guide inflation expectations and future inflation in a satisfying way. An increasing focus on inflation projections runs the risk of leading to inflation target deviations and, in addition, undesirable policy-induced cyclical swings of the economy.

A forward-looking, price stability-oriented monetary policy has to base its decisions on variables which have a reliable and predictable influence on future inflation. Monetary policy should (empirically) analyse the pressure on the price level in the future resulting from variations of these variables and act accordingly. Given its theoretical and empirical underpinnings, monetary analysis in the form of the “price gap”, rather than staff inflation projections, should command the highest attention of ECB monetary policy-making. Such a policy focus should keep the market’s inflation expectations and future inflation much better in line with the bank’s objective than focusing policy on “black box” ECB staff inflation projections.

Part 2: Asset price inflation – a source of concern for policy makers

CONTENT: *2.1 Latest asset price developments. – 2.2 Price stability and asset prices. – 2.3 Challenges for monetary policy.*

SUMMARY: *Since the early 1980s, the movements of (financial) asset prices have remained a source of concern in the formulation of monetary policy. It is fair to say that so far no definite answer has emerged as to how central banks should best deal with this issue. However, there should be little doubt about the fact that "asset price inflation" may entail severe costs, just like "traditional" consumer price inflation. So if it is the objective of central banks to preserve the purchasing power of money – as the latter is a crucial ingredient in fostering growth and employment – they cannot ignore asset price developments going forward. In principle, we would argue that price stability can only be maintained if the economy's total price level – that is the price level consisting of prices for goods and services of the current production and asset prices – does not rise over time (at unacceptable rates). Whether this is the actually case is still an unanswered question in most economies, largely due to the lack of available data. That said, a first step in the right direction would be to start stepping up efforts aimed at improving the availability and quality of price data regarding the economy's stock of wealth and incorporate these data into policy considerations.*

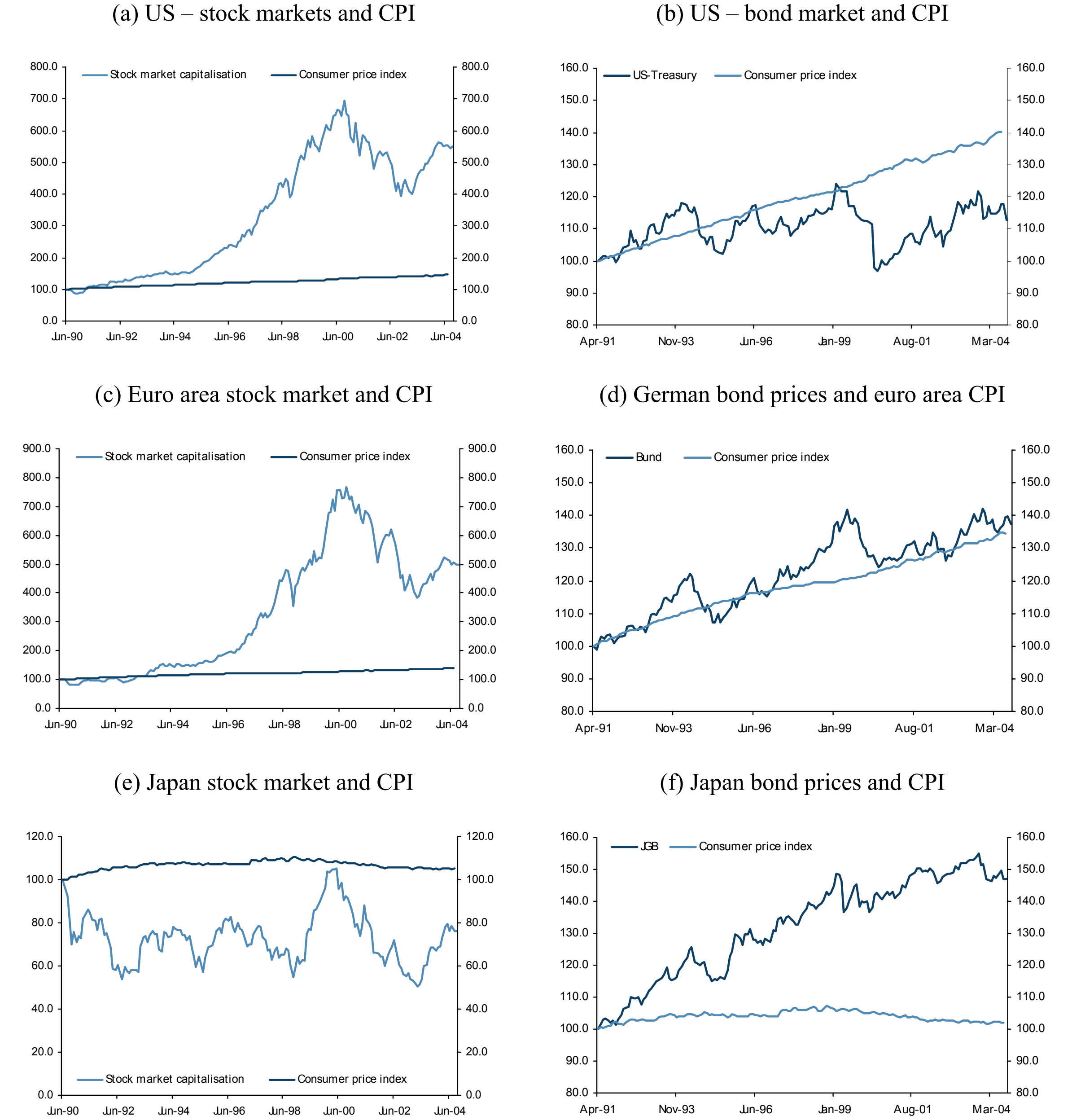
2.1 Latest asset price developments

Since the early 1980s, the movements of (financial) asset prices have been a source of concern for central banks in the formulation of monetary policy[11]; they have also presented a challenge to researchers, attempting to explain and interpret the behaviour of asset prices. The world-wide collapse in equity prices in 1987, the property cycles in several industrial countries during the second half of the 1980s and the sharp rise in bond yields in 1994 ("bond market crash") were to a large extent unexpected by market agents and policy-makers alike and may have established a new trend for asset price formation. The 1990s have not only been a period of marked swings in financial asset prices but also of exceptionally strong price gains in many asset markets – despite the fact that consumer price inflation remained more or less under control – or was constant following a period of disinflation – in most western industrial countries. This applies in particular to the second half of the 1990s; the "New Economy" boom.

As an example, Figures 2.1 (a), (c) and (e) show the developments of the consumer price index (CPI) and the stock market valuation in the US, the euro area, and Japan for the period June 1990 to July 2004. Figures 2.1 (b), (d) and (f) exhibit the CPI and the bond market valuation, approximated by future prices for government bonds, for the currency areas under review. With the exception of Japan, the increase in stock market valuations since the early 1990s has been much stronger than the rise in the CPIs. At the same time, the rise in bond market valuations in the US has been less than the rise in the CPI. In the euro area, in contrast, the bond market valuation – approximated by the German Bund-Future – has been developed broadly in line with the CPI. In Japan, the price gains in the bond market price gains have outstripped the rise in the CPI.

[11] See, for instance, F. Smets (1997), Financial assets and monetary policy: Theory and evidence, BIS Working Paper No 47 and B. Dupor (2002), "Comment on monetary policy and asset prices", Journal of Monetary Economics, 49 (1), pp. 99-106.

Figure 2.1. – International financial asset prices and consumer price index (CPI)



Source: Thomson Financials; own calculations. June 1990 = 100.

The strong price gains in international stock markets in the second half of the 1990s, followed by the stock “market crash”, from the middle of 2000, have stimulated more intense debate among policy makers and academics on the role that (financial) asset prices should play in monetary policy.[12] Of course, in this context numerous questions are still to be solved. Under one view, exemplified by Alan Greenspan (2002) and Bernanke and Gertler (1999, 2001), monetary policy should remain focused on achieving the macroeconomic goals of low inflation and stable growth, and should do no more than deal with the fall-out from the eventual

[12] This is perhaps best expressed by Otmar Issing, Chief Economist of the ECB: “I grant that nobody has yet found a definite answer to how central banks should best deal with asset prices. This issue will not go away but will become even more important over time as our societies continue to accumulate wealth.” Introductory Statement at the ECB Workshop on “Asset Prices and Monetary Policy”, 11 – 12 December 2003, Frankfurt, p. 9. In this context see also Detken, C., Masuch, K., Smets, F. (2003), Issues raised at the ECB workshop on “Asset Prices and Monetary Policy” (http://www.ecb.int/events/pdf/conferences/detken-masuch-smets.pdf).

unwinding of an asset price bubble. An alternative perspective is that such an unwinding may lead to financial instability and that it is better to take pre-emptive action against the bubble during the upswing (see, for instance, Crockett (2003), Borio and Lowe (2002), Cecchetti, Genberg, Lipsky and Wadhwani (2000) and Bordo and Jeanne (2002)).

2.2 Price stability and asset prices

In what follows, we confine our considerations to the role asset prices may play in the overall objective of maintaining price stability. In the last years, a broad consensus has emerged that price stability deserves primary attention of monetary policy makers. A non-inflationary environment, that is stable money, is considered as conducive for growth and employment. As such, price stability is not an objective on its own but rather an "intermediate target": price stability allows market agents to made efficient decisions, supported by a well functioning price mechanism which channels scarce resources to the best use. To this end, price stability is usually identified with an increase in the consumer price index of between 1 to 3 percent per year.

Most central banks have announced numerical and quantitative definitions of price stability (for an overview see Box 1). A prominent exception, though, is the US Federal Reserve, which has neither set a numerical target nor a quantitative definition of price stability. In the early 1990s, Fed Chairman Alan Greenspan clarified that price stability would be obtained "households and businesses need not factor expectations of changes in the average level of prices in their decisions".[13] Also, the Bank of Japan has not set a numerical definition of price stability. On 13 October 2000 the Policy Board of the BoJ tried to clarify the definition of price stability for Japan as an environment where households and firms can make decisions regarding such economic activity as consumption and investment without being concerned about the fluctuation of the general price level.[14]

13 See Greenspan, A. (1994), Statement before the Subcommittee on Economic Growth and Credit Formulation of the Committee on Banking, Finance, and Urban Affairs, U.S. House of Representatives, February 22, 1994.

14 Bank of Japan, On price stability, October 2000 (http://www.boj.or.jp/en/seisaku/00/pb/data/k001013a.pdf)

Box 1. –Inflation targets or definitions of price stability in selected countries

COUNTRY	INDICATOR	NUMERICAL VALUE DEFINITION/TARGET	EX-ANTE HORIZON (*)	ACCOUNTABILITY (EX POST)(*)
1. Europe:				
Euro area	HICP	Below 2% (since 1999) Definition of price stability	Medium term (not sole focus on inflation forecasts; prominent role for monetary developments, which exhibit a medium-term relation with prices)	Medium term
Memo item: Euro area countries prior to 1999 (3)				
Finland	CPI	(about) 2 % Objective for 1998	Focus on two years ahead inflation forecast	
France	CPI	Not exceeding 2% Objective for 1998		Inflation in the year concerned
Germany	Not specified	2% before 1997 1.5 – 2% for 1998 "inflation norm"	Annual monetary target	Monetary developments in the year concerned
Italy	CPI	Not exceeding 2% Objective for 1998		
Spain	CPI	3.5%-4% (Jan. 95-96:Q1) 3%-3.25 % (96:Q1-97:Q1) below 3% during 1997 below 2.5%-2.75% for late 1997 2% for 1998		Inflation in the year concerned
European countries not in the euro area:				
Norway	CPI Focus on core inflation	2½% with a fluctuation margin of ±1% Target	Main focus on 2 years ahead inflation forecast	Timeless with escape clauses (2)
Sweden	CPI	2% with a fluctuation margin of ±1% (Jan.95-now) Target	Main focus on 1 to 2 years ahead inflation forecast with possibility of extending horizon	Escape clauses (2)
Switzerland	CPI	Below 2% Definition of price stability	Medium term with a focus on three years ahead inflation forecast	Medium term
United Kingdom	RPIX (Retail Price Index excluding mortgage interest payments)	1%-4% (Oct. 92-June 97) 2.5 % (1) , (June 97-now) Target	Medium term (with a focus on two years ahead inflation forecasts)	Timeless with escape clauses (2)

Source: See next page.

Box 1: Inflation targets or definitions of price stability in selected countries (cont'd)

COUNTRY	INDICATOR	NUMERICAL VALUE DEFINITION/TARGET	EX-ANTE HORIZON (*)	ACCOUNTABILITY (EX POST) (*)
		Target		business cycle
2. Other OECD countries:				
Australia	CPI	2 – 3%, (Jan. 1993-now)	Medium term	On average over the
Canada	CPI Focus on CPI excluding food energy, and the effect of indirect taxes	Midpoint 2%-4% (Feb. 91-end-1992. Midpoint 1.5%-3.5% (end-92-mid 1994). Midpoint 1%-3% (Dec. 1993 (revised)-Feb 2001; then renewed, and valid up to end-2006). Target	Medium term with focus on six to eight quarters ahead	
Japan	CPI	No numerical value (5) Qualitative definition of price stability	(6)	
New Zealand	CPI (excluding credit services)	3%-5%, range target (Mar. 90-Dec. 90) 2.5%-4.5%, range target (Dec. 90-Dec. 91) 1.5%–3.5% (Dec. 91-Dec. 92) 0%-2% (Dec. 92-Dec 96) 0%-3% (Dec. 96-Nov. 2002) 1%-3% (Nov. 2002-now) Target	Medium term (prior to Nov. 2002: main focus on 6 to 8 quarters ahead inflation forecast)	Medium term (future CPI between 1-3% on average over the medium term)
United States	Not specified Focus on several inflation measures	No numerical value (4) Qualitative definition of price stability		

Source: Castelnuovo, E., Altimari, N. and Palenzuela, R., Definition of price stability, range and point inflation targets: the anchoring of long-term inflation expectations, ECB Working Paper No. 273, September 2003. Notes to Table 1: (*) Ex ante horizon: the horizon over which the central bank will seek to pursue its objective or re-establish it after a shock has occurred. Accountability ex post: the time period over which the central bank is to be held accountable. (1) If inflation as measured by the RPIX is more than one percentage point above or below the target of 2.5%, the Governor of the Bank of England needs to write an Open Letter of explanation to the Chancellor. (2) Timeless horizon implies that, in principle, the inflation target has to be maintained at all times. Escape clauses: when explicit contingencies under which a temporary deviation from price stability can be allowed are provided. (3) When adopting the broad economic policy guidelines in July 1995 the Ecofin indicated that a value of 2% would be the maximum rate of inflation compatible with price stability. This was reconfirmed in the 1998 guidelines. (4) The Chairman of the US Fed, Alan Greenspan, stated that "price stability obtains when people do not consider inflation a factor in their decisions". (5) The BoJ has defined price stability "as an environment where economic agents including households and firms can make decisions regarding such economic activity as consumption and investment without being concerned about the fluctuation of the general price level". (6) On 19 March 2001 the BoJ announced that it will continue its policy of quantitative easing "until the CPI registers stably a zero percent or an increase year on year".

In practice, price stability is mostly defined by some form of an (adjusted) consumer price index. Usually, financial asset prices are not included in these definitions.[15] The earliest work on the inclusion of asset prices in measures of inflation can be traced back to Irving Fisher (1911). Fisher's intent appears to have been a desire to find a broad transactions price metric to guide monetary authority in establishing the price of gold. That is, he was considering an index number that best reflected the price level as implied by the equation of exchange. How-

[15] To some extent, asset price developments might be captured by including rents and interest rates into the definition of price stability.

ever, Fisher was always very clear that different problems necessitated different indexes (broadly differentiated by the comparative places or comparative times under investigation.)

The appropriateness of any index number can only be evaluated in the context in which it is being applied. The idea that asset prices should receive some consideration in the construction of aggregate price movements remained a largely dormant issue until the work of Alchian and Klein in 1973.[16] The authors argued that monetary policy should be concerned with broader measures of prices than those constructed from the income and product accounts deflators or standard expenditure-weighted indices. More recently, Goodhart (1995) has echoed this argument, calling upon monetary policies to give asset prices an explicit role in the policy making process.[17]

Figure 2.2. – Money demand and asset prices as part of the price level

Rising stock and/or bond prices are often considered to be economically favourable, fostering – via a "wealth effect" – consumption and investment, and thereby leading to higher output and employment. To outline the effect of rising asset prices, we set out a very simple model. To start with, the real money demand function is defined as:

(1) $M / P = Y^k \cdot e^{-h \cdot r}$,

where *M* is the stock of money, *P* the price level, *h,* with *h* > 0, is the interest elasticity of money and *r* is the return on bond holdings. Taking logs, the demand for real money balances is:

(2) $m - p = k \cdot y - h \cdot r$.

The economy's price level is $P = P_Y^{(\alpha)} \cdot P_S^{(1-\alpha)}$, where P_Y and P_S represent the price levels for output and bonds, respectively. α and $1-\alpha$ represent the share of the respective price levels in the economy's overall price level, with $0 \leq \alpha \leq 1$. In logs, one can write equation (2) as:

(3) $p = \alpha p_Y + (1-\alpha) p_S$

If the coupon of a consol ("perpetuity") is defined as *C* money units per annum, and the current market price of the bond is $P_t^{(\infty)}$, then a simple measure of return $R_t^{(\infty)}$ is the flat yield: $R_t^{(\infty)} = C / P_t^{(\infty)}$. Taking logs one yields:

(4) $r_t^{(\infty)} = c - p_t^{(\infty)}$.

Inserting (4) and (3) in (2), one yields:

(5) $m - \alpha p_Y - p_S (1 - \alpha + h) = k \cdot y - h \cdot c$.

Equation (5) shows that the higher the share of bond prices (e.g. wealth) in the total price level is, and the higher *h* is, the higher will be the impact of bond price changes on real money holdings and *vice versa*. Assuming output to be at potential, and *c* to be constant, a rise in bond prices would, ceteris paribus, lead to a decline in real money holdings which, in turn, would require a decline in output to restore equilibrium. A rise in bond prices would therefore, in this simple "neo-classical" model, exert a dampening rather than expansionary ("wealth") effect on output.

In terms of preserving the purchasing power of money, the approach of Alchian and Klein intuitively appeals from a theoretical perspective. In general, money holders can be expected to purchase both goods and services out of the current production and existing wealth, i.e.

16 See Alchian, A. A., Klein, B. (1973), On a correct measure of inflation, in: Journal of Money, Credit and Banking, Vol. 5, No. 1, pp. 173 – 91.

17 See Goodhart, C. A. E. (1995), Price stability and financial fragility, in: Sawamoto, K. and Nakajima, Z. (eds.), Financial markets and financial crises, NBER Project Report, Chicago Press, Chicago. See in this context Bryan, M. F., Cecchetti, S. G., O'Sullivan, R. O. (2001), Asset Prices in the Measurement of Inflation

stocks, bonds, real estate, housing, etc. A rise in the prices for the stock of wealth that is not compensated for by a decrease in prices for current income products, for example, would therefore be inflationary, i.e. it would erode the purchasing power of money. That said, the policy objective of preserving the purchasing power of money would therefore require the central bank indeed to keep the economy's price level – which is made up of prices for the stock of wealth and current income goods – stable over time. In fact, a focus on (selected financial) asset prices could actually be warranted if consumer prices and asset prices were to not move in parallel over time, that is, if they are not cointegrated.

2.3 Challenges to monetary policy

In view of the above one could think about broadening the policy objective of central banks to stabilise an index consisting of consumer and (financial) asset prices. However, it could be argued that this approach, if put into practice, would create more difficulties for central banks than it solves:[18]

— If the end of monetary policy is broadened beyond purely stabilising consumer prices by focusing on an amalgamated price index that includes (financial) asset prices, this would presumably result in an index exhibiting higher volatility than the traditionally defined consumer price index. That said, targeting such a broad index might lead to greater and more frequent changes in central bank rates compared with the status quo, which might have negative effects on output and employment.

— The foremost problem with asset price movements lies in the "signal extraction problem". Asset prices may be driven by a number of (fundamental) factors, namely expected returns, future short-term rates, time preferences, risk and liquidity premia, etc. It might thus be difficult, if not impossible, to identify the causes of the change in asset prices. If, for example, stock prices rise, no policy action would be required if prices move closer towards fundamentally justified price levels. In contrast, a case for policy intervention might be made if prices would move away from equilibrium values. The identification problem is thus twofold: firstly, in identifying to what degree asset prices reflect fundamentals and, secondly, in identifying how the new price is in accord with the state of fundamentals.

— On a more technical level, there may be some difficulty in constructing an index covering all relevant asset markets properly. For instance, for some asset prices – housing might be a good example – it might be difficult to get hold of data on a timely basis. Also, heterogeneous product prices might be driven by relatively pronounced expenditure patterns which can be expected to exert a rather strong impact on prices, which should, ceteris paribus, contribute to the volatility of the overall price index.

Perhaps some of the concerns expressed above would be mitigated when we subject them to closer scrutiny. For instance, a more volatile price index – which might be the case if the central bank were to include consumer as well as asset prices in its target index – does not necessarily imply a more activist monetary policy. This would be the case only if monetary policy were to react to changes in the objective rather than "leading" intermediate, or indicator, variables. It is an open question as to whether the central bank could identify variables that have a potential to predict future inflation of the total price level and which can be influenced by the

[18] See Capel, J., Houben, A. (1998), Asset inflation in the Netherlands: assessment, economic risks and monetary policy implications, in: Bank for International Settlement, The role of asset prices in the formulation of moentary policy, Conference Papers, Vol. 5, March, p. 276.

central bank accordingly. This question can only be properly answered by theoretical reasoning and empirical research.

Furthermore, the signal extraction problem might not necessarily arise when using a broadly defined price index, including consumer and asset prices. This is because monetary policy would not have to react to price movements regarding sub-indices of the total price index but merely aim to stabilise the price index over time: the central bank may well accept a strong rise in asset prices if it is compensated for by declines in prices of goods and services as then the total price level would not rise. Currently, there might be problems in providing data on the asset classes under review in a reliable and timely manner. However, the latter might be solved by stepping up efforts to improve the availability and quality of price data for the economy's stock of wealth.

Of course, any broadening of the catalogue of currently prevailing objectives of the central banks as outlined above would have to be based on some kind of rationale. The latter may be found in carefully analysing the costs and benefits of asset price inflation, in the same way that it is usually done with consumer price inflation. For instance, asset price inflation might initially increase output and employment and may therefore be seen as beneficial. However, there is the probability that a continuation of an "asset inflation boom" may lead to on an ongoing acceleration of inflation, which could turn out to be costly, with the boom ending perhaps in financial crises and severe recessions and even deflation.[19] An asset price crash, especially if in the form of a bursting bubble, could be associated with overall economic dynamics that might, *de facto*, endanger price stability. For example, the bursting bubble could lead to a sharp drop in aggregate demand, and thus deflationary risks, both via direct wealth effects and, in the event that the stability of the financial sector is affected, via a credit crunch. In sum, one of the challenges for monetary policy going forward is to come to grips with the role asset prices play in changes in the economy's overall price level and therefore the purchasing power of money.

[19] See C. Borio and P. Lowe (2002), Asset prices, financial and monetary stability: Exploring the nexus, BIS Working Paper No 114, and the subsequent paper by C. Borio and P. Lowe (2004), Securing sustainable price stability: Should credit come back from the wilderness?, BIS Working Paper No 157.

Part 3: Impact of short-term rates on German stock market returns

Summary: *Is a central bank able to influence stock market returns? In order to answer this question, we test for cointegration between stock market returns and central bank interest rates in Germany. We cannot empirically reject the view that, by letting short-term rates deviate from a certain level of equilibrium, the Bundesbank – and then the ECB – have had a significant short-run impact on asset prices. One of the main findings of the section is that – at least for the selected error-correction model – the relation between monetary policy and stock market returns is one-way, from the first to the latter. However, the results are confined to a single stock market return measure, namely dividend growth. Thus, empirical evidence suggests that it would be much too early to draw policy-relevant conclusions at this stage. There is still too little known as to whether the central bank is able to exert a systematic influence on the stock market. However, from the perspective of sound monetary policy, an answer to this question is needed. Increased research efforts are therefore needed in this field.*

3.1. Introduction

This section deals with the impact of monetary policy on stock market returns in Germany. It sheds some light on the more general debate, that is whether: (a) the central bank as a monopolistic supplier of base money can influence stock market returns in a systematic fashion; and (b) if this is the case, whether asset prices should be used as monetary policy indicators (ECB, 2002). In principle, it is generally acknowledged that there are two main channels through which a central bank can influence asset prices. Firstly, the central bank is able to determine short-term interest rates, which act as a benchmark for short-term returns and are used for discounting the assets' future income streams. Thus, the central bank is able to affect asset prices via agents' expectations about the future path of money market rates (short-run impact). Secondly, the long-run perspective about future inflation has an impact on the current prices of long-term assets, since nominal long-term returns usually contain an inflation premium. Given that monetary policy determines inflation in the long run, it has a strong impact on asset prices via inflation expectations (long-run impact). However, the short run and the long run are intertwined since, for instance, changes in inflation expectations should cause a break in the sequence of expected short-term rates. This interconnection may serve as the first hint that the use of the usual error-correction modelling framework, which enables us to model this link between the short run and the long run is highly suitable in this context.

Which policy implications would emerge from the finding of a significant and stable relationship between monetary policy and stock prices? In our view, there are clear implications. First, by letting short-term rates deviate from a certain level of equilibrium, the central bank may have a significant short-run impact on asset prices (short-run impact). However, indications of the change in asset prices depend on whether the long-term relationship between monetary policy and asset prices is stable, i.e. the central bank's reaction function has not changed and is perceived still to be credible by the actors (long-run impact). Hence, and this is the second implication, only a predictable and transparent monetary policy strategy establishes a stable long-term relation between monetary policy and asset prices. However, since the long and the short run are intertwined, the sound implementation of a transparent monetary policy is an indispensable condition even in the short run. However, in the short run monetary policy intervention leads to forecastable fluctuations of asset returns around an equilibrium value. Third, in principle the central bank is able to reduce stock price volatility by diminishing the uncertainty of future rate changes, volatility spillovers to other financial markets could be avoided and the option value of waiting with investment decisions would be reduced (Bean, 2004, Dupor and Conley, 2004, Domanski and Kremer, 1998, pp. 24 and 41 f., and ECB, 2002, pp. 39ff.).

In order to tackle this important question we test for a stable cointegration relationship between stock market returns and the central bank interest rate. In this section, the bounds testing procedure proposed by Pesaran, Shin and Smith (1996) is applied to the estimation of the impact of monetary policy on stock market returns. We examine the existence of a long-run relationship between stock market returns and the relevant explanatory variable. Some new econometric techniques proposed by Pesaran, Shin (1998) are applied to improve on some of the critical points of earlier studies on the impact of monetary policy on stock market returns.

By construction, the most often-used indicator of monetary policy, the one-month-money market rate, often leads to relatively *small sample sizes*, for instance, due to monetary policy regime shifts. The main objection is that in this case one only has a limited number of degrees of freedom due to the use of annual data. But the distribution of the test statistics is only known for the large sample case. As a consequence, there is often *no clear information on the integration and cointegration properties* of the data, especially market interest rates. While there are upper and lower bounds for the interest rate available from theory and, hence, the interest rate should be stationary, unit root tests often cannot empirically reject the I(1) hypothesis for the same variable as a sample property. The same is, in principle, valid for different measures of stock market returns. Thus, whether variables should be introduced in differenced or level form is highly questionable.

A procedure that avoids these difficulties and appears to be eminently suitable for the problem at hand is that proposed by Pesaran, Shin and Smith (1996, 2001) and Pesaran and Shin (1999), respectively. It is *as efficient as possible* in the case of small samples. In addition, it is also capable of dealing with the controversial issue of *(lack of) exogeneity* of the monetary policy variable. We choose this approach in this section since it has the additional advantage of yielding *consistent estimates of the long-run coefficients* that are asymptotically normal *irrespective of whether the underlying regressors are I(0) or I(1)* and of the extent of cointegration. This is a key property since a second objection raised in the literature is that it is not clear whether the 1-month money market rate measuring monetary policy and different measures of stock market returns are I(0) or I(1). Since a third objection against the usual procedures to assess the impact of monetary policy on asset prices in general is that they (by estimating VARs only in differences) do not allow one to distinguish clearly between long run and short run relationships, the procedure used in this section will also allow *the correct dynamic structure* to be obtained.

In this section we apply the procedure proposed by Pesaran, Shin and Smith (1996) on *monthly* data for Germany. The approach used here involves testing the null hypothesis that there exists no long-run relationship between the levels of the variables under consideration using the bounds procedure by Pesaran, Shin and Smith (1998). In the spirit of that study, we suggest moving to error-correction modelling only if the negation of a long-run relationship is rejected. The test is the standard Wald or F-statistic for testing the significance of the lagged levels of the variables in a first difference ARDL regression (with a non-standard distribution under the null).

3.2. Modelling monetary policy impacts on stock prices

The return of the stock market *i* in period *t*, $r_{i,t}$, equals the risk free rate, rf_t, plus a (time-invariant) risk premium, ϕ, demanded by investors to hold risky assets:

$$(1) \qquad r_{i,t} = rf_t + \phi$$

Assuming that the short-term interest of the central bank actually determines the risk free rate, and, in addition, that the risk premium is a stationary variable, the central bank can be expected to have a systematic impact on stock returns. Put another way, equation (1) would suggest that stock returns and central bank rates are cointegrated.

In empirical terms, the monetary policy variable should not, a priori, be excluded when analysing a *long-term* relationship between the stock market return and its determinants. However, some readers might have a strong prior belief that monetary policy shocks cannot have permanent effects on stock returns (see, e.g., ECB, 2002, p. 46). Since this is not central to the analysis in this study, we choose not to take a view on this issue. Moreover, we believe the question of *short-term versus long-term* impacts of monetary policy on stock prices can only be solved empirically. The results based on empirical tests of the significance of monetary policy in the stationary and in the non-stationary parts of error-correction models which we present below are compatible with both views.

3.3. Testing for the existence of a long-run relation between monetary policy and German stock market returns

The test for the existence of long-run relations between stock market returns and the short-term money market rate as a proxy for monetary policy was conducted for the German stock market for the period August 1974 to September 2003. We used monthly data provided by Datastream Primark and calculated three alternative future stock market return measures (dependent variables), namely (i) annualised one-month continuously compounded stock market returns (h); (ii) annualised one-month dividend growth rates in percent (Δd); and (iii) the difference between the two ($h–\Delta d$).[20] These performance measures are calculated over various holding periods, namely 1, 3, 12, 24, 36 and 48 months. In the following, they are regressed on the one-month money market rate (independent variable) (i1m) after we have ensured that there is no problem of “reverse causation”, i.e. that the short-term money market rate really is the ‘forcing variable’. Concerning the monetary policy stance, a further important difference is that we experimented with some other monetary policy variables, but we finally decided to use the one-month money market rate I1M.

First, one might think of using *central bank rates* instead of the money market rate. However, this would mean that we are dealing with monthly observations of series that move with discrete jumps (the refi rate for the ECB). This is somewhat of an extreme exercise because this sort of test is designed for smooth variables instead of variables that jump from one value to another. Note, however, that targets are typically modified in discrete increments rather than continuously. Hence, the very nature of what we want to capture is discreet and represents a structural break in the series. Moreover, the changes in targets are spaced irregularly in time (Hamilton and Jordá 2000). We could argue that by using this dataset we are forcing the series to maximise its co-movements. If we do not find empirical evidence with this data set, it

[20] The regressions for dividend and profit growth are subject to the omitted variables problem because, in that case, expected stock market returns introduce noise. To circumvent this problem, the differences between h and Δd, $h–\Delta d$, were also calculated.

is doubtful that we would find it even with a more "conventional" dataset. The smoother the series (take for instance the monthly 13-month LIBOR money market rates) the more difficult it is to capture any reaction to abrupt rates changes and the more contaminated this series would be with irrelevant information (Garcia-Cervero, 2002).

So, in this context, what are the appropriate levels for interest rates? Optimally, we should investigate the central bank's instrument for setting monetary policy. Both the ECB and the Bundesbank operate in the money market, but at slightly different maturities. They cannot influence longer-term interest rates directly (for the ECB see Borio 2001); instead, their direct influence is limited to the rate for fortnightly operations, in the case of the ECB.[21] The monthly rates we use are of course, influenced by expectations for the future path of the shorter rates controlled by the respective central banks.[22]

A priori, if one uses market interest rate data, it becomes inherently difficult to distinguish policy maker's intentions from demand disturbances in financial markets (Bergin and Jordá 2002, p. 2). However, our inspection of the data clearly indicates that central bank rates and market rates are closely correlated. Moreover, using market rates, one has the advantage of being able to capture, albeit imperfectly, the probability of future interest rate moves by the central bank. If one uses central bank rates, one has only the realisations, not the expectations, that determine market rates; these, in turn, are the rates that influence the economy. Of course, our choice of monthly data eliminates some of the noise that might come from short-term disturbances in money markets and might be apparent in, e.g., daily data. Further details on the series are given at the end of this section.

To convey a broad-brush view on the data and indicate possible correlations, Figure 1 shows three scatter plots. It shows cross-plots of three measures of stock market returns against the1-month money market rate. The charts suggest, first, that the conjectured *positive* relationship between the 1-month money market rate (I1M) and the annualised one-month continuously compounded stock market returns lagged four years (h48) holds for the German stock market. Second, the conjectured *positive* relationship between the 1-month money market rate (I1M) and the 4-years-lagged difference ($h–\Delta d$) between the annualised one-month continuously compounded stock market returns (h) and the annualised one-month dividend growth rates in percent (Δd) (hd48) is also corroborated by the visual inspection of Figures below. Third, as indicated by the theoretical considerations outlined earlier, the relation between I1M and d48 appears to be indeed negative. What matters for our empirical work, however, is that the overall relationships in these figures show a clear positive or negative relation - rather than being vertical or horizontal. Figure 2 shows the variables under review over time.

---

21 The ECB also provides some funds at longer maturities (three months).

22 See Ulrich (2003), p. 7, and Wyplosz (2001), pp. 6f. However, Perez-Quiros and Sicilia (2002), pp. 7ff., argue that policy announcements made on Council meetings should not trigger any reaction of asset prices in case of full predictability, since market participants have already correctly anticipated these policy decisions on the day when the central bank rate is changed. However, in a world of uncertainty, collective decisions on monetary policy and lack of transparency, effective communication and active guidance to the markets, predictability and the anticipation of the exact timing of interest rate changes might not be fully attainable. This would at least theoretically justify the use of the refi rate in our case.

Figure 1. – German stock market returns and the money market rate (1974M8 to 2003M9)

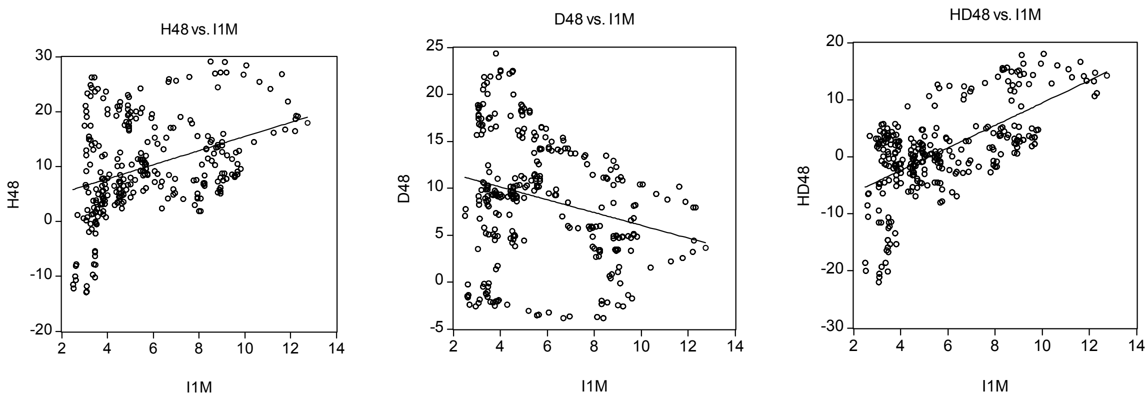
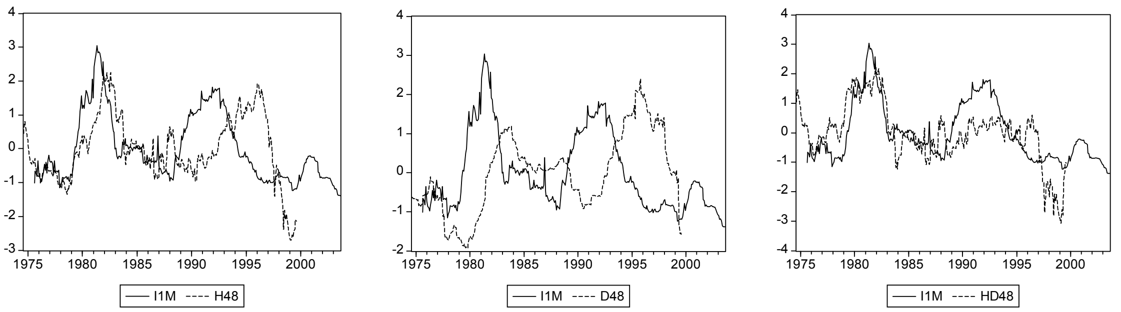


Figure 2. – Stock market returns and the money market rate over time (normalized scaling)



Source: Thomson Financials, own calculations.

3.3.1. Testing for cointegration: The Pesaran, Shin and Smith ARDL approach

As mentioned above, an important problem inherent in the residual-based tests and even in some system-based tests for cointegration is given by a decisive precondition. One must know with certainty that the underlying regressors in the model, i.e. our monetary policy variable, are integrated of the order one, i.e. I(1). However, given the low power of unit root tests there will always remain a *certain degree of uncertainty with respect to the order of integration* of the underlying variables. For this reason, we now make use of a new approach proposed by Pesaran, Shin and Smith (1996) to test for the existence of a linear long-run relationship, when the orders of integration of the underlying regressors are not known with certainty. The test is the *standard Wald or F statistic* for testing the significance of the lagged levels of the variables in a first-difference regression. The involved regression is an error-correction form of an autoregressive distributed lag (ARDL) model in the variables of interest (here: labour market variables).

More specifically, in the case of an unrestricted ECM, regressions of y on a vector of x's, the procedure suggested by Pesaran, Shin and Smith (1996) as a first step involves estimating the following model (Pesaran, Shin and Smith (1996, pp. 2 ff.)):

$$\Delta y_t = a_{0y} + a_{1y} \cdot t + \phi y_{t-1} + \delta_1 x_{1,t-1} + \delta_2 x_{2,t-1} + \ldots + \delta_k x_{k,t-1} +$$

(2)

$$\sum_{i=1}^{p-1} \psi_i \Delta y_{1,t-i} + \sum_{i=0}^{q_1-1} \varphi_{1i} \Delta x_{1,t-i} + \sum_{i=0}^{q_2-1} \varphi_{i2} \Delta x_{2,t-i} + \ldots + \sum_{i=0}^{q_k-1} \varphi_{ik} \Delta x_{k,t-i} + \xi_{ty},$$

with ϕ and δ's as the long-run multipliers, Ψ's and φ's as short-run dynamic coefficients, (p,q) as the order of the underlying ARDL-model (p refers to y, q refers to x), t as a deterministic time trend, k as the number of 'forcing variables', and ξ uncorrelated with the Δx_t and the lagged values of x_t and y_t.

As a second step, one has to compute the usual F-statistic for testing the joint significance of $\phi = \delta_1 = \delta_2 == ... = \delta_k = 0$. However, the asymptotic distributions of the *standard Wald or F statistic* for testing the significance of the lagged levels of the variables are *non-standard* under the null hypothesis that there exists no long-run relationship between the levels of the included variables. Pesaran, Shin and Smith (1996), pp. T1 f., provide *two sets of asymptotic critical values*; one set assuming that all the regressors are I(1); and another set assuming that they are all I(0). These two sets of critical values provide a band covering all possible classifications of the regressors into I(0), I(1) (or even mutually cointegrated).

In view of this result, a third step we use the appropriate bounds testing procedure. The test proposed by Pesaran, Shin and Smith (1996) is consistent. For a sequence of local alternatives, it has a non-central χ^2-distribution asymptotically. This is valid irrespective of whether the underlying regressors are I(0), I(1) or mutually cointegrated. The recommended proceedings based on the F-statistic is as follows. One has to compare the F-statistic computed in the second step with the upper and lower 90, 95, 97.5 or 99 percent critical value bounds (F_U and F_L). As a result, three cases can emerge. If $F > F_U$, one has to reject $\phi = \delta_1 = \delta_2 = ... = \delta_k = 0$. $\phi = \delta_1 = \delta_2 = ... = \delta_k = 0$ and hence conclude that there is a long-term relationship between y and the vector of x's. However, if $F < F_L$, one cannot reject $\phi = \delta_1 = \delta_2 = ... = \delta_k = 0.\phi = \delta_1 = \delta_2 = ... = \delta_k = 0$. In this case, a long-run relationship does not seem to exist. Finally, if $F_L < F < F_U$ the inference has to be regarded as inconclusive. The order of integration of the underlying variables has to be investigated more deeply. This third step can also be applied based on the W-statistics.

The above procedure should be *repeated* for ARDL regressions of *each* element of the vector of x's on the remaining relevant variables (including y) in order to select the so called 'forcing variables'. For example, in the case of k = 2, the repetition should concern the ARDL regressions of x_{1t} on (y_t, x_{2t}) and x_{2t} on (y_t, x_{1t}). If it can no longer be rejected that the linear relationship between the relevant variables is not 'spurious', one can estimate coefficients of the long-run relationship by means of the ARDL-procedure. This estimation procedure is discussed in section 4 of this contribution.

3.3.2. Application to German Stock market data

Since the choice of the orders of the included lagged differenced variables in the unrestricted ECM specification can have a significant effect on the test results, models in the stock market returns (*h*, *Δd* or *h–Δd*) and the logs of the 1-month money market rate (I1M) are estimated for the orders p = q = 2, 3, 4, …, 12. Finally, in the absence of a priori information about the direction of the long-run relationship between *h*, *Δd* or *h–Δd* and the monetary policy variables, we estimate unrestricted ECM regressions of *h*, *Δd* or *h–Δd* (as the respective dependent variables y) on the "vector" of monetary policy variables (x) as well as the reverse regressions of x on y. More specifically, in the case of the unrestricted ECM regressions of y on x, we re-estimate equation (2) using monthly observations over a maximum sample ranging from August 1974 to September 2003. In view of the monthly nature of observations we set the maximum orders to 12, i.e. we estimate eq. (1) for the order of $p = q_1 = q_2 = 12$ over the same sample period. It is important to note already at this early stage of investigation that we have to choose p and q *quite liberally* in order to endogenise the stock market returns LBAI (detailed proofs can be found in Pesaran, Shin (1998) and Pesaran, Shin and Smith (1996)).

As shown in detail in many empirical studies, there are a number of main culprits, such as German reunification, the stock market crash and the launch of the euro, which are likely to have dramatically altered the stock market dynamics. For this reason, one could tend to rely more on estimates that take these shocks explicitly into account by means of structural break dummies. However, an implementation of such kind of dummies in the cointegration equation implies a *permanent* change in the relation between the stock market return and monetary policy. Moreover, we decided not to specify ad hoc-dummies but to let the data speak for itself; instead we prefer to gain an understanding of these events by the dynamic structure of our model itself. As we are interested in the impact of the money market rate, namely of I1M, but take it for granted that the constant (i.e., the stationary risk premium) also influences stock market returns, we distinguish between *three different definitions of stock market returns* (cases *h*, *Δd* and *h–Δd*, in each of these cases the monetary policy stance might alternatively be approximated by the one-month money market rate I1M) as implied by theory (see section 2):

- *Model 1*: (h, I1M, intercept), means: h, I1M and a constant included in the long-run relation,
- *Model 2*: (*Δd*, I1M, intercept), means: *Δd*, I1M and a constant included in the long-run relation, and
- *Model 3*: (*h–Δd*, I1M, intercept), means: *h–Δd*, I1M and a constant included in the long-run relation.

The models 1, 2, and 3 each portray an important implication of the theoretical model derived in section 2, namely that there is cointegration between monetary policy and stock market returns. It is also connected with a second implicit idea inherent in the model insofar as it allows monetary policy to slow down the adjustment to a new stock market equilibrium in the wake of a shock.[23] The core implication of the model derived above is that the 1-month money market rate determines the average German stock market returns in the short *and* in the long run. In sum, thus, our modelling approach is strictly *guided by theory*.

The following estimations - like all other computations in this section - have been carried out using the program Microfit 4.0 (see Pesaran and Pesaran, 1997). We now let the data tell us which of the above case model fits the German stock market data best. Tables 1a to 1c display the empirical realisations of the F-statistics for testing the existence of a long-run relationship between the stock market return and the 1-month money market rate (model 1: $x = h$, model 2: $x = \Delta d$, and model 3: $x = h–\Delta d$). In all of these cases, the underlying equations pass the usual diagnostic tests for serial correlation of the residuals, for functional form misspecification and for non-normal and/or heteroscedastic disturbances.

[23] In principle, a more sophisticated specification our hypothesis could have made the impact of monetary policy dependent on the sign of the error-correction term (negative, if the latter is positive and vice versa) via e.g. the sign function. However, this way of modeling is certainly beyond the scope of this section.

The 90, 95 and 99 percent lower and upper critical values bounds of the F-test statistic dependent on the number of regressors and dependent on whether a *linear trend* is included or not are originally given in Table B in Pesaran, Shin and Smith (1996) and usefully summarized in Pesaran and Pesaran (1997), Annex C, Statistical Tables, Table F. The critical value bounds for the application without trend are given in the middle panel of this Table F at the 90 percent level by 4.042 to 4.788, at the 95 percent level by 4.934 to 5.764 and at the 99 percent level by 7.057 to 7.815. For the application with a linear trend, the respective upper bound critical values can be found in the lower panel of Table F: 5.649 to 6.335 (at the 90 percent level), 6.606 to 7.423 (at the 95 percent level) and 9.063 to 9.786 (at the 99 percent level). We took the upper bound critical values from these intervals and tabulate them in Tables 1a to 1c as the relevant conservative benchmarks to check the significance of the cointegration relationships. We also experimented with the inclusion of several dummies which approximate the above mentioned shocks like, e.g. the launch of the euro.

According to the empirical F-values in Tables 1a, 1b and 1c, we find that the null hypothesis of no long-run relationship in the case of unrestricted ECM regressions of the log of stock market returns on the 1-month money market rate is *rejected* in six cases at $\alpha = 0.1$ and in one of the cases even at the 5 percent level. Five of these cases emerge if a deterministic trend is excluded.

Table 1a - *F-Statistics for Testing the Existence of a Long-Run Relationship Between the Stock Market Return and the 1-Month Money Market Rate (Model 1: x=h)*

	Based on regressions with the change of stock market returns d(h) as dependent variable		Based on regressions with the change of the 1-month money market rate d(I1M) as dependent variable	
MA-order of h	*Without trend*	*With trend*	*Without trend*	*With trend*
h1	0.38514	.37331	.62112	1.2964
h3	0.33054	.29174	.68269	1.4027
H12	4.1498	3.4756	1.1217	1.8822
H24	1.6206	1.5370	1.3958	1.8462
H36	3.0513	2.7825	3.1644	3.2346
H48	3.3059	3.0115	2.6173	2.3888
$F^C(0.1)$	*4.788*	*6.335*	*4.788*	*6.335*
$F^C(0.05)$	*5.764*	*7.423*	*5.764*	*7.423*
$F^C(0.01)$	*7.815*	*9.786*	*7.815*	*9.786*

Table 1b - *F-Statistics for Testing the Existence of a Long-Run Relationship Between the Stock Market Return and the 1-Month Money Market Rate (Model 2: x = Δd)*

	Based on regressions with the change of stock market returns d(Δd) as dependent variable		Based on regressions with the change of the 1-month money market rate d(I1M) as dependent variable	
MA-order of Δd	*Without trend*	*With trend*	*Without trend*	*With trend*
$\Delta d1$	1.1636	.70023	.55420	1.2435
$\Delta d3$	**5.7272**	5.3409	.34943	.93343
$\Delta d12$	**5.7826**	**6.3054**	.30969	1.0161
$\Delta d24$	**4.8634**	4.0246	.81902	.78559
$\Delta d36$	3.1176	2.9596	1.9467	1.0164
$\Delta d48$	**4.8219**	4.2469	2.8897	1.7384
$W^C(0.1)$	*4.788*	*6.335*	*4.788*	*6.335*
$W^C(0.05)$	*5.764*	*7.423*	*5.764*	*7.423*
$W^C(0.01)$	*7.815*	*9.786*	*7.815*	*9.786*

Table 1c - *F-Statistics for Testing the Existence of a Long-Run Relationship Between the Stock Market Return and the 1-Month Money Market Rate (Model 3: x=h–Δd)*

	Based on regressions with the change of stock market returns d($h-\Delta d$) as dependent variable		Based on regressions with the change of the 1-month money market rate d(I1M) as dependent variable	
MA-order of ($h-\Delta d$)	*Without trend*	*With trend*	*Without trend*	*With trend*
($h-\Delta d$)1	.047213	.098401	.64266	1.3679
($h-\Delta d$)3	1.2670	1.4044	.67448	1.5319
($h-\Delta d$)12	**5.0548**	5.4894	1.1937	2.6843
($h-\Delta d$)24	.10459	.10481	.75332	2.2693
($h-\Delta d$)36	.94473	.49116	2.0034	3.4625
($h-\Delta d$)48	.47441	.10662	.78167	1.1507
$W^C(0.1)$	*4.788*	*6.335*	*4.788*	*6.335*
$W^C(0.05)$	*5.764*	*7.423*	*5.764*	*7.423*
$W^C(0.01)$	*7.815*	*9.786*	*7.815*	*9.786*

Notes: Lag orders: $p = q_1 = q_2 = 12$. Maximum sample: 1974.8 to 2003.9. Individual samples: For MA=12 months: 1975M8 to 2002M9. For MA=24 months: 1975M8 to 2001M9. For MA=36 months: 1975M8 to 2000M9. For MA=48 months: 1975M8 to 1999M9.

Overall, the results displayed in the Tables 1a to 1c provide *some evidence in favour of the existence of a long-run relationship* between the (future) stock market returns (as measured by *h*, *Δd* or *h–Δd*) and the 1-month money market rate and the estimated constant, i.e. the risk premium. This is valid at least if we approximate stock market returns by the variable *Δd* and use MA orders of 3, 12, 24, or 48 in the applications without a linear trend. However, no cointegration has to be rejected in case of stock market returns *Δd* also if we use an application with a deterministic trend and a MA-order of 12. For all other specifications of the stock market returns, namely h and ($h–\Delta d$), we do not find any cointegrating relationships except for $h–\Delta d$ and the application without a deterministic trend (MA=12).

But in view of the potential endogeneity of monetary policy with respect to stock market performance, it is not possible to know a priori whether monetary policy, i.e. the 1-month money market rate, is the 'long-run forcing' variable for the average future stock market return performance.[24] Since we see this point as of primary importance (although not tackled in the literature so far), we have considered all possible regressions and substituted the change in the stock market return dh, d(Δd) or d($h–\Delta d$) as the dependent variable in eq. (8) by the change in the 1-month money market rate d(I1M), in order to test whether this relationship is *spurious* in the sense that we do not capture the 'correct direction of causation'. For instance, we have to ensure that the future stock market return is not among the forcing variables. The results of the reversed test equations are displayed in the second large columns of Tables 1a to 1c. In the case of x = Δd and for a wide range of moving averages (3, 12, 24 and 48 months), we find that the *direction* of this relation is most likely to be *from the 1-month money market rate to the future stock market returns,* so that the 1-month money market rate I1M can be considered as the 'long-run forcing' variable for the explanation of the variable Δd. In case of MA=12, this is even valid for a specification including a linear trend. Analogously, the 1-month money market rate I1M can be regarded as the 'long-run forcing' variable for the explanation of the variable Δd if MA=12 and As a consequence, in this case the parameters of the long-run relationship can now be estimated using the ARDL procedure discussed in Pesaran and Shin (1999). Experimenting with dummies coded as one from October 1987 onwards, from July 1990 onwards, from August 2001 onwards and from September 2001 onwards did not change the results substantially.

As a robustness check, we have also moved to some complementary tests for cointegration on the basis of models 1 and 2 in an earlier version of the section. When using cointegration analysis in the Johansen-framework (Johansen (1991, 1995)), we would first need to establish that all the underlying variables are I(1). However, such pre-testing results may adversely affect the test results based on cointegration techniques (Cavanaugh et al. (1995), Pesaran (1997)). This insight already motivated us to use the Pesaran, Shin and Smith (1996) approach and not to display the results here. The latter are available in Belke and Polleit (2004a). In general, the results of these traditional cointegration exercises not displayed here convey the impression that cointegration properties appear clearly if, and this is important in the light of the literature on monetary policy reaction functions and on the impact of monetary policy on asset prices, cointegration is indicated if exogeneity is imposed (solely) on the monetary policy variable.[25]

[24] For instance, monetary policy could have systematically and preemptively reacted to the emergence of asset price bubbles. More generally, asset prices as predictors of the future course of the economy might have triggered some monetary policy action. See, e.g., Bean (2004), Dupor and Conley (2004) and ECB (2002) for good summaries of this discussion in the literature.

[25] Belke and Polleit (2004a) apply the standard system approach of Johansen (1991) and are able to confirm the above results for the 1-month money market rate I1M and the annualised one-month dividend growth rates in percent d3 within this standard framework. In addition, they show based on the long-run structural modelling approach by Pesaran and Pesaran (1997), and Pesaran, Shin and Smith (1997) that, if exogeneity is imposed on the 1-month money market rate, the existence of no cointegration vector has to be rejected. If, in turn, exogeneity is imposed on the German stock market returns, the null hypothesis of no cointegration cannot be rejected any more. This clear result strongly corresponds to our results in section 3 based on the ARDL approach to cointegration and again highlights that the 1-month money market rate is the ‘forcing variable’ for stock market returns if defined as the annualised one-month dividend growth rates in percent (Δd). This can be interpreted as a further robustness check.

In Belke and Polleit (2004b), we start from the above results and turn to the *estimation of the long-run coefficients* and the associated *error-correction models* for the German stock market. This part of the analysis has to be interpreted as an important completion of the analysis of the impact of monetary policy on stock markets. That is, in this contribution, we explicitly take into account the existence of a *long-term* relationship between stock market returns and monetary policy and the *short-term deviations* from it as a driving force of short-term movements in stock market returns. By this, we allow monetary policy to have a short-term *and* a long-term (and by this, via feedback mechanisms, further short-term) impacts on the stock market return. As a robustness check, we tested for a break due to the start of EMU in 1999. We find that the relation appeared to be more stable before EMU, and more instable for the whole sample including the DM and the euro period.

4. Conclusions and implications for the debate on the impacts of monetary policy on asset prices

By accepting our main result for the selected indicator of stock market returns and the selected lag structure, one could jump to the policy conclusion that the interest rate-setting by the central bank has a significant impact on German stock market returns. We cannot empirically reject the view that, by letting short-term rates deviate from a certain equilibrium level, the Bundesbank – and later on also the ECB – had a significant short-run impact on stock prices. Moreover, we show empirically that the long-term relationship between monetary policy and asset prices has not changed within the sample from 1973 to 2003 considered by us. Hence, we conclude that the central bank's reaction function has not changed over time and has been perceived to be credible by the market agents. In addition, we empirically corroborate the view that monetary policy interventions lead to forecastable fluctuations of German stock market returns around an equilibrium value. Finally, the Bundesbank and also the ECB were in principle able to reduce stock price volatility by diminishing the uncertainty of future rate changes. By this, the monetary authorities relevant for Germany delivered an important positive contribution for economic growth since they were able to reduce the option value of waiting with investment decisions.

One of the main findings of the section is that – at least for the selected error-correction model – it is a *one-way* relationship between monetary policy and stock market returns *from the first to the latter*. Hence, in this case the monetary policy variable can best be characterised as a so-called 'forcing variable' of stock market returns. Following this interpretation, one would feel inclined to conclude that the empirical results presented in this section indicate that the monetary policy strategy followed by the Bundesbank, at least, has been able to provide a reliable medium-term orientation for actors on asset markets. However, this seems to be less so for the ECB since we find in our robustness checks that the relation between monetary policy and stock prices appeared to be more stable before EMU, and more instable for the whole sample including the DM and the euro period.

However, in the light of our empirical results, such reasoning would appear to be premature at this stage of analysis. We show that an increase in the 1-month money market rate has a statistically significant negative impact on the German stock market returns (with one exception, i.e. one ECM specification based on $h–\Delta d$) *only if* the latter are defined as the annualised one-month dividend growth rates in percent. In line with theory, the sign of the impact of monetary policy on stock market returns becomes positive if these returns are measured by ($h–\Delta d$), i.e. the difference between the annualised one-month continuously compounded stock market returns h and Δd. However, in a companion study, we could gain significant error-correction parameter estimates only for a small share of all possible specifications. Moreover, it proved to be extremely difficult to identify an empirical model with good forecasting properties, at least for the longer term, i.e. 12 months. Hence, it cannot be claimed in general at this stage of analysis that a forecast of the future course of monetary policy is generally useful for forecasting stock market returns.

Moreover, we acknowledge that some aspects of the main results still remain unsatisfactory. For instance, one would have expected that a wider range of specifications of stock market returns would show a stronger impact of monetary policy, a result only partially confirmed by the data. In addition, it will never be possible to state beyond any doubt that the 1-month money market rate does not stand for some other macroeconomic variable, such as noise that might come from short-term disturbances in money markets (see also our extensive discussion of this point in section 3). Hence, some aspects of our results can certainly be disputed on technical grounds.

Finally, we realise that the results are preliminary and still in their infancy, not least because the questions posed in this section have not been tackled in this systematic econometric fashion in the literature so far. However, most of the progress claimed by this section is in the field of methodology. For instance, the quite limited number of observations is no reason to be overly cautious any more when studying stock market relationships. The reason is that the procedure used in this contribution is robust with respect to small samples and the *uncertainty of the order of integration* of the included variables. This approach could be followed in this section only for one 'country', namely Germany, since replicating it for many others like the US would simply have taken too much space. We leave this task for future research.

It seems to be the biggest challenge for future research to identify the *details of the transmission channel of monetary policy to stock market returns* from a theoretical perspective. Empirical work could follow in the sense that it could exploit the progress in economic theory by imposing it as a restriction on the empirical models in order to exactly identify long-run relationships (Pesaran, 1997). However, because of scarcity of knowledge in this area, there is still a long way to go.

References

Bean, C. (2004): Asset Prices, Financial Instability, and Monetary Policy, in: American Economic Review – Sections and Proceedings, Vol. 94, No. 2, pp.14-23.

Belke, A., Polleit, T. (2004a): Monetary Policy and Stock Market Returns - A Long-Run Structural Modelling Approach, Frankfurt and Stuttgart, mimeo.

Belke, A., Polleit, T. (2004b): Monetary Policy and Stock Market Returns: A Cointegration Application of the ARDL Approach, Frankfurt and Stuttgart, mimeo.

Bergin, P.R., and Jordá, O. (2002): Measuring Monetary Policy Interdependence, forthcoming in: Journal of International Money and Finance.

Borio, C. (2001): Comparing Monetary Policy Operating Procedures Across the United States, Japan, and the Euro Area, *BIS Section* 9, Bank for International Settlements, Basle, pp. 1-22.

Domanski, D., Kremer, M. (1998): What Do Asset Price Movements in Germany Tell Policy Makers, in: The Role of Asset Prices in the Formulation of Monetary Policy, Bank for International Settlement, Conference Papers, Basle, Vol. 5, pp. 24-44.

Dupor, B., Conley, T. (2004): The Fed Response to Equity Prices and Inflation, in: American Economic Review – Sections and Proceedings, Vol. 94, No. 2, pp. 24-32.

European Central Bank (2002): The Stock Market and Monetary Policy, Monthly Bulletin, February, Frankfurt/Main, pp. 39-52.

Garcia-Cervero, S. (2002): Is the FED Really Leading the Way?, Deutsche Bank Europe Weekly 22 November 2002, Global Markets Research, London, pp. 8-10.

Johansen, S. (1991): Estimation and Hypothesis Testing of Cointegrating Vectors in Gaussian Vector Autoregressive Models, in: Econometrica, Vol. 55, S. 251 - 276.

Perez-Quiros, G., Sicilia, J. (2002): Is the European Central Bank (and the United States Federal Reserve) Predictable?, *European Central Bank Working Section* 192, November, Frankfurt.

Pesaran, M.H. (1997): The Role of Economic Theory in Modelling the Long-Run, in: Economic Journal, Vol. 107, pp. 178 - 191.

Pesaran, M.H., Pesaran, B. (1997): Working with Microfit 4.0 - Interactive Econometric Analysis, Oxford University Press.

Pesaran, M.H., Shin, Y. (1999): An Autoregressive Distributed Lag Modelling Approach to Cointegration Analysis, in: Strom, S., and P. Diamond (eds.), Econometrics and Economic Theory in the 20th Century: The Ragnar Frisch Centennial Symposium, chapter 11, Cambridge, Cambridge University Press., Manuscript Version 1998.

Pesaran, M.H., Shin, Y., Smith, R.J. (1996): Testing for the Existence of a Long-Run Relationship, DAE Working Section No. 9622, Department of Applied Economics, University of Cambridge.

Pesaran, M.H., Y. Shin, and R. J. Smith (2001): Bounds Testing Approaches to the Analysis of Level Relationships, in: Hendry, D.F., and M.H. Pesaran (eds.), Journal of Applied Econometrics, Special Issue in Honour of J D Sargan - Studies in Empirical Macroeconometrics, Vol. 16, pp. 289-326.

Ulrich, K. (2003): *A Comparison Between the Fed and the ECB: Taylor Rules*, ZEW Discussion Section No. 03-19, Centre for European Economic Research, Mannheim.

Wyplosz, C. (2001): *The Fed and the ECB*, Briefing Note to the Committee for Economic and Monetary Affairs of the European Parliament, September 12, Brussels.

Data

All stock market data for Germany was taken from the Thomson Financials data base. The indices used cover around 80% of the stock market capitalization in Germany.

The following stock market return measures were calculated:

h = holding stock market returns (capital gains plus dividend returns, presented by the total stock market performance index), expressed as the annualised one-month continuously compounded stock return in percent;

Δd = dividend growth, expressed as the annualised one-month continuously compounded stock return in percent and

$h - \Delta d$ = holding period return minus dividend growth.

In the text, a number behind a variable indicates the time horizon under review. For instance, *h*36 would indicate the holding period return over the coming 36-months.

I1MBIP91: 1-month-money market rate, DM until December 1998 and Euro from January 1999 on (Source: Datastream Primark).

Part 4: ECB policy and euro inflation outlook

CONTENT: *1.1 Global liquidity expansion remains strong. – 1.2 A brief look at inflation expectations. – 1.3 Euro area inflation forecast.*

SUMMARY: *“Global liquidity” remains very high: money holdings in the western industrialised world in relation to real income have increased strongly since around the end of 1996. The consequences of global “excess liquidity” are as yet unclear. In the euro area, excess liquidity, measured in the form of the “price gap”, is exceptionally high. This is accompanied by fairly robust bank loan growth and real short-term interest rates at record lows. Moreover, market inflation expectations seem to have moved above the ECB’s upper 2.0% ceiling, potentially signalling market agents’ doubts about the bank’s commitment to keeping inflation on its intended course. According to our model, the annual rise in the HICP should average 2.1% in 2004, rising further to 2.2% in 2005. That said, the ECB will have to move rates towards a somewhat “more neutral” level of 3.0% until the middle of 2005 to keep future inflation below 2.0% in the coming years.*

4.1 Global liquidity expansion remains strong

One striking development in recent years has been the very strong expansion of monetary aggregates in the world’s leading economies. Below, we therefore take a brief look at global monetary expansion and its relation to key macroeconomic variables.[26]

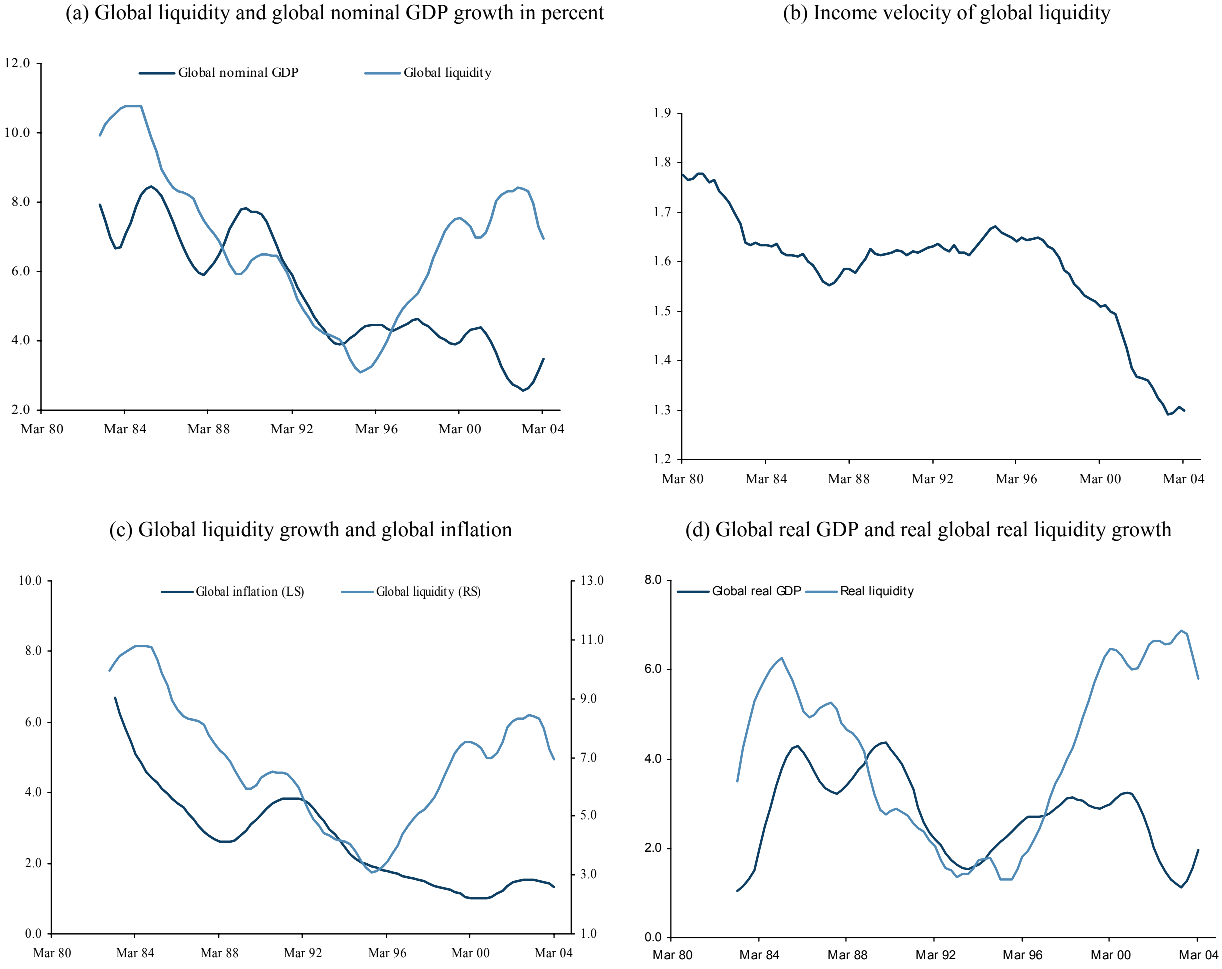
Figure 4.1.1 shows the expansion of aggregated money supply in the US, the euro area, Japan, UK and Canada (“global liquidity”) and the aggregated nominal GDP in these countries (“global nominal GDP”) for the period Q4 1982 to Q1 2004. As can be seen, since the middle of the 1990s global liquidity has grown much more strongly than nominal GDP (see Figure 4.1.1 (a)). This can also be looked at as a decline in the income velocity of the global liquidity aggregate (see Figure 4.1.1 (b)). The income velocity declined from around 1.7 at the beginning of 1997 to less than 1.3 in the first quarter of 2004. This implies that market agents have increased their holdings of real money balances relative to real incomes. As a result, it does not come as a surprise that global liquidity growth and global inflation have diverged significantly since around the middle of 1995 (see Figure 4.1.1 (c)). While annual money supply growth stood at nearly 7.0% at the beginning of 2004, global inflation was just 1.3%. Finally, Figure 4.1.1 (d) shows real global liquidity growth – that is, global liquidity less the change in the deflator of global income – and real output growth. Real liquidity growth has outpaced real income growth by quite a margin since around the middle of the 1990s.

What does the high liquidity overhang – defined as real liquidity growth minus real output growth – entail for future inflation? If the liquidity built up can be ascribed to a structural change in the demand for money, there should be little concern about the risks to future price

[26] The issue of the strong expansion rates of “global monetary aggregates” was raised by the ECB in its January 2004 Bulletin (pp. 10 – 12); see also Sousa, J., Zaghini, A., Monetary policy shocks in the euro area and global liquidity spillovers, ECB Working Paper No. 309, February 2004. Also, the issue was addressed in the Bank for International Settlements’ Annual Report 2004 (pp. 71 – 73). The bank identified two risks in the G3 (that is the US, the euro area and Japan): “First, even if inflation is quiescent in the short run, very low policy rates could still increase the risks of higher inflation in the future. They might also feed growing financial imbalances, which could then unwind in a debilitating fashion. The rapid growth of monetary and credit aggregates, rising asset prices and the unusual compression of yield spreads recently can be viewed as potential indicators of such risks in the G3 economies themselves. Second, these developments might have undesirable implications elsewhere because of the special role played by the G3 currencies as international currencies. Excessive liquidity creation in the G3 could potentially spill over to non-G3 economies, likewise raising the risks of higher inflation and unsustainable asset price developments there.”

stability and/or financial market stability. However, if the increase in money holdings relative to real income proves to be temporary rather than persistent, the liquidity overhang may pose a substantial inflation risk (and also have implications for financial stability). In such a case, market agents would try to reduce money holdings relative to income, resulting in higher demand, which should lead to higher output and/or inflation. Given that average real output growth averaged 2.7% in the period Q1 1981 to Q1 2004, and that real liquidity growth stands at 5.7%, there is certainly the risk that strong liquidity growth could put upward pressure on global inflation going forward.

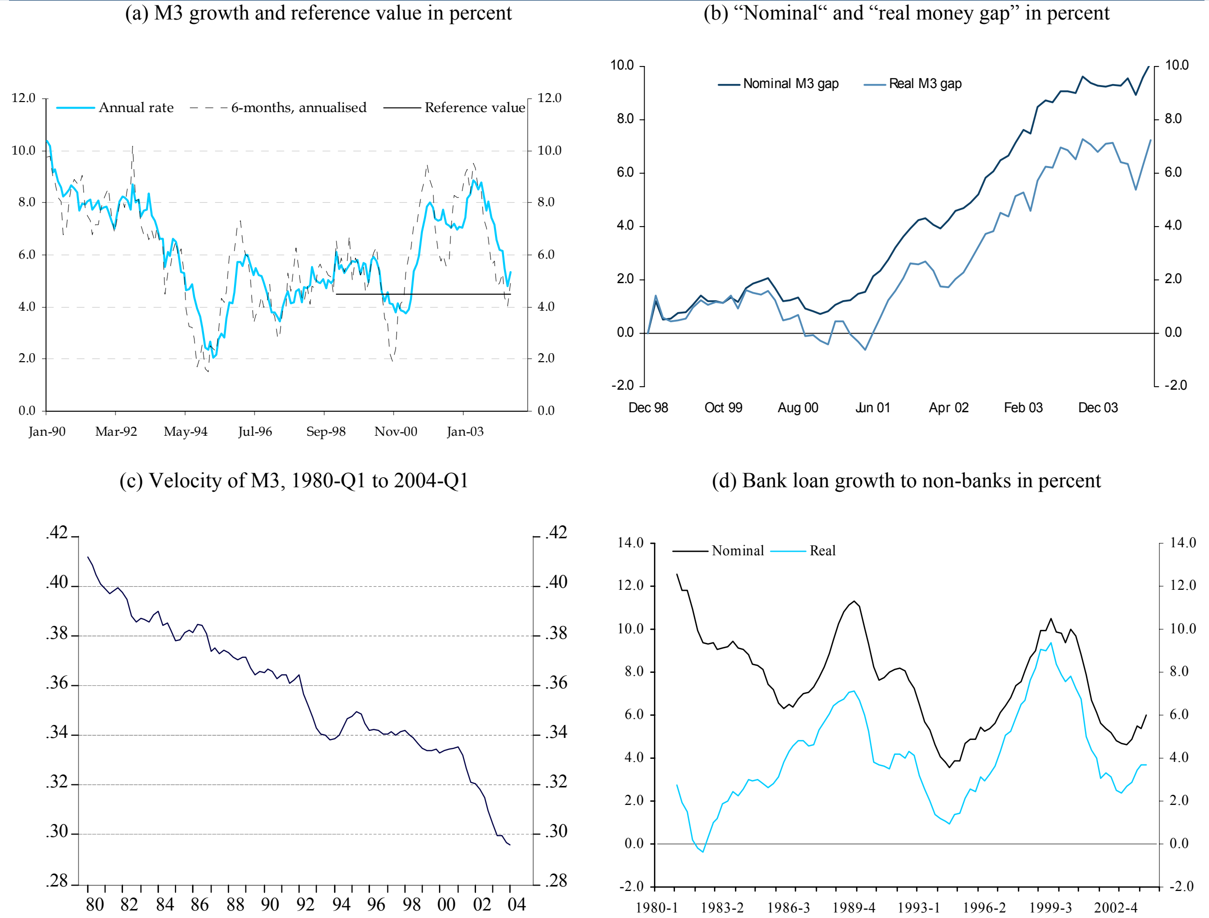
Figure 4.1.1. – Global liquidity, inflation, income and velocity of liquidity



Data source: National central banks; Thomson Financials, Bloomberg; own calculations. Real growth rates were calculated by subtracting the change in the GDP deflator from nominal values.

Figure 4.1.2 (a) shows the growth rate of M3 in the euro area. From mid-2001 to May 2004, annual M3 expansion stood at 7.1% on average, significantly above the 4½% reference value. As a result, the real price gap on the basis of M3 has increased to more than 6.0%, implying that the liquidity built up could raise the euro area price level by the same percentage change on a persistent basis. – The income velocity of M3 has declined well below its trend value (see Figure 4.1.2 (c)), evidence that market agents are currently holding real M3 balances well in excess of the long-run trend. Bank loans extended to firms and private households in the euro area (both in nominal and real terms) have bottomed out (see Figure 4.1.2 (d)). It should be noted that even during the cyclical slowdown, credit expansion remained relatively robust, having developed more or less in line with the long-term average.[27]

Figure 4.1.2. – Monetary trends in the euro area



Data source: ECB, Bloomberg, Thomson Financial; own calculations. Real growth rates = nominal growth rates minus annual change of the consumer price index.

When viewed together, money and credit data in the euro area do certainly not indicate any kind of monetary shortages that could exert downward pressure on prices and output. The latest decline in stock market volatility and an environment of relatively tight international credit spreads also provide comfort in this respect (see Figure 4.1.3 (a) and (b), respectively). In fact, concerns about the consequences of rising liquidity on future price stability are warranted. Euro area real liquidity supply growth well above the euro area's trend GDP growth suggests upward pressure on future prices if the decline in the income velocity of M3 does prove to be temporary rather than persistent. Such a risk is clearly plausible as long as the demand for M3 is assumed to be stable.

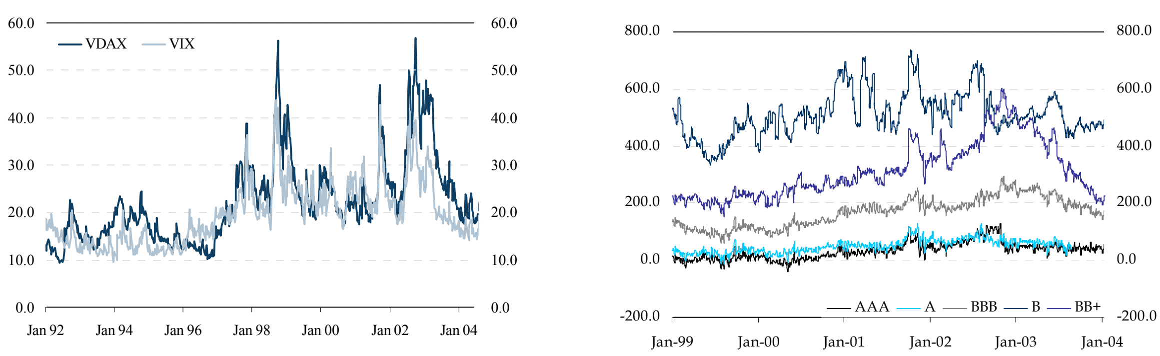
Of course, high excess liquidity poses not only a potential risk to consumer prices but also to asset price inflation. In the past, stock markets and, albeit to a lesser extent, bond markets, have already shown price increases well above the rate usually identified with price stability when measured by the consumer price index "norm". Three inter-related factors may explain why excess money could continue to exert upward pressure on financial asset prices: (i)

[27] In this context it should be noted that the decline in bank loan growth, which began in 2000, did not, according to our analysis, suggest supply-side restrictions, which have overly dampened money production. See ECB Observer No 5 (www.ecb-observer.com).

heightened risk aversion could encourage market agents to place excess liquidity in financial market assets, in particular bonds, rather than investing in new, real investment projects; (ii) the expectation that monetary policy will give the business cycle a relatively high weight in its reaction function could induce "moral hazard", thereby leading to a bidding-up of asset prices; (iii) the latest decline in stock market valuations has translated into an increase in real money supply: whereas stock prices have declined markedly, the stock of money outstanding has remained unaffected. As a result, the increase in real money supply might again translate (at least in part) into an asset price increase. Such a process would be strongly supported if money supply continues to grow over-generously. Needless to say, a potential increase in asset prices to levels well above "fundamental value" might have destabilising effects once a price correction ensues, which, in turn, could negatively affect financial sector stability.

Figure 4.1.3. – Stock market volatility and credit spreads

(a) Stock market volatility (b) US yield spreads

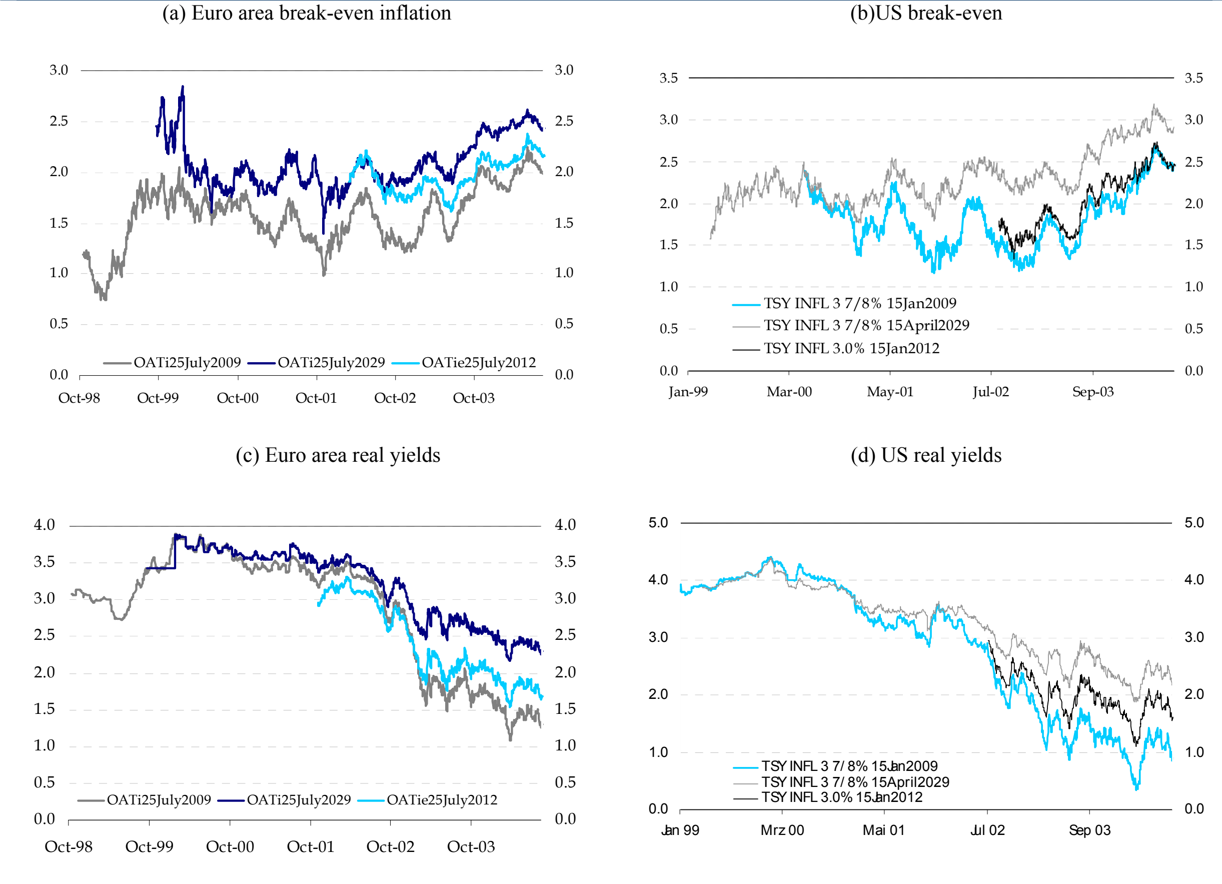


Data source: Bloomberg; own calculations. – Legend: VDAX = volatility of the DAX, VIX = volatility of the S&P 500. – Credit spreads in basis points.

4.2 A brief look at market inflation expectations

Market agents' inflation expectations as measured, for instance, by "break-even" inflation (BEI) have been edging up in recent months both in the euro area and the US (see Figure 4.2.1). As far as the euro area is concerned, BEI have exceeded the ECB's upper 2.0% ceiling since around the middle of April 2004 (for bonds maturing July 2009) and the beginning of June 2003 (for bonds maturing July 2029). Of course, movements in this indicator should be interpreted with some caution because of the presence of various premia that may distort its information content. In this regard, recent increases in oil prices may have raised inflation uncertainty among market participants, leading to higher risk premia being embedded in the breakeven inflation rates. However, the fact that BEI has risen lately and keeps stubbornly trading above the level of inflation envisaged by the ECB is certainly discouraging. It might indicate that the market is losing confidence in the bank's price stability promise.

Figure 4.2.1. – Break-even inflation and real interest rates of long-term government bonds



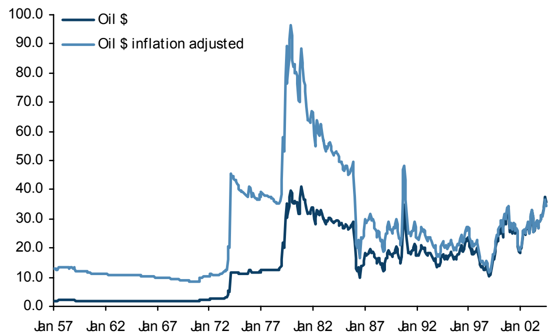
Data source: Bloomberg; own calculations.

One reason for higher inflation expectations might be the latest oil and energy price developments. Figure 4.2.2 (a) and (c) show prices for oil and commodities (the latter shown by the CRB future) in US-dollar and euro for the period late 1950s to July 2004 both in nominal and real terms. On an inflation-adjusted basis, the latest marked rise in nominal prices has kept real oil prices relatively low compared with, for instance, the two oil price shock periods. The same applies to commodity prices in general as expressed by the CRB future price index (see Figures 4.2.2 (b) and (d)). So far, the rise in oil prices has had a relatively limited effect on output, as a result of technological innovation, the development of cost-effective alternative sources of energy and a wide range of conservation measures; the volume of oil imports relative to GDP in industrial countries has fallen since the 1970s.[28]

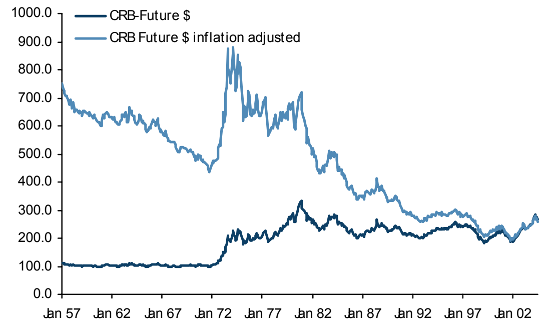
[28] See, for instance, Bank of International Settlement, 70th Annual Report, p. 22.

Figure 4.2.2. – Oil and CRB-future prices

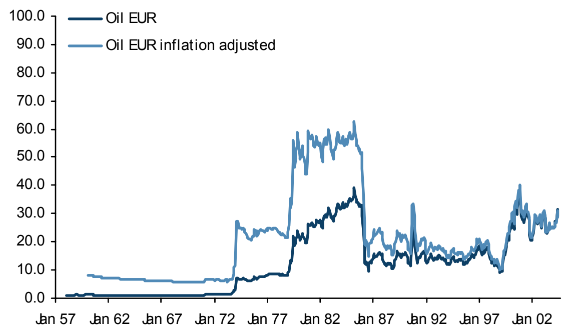
(a) Oil price in US-dollar



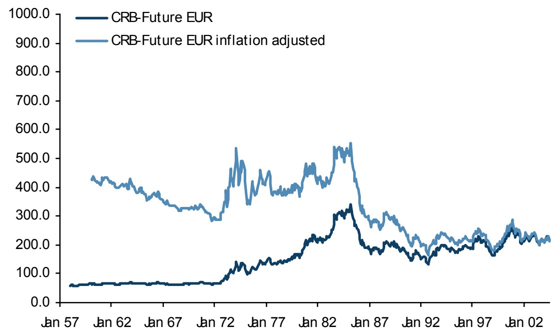
(b) CRB-futures prices in US-dollar



(c) Oil prices in euro



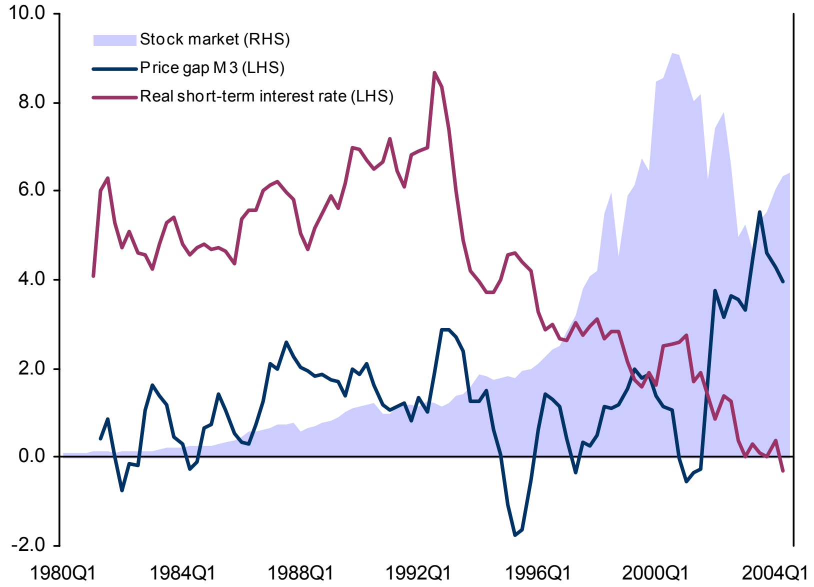
(d) CRB-Future prices in euro



Data source: Thomson Financial, Bloomberg; own calculations.

Several factors such as, for instance, greater global competition in product and factor markets and wage restraint, might suggest that the “spillover effects” of higher energy prices would pose no risk to inflation at this point. However, the concurrence of a “cost push effect” in the form of rising oil and commodity prices and a very high excess money supply should be a cause of concern for policy makers. Excess liquidity would allow market agents to finance higher prices without reducing demand for other goods and services – which would be the case if the money supply were “tight”. A broad-based increase in energy and commodity prices improves firms’ ability to pass through higher input costs to prices.

Figure 4.2.3. – Stock market, price gap M3 and real short-term rates



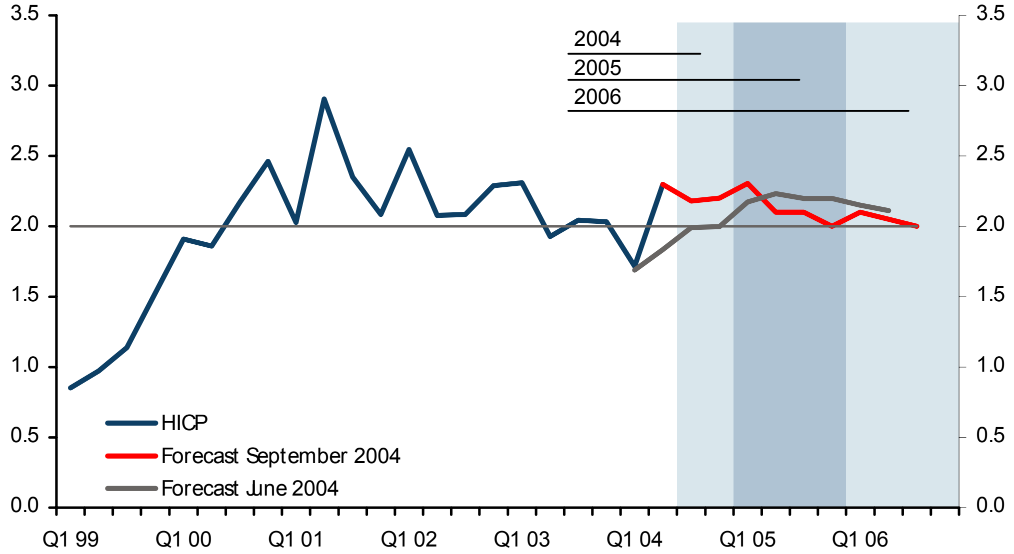
Source: ECB, Thomson Financial; own estimates.

Of course, market agents might increasingly view the record low short-term interest rates as incompatible with future low inflation (see Figure 4.2.3.). Real short-term interest rates in the euro area have actually entered negative territory recently. The decline in borrowing costs has now been accompanied by a marked increase in inflation potential as defined by the M3 price gap. With an improving economy, market agents might become increasingly aware of the risk that excess liquidity will ultimately show up in higher prices. Indeed, the latest developments suggest that inflation is, if anything, set to rise rather than fall below 2.0% as expected by the ECB. Of course, the risk that an overly expansionary monetary policy will (also) inflate (financial) asset prices prevails.

4.3 Euro area inflation forecast

To estimate euro area inflation we took advantage of the "price gap" (see earlier *ECB Observer* reports for details of the model applied). Here, we regressed quarterly changes to the annual change in the euro area consumer price index (*DDLNCPI*) on to (i) quarterly changes to the annual change in the price gap of M3 (*DDLN4PLM3*, gliding four-quarter average), (ii) quarterly changes to the annual change in the output gap (*DDLN4OG*, gliding four-quarter average), (iii) quarterly changes to the annual change in oil prices (*DDLNOIL*), (iv) quarterly changes to the annual change in the EUR/USD exchange rate (*DDLN4EUROUSD*), gliding four-quarter average), and (v) lagged quarterly changes to the annual change in the price level (*DDLNCPI*).

Figure 4.3.1. – Euro area inflation for the period 1999-Q1 to 2006-Q3(F)



Source: ECB, Thomson Financials; own estimates.

Figure 4.3.2. – Assumptions

		GDP (real)[1] growth	GDP[2] real trend growth	M3[3] growth	Oil price[4]	EUR/USD[5]
2004	Q1	1.3	1.6	6.3 (6.4)	32.1	1.25
	Q2	2.0 (1.5)	1.7	5.2 (6.0)	35.6 (34.0)	1.21 (1.20)
	Q3	2.0	2.0	5.5	38.0 (30.0)	1.20
	Q4	2.3	2.3	5.5	40.0 (30.0)	1.20

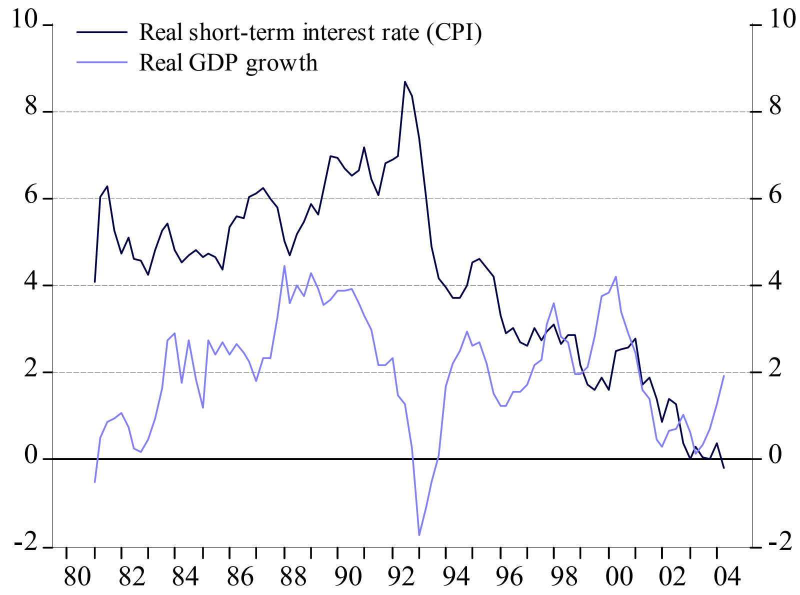
For the period 2005 to 2006, the forecasts prevailing in 2004-Q4 are kept constant.

Legend: 1) real GDP, annual change in percent, seasonally adjusted. – 2) Potential GDP, annual change in percent, past values calculated on the basis of the Hodrick-Prescott-Filter; since 2004-Q3 estimate ECB Observer. – 3) Stock of money M3, annual changes in percent, seasonally adjusted. – 4) Oil price in US-dollar (brent, per barrel). – 5) EUR/USD represents the euro exchange rate vis-à-vis the US-dollar. Values in brackets show the original assumptions.

Figure 4.3.1 shows actual inflation for the euro area for the period Q1 1999 to Q2 2004 and forecast inflation for the period Q3 2004 to Q3 2006. The forecast rests on the following assumptions (see Figure 4.3.2): (i) potential euro area output growth is 2.0% in Q3 2004 and moves towards 2.3% thereafter; (ii) the oil price is US$38 in Q3 2004 and rises to US$ 40.0 thereafter, (iii) the euro exchange rate vis-à-vis the US dollar will be 1.20, (iv) annual output growth is assumed to be 2.0% in Q3 2004 and 2.3% thereafter; (v) annual M3 growth will decline towards 5.5% in the total period under review. On the basis of these assumptions, the model predicts inflation to be 2.1% in 2004, rising further to 2.2% in 2005.

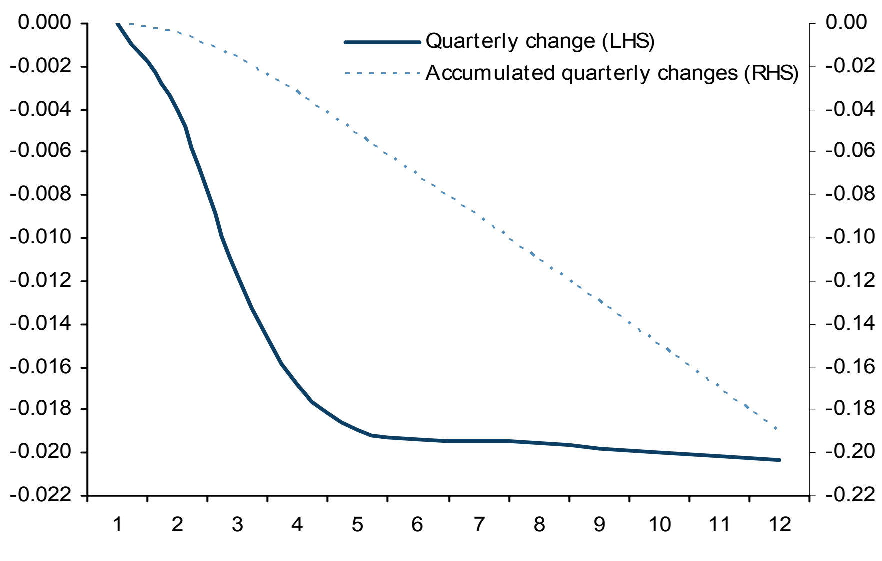
The latest rise in the oil price can be held responsible for the short-term rises in the HICP. A rise in actual inflation, however, will actually imply a decline in real money supply, thereby easing somewhat the upward pressure of future inflation. This is the reason why the forecasts for September 2004 until 2005-Q2 show a sharper rise compared with the June 2004 forecast. In addition, further improving growth will tend to close the output gap further, thereby leading to upward pressure on the HICP. (Note that an increase in the annual rise in the output gap leads to an acceleration of HICP inflation and vice versa.) The forecasting model assumes an increase in ECB rates starting in Q4 this year towards 3.0% – a somewhat "more neutral" rate – until the middle of 2005 in order to slow down money supply growth.

Figure 4.3.3. – Real short-term rate and real GDP growth in the euro area in percent



Source: ECB, Thomson Financials; own calculations. The real short-term rate was calculated by substracting the annual increase of the CPI from the nominal rate. Period 1980-Q1 to 2004-Q2.

Figure 4.3.4. – Response of real M3 holdings to a one-off 25bp rate increase



Source: ECB, Thomson Financials; own calculations. Legend: The *x*-axis shows the number of quarters, the *y*-axis the quarterly changes in real M3-holdings (as expressed by the first differences of log values). The impulse-response function was calculated using a money demand system in a VECM.

A number of considerations suggest that the ECB should end the policy of easy money sooner rather than later and start raising rates to slow down the rise in the price gap. To start with, it is hard to see that negative short-term interest rates would be compatible with putting a rein on money and credit expansion (GDP growth exceeding the real short-term interest rate; see Figure 4.3.3). Moreover, monetary policy works with long and variable lags on the economy, e.g. inflation. To give an indication of time lags, Figure 4.3.4 shows the response of real M3 holdings to a one-off 25bp rise in the short-term interest rate. As can be seen, it takes more than five quarters for an interest rate hike to have its greatest effect on real M3 holdings. And finally, one has to take into account the rather long time lag with which a change in money, e.g. the price gap, influences inflation.

That said, currently relatively low inflation is hardly a proper yardstick when it comes to deciding about changes in monetary policy; because of the long and variable time lags, the prevailing inflation rate can be assumed to be the result of the monetary policy pursued in the past. In this context, the assessment of Fed Chairman Alan Greenspan should be noted: "In recognition of the lag in monetary policy's impact on economic activity, a pre-emptive response to the potential for building inflationary pressures was made an important feature of policy."[29] Given that in the euro area the price gap plays a highly important role in determining future inflation, monetary policy action is needed to slow M3 growth through higher interest rates.

[29] Alan Greenspan, Risk and uncertainty in monetary policy, At the Meetings of the American Economic Association, San Diego, California January 3, 2004 (http://www.federalreserve.gov/boarddocs/speeches/2004/20040103/default.htm).

APPENDIX

A.1. – Schedules for the meetings of the Governing Council and General Council of the ECB and related press conferences 2004 to 2005

Governing Council	General Council	Press Conferences
	Remainder of 2004	
16 September	16 September	
7 October (Belgium)		7 October
21 October		
4 November		4 November
18 November		
2 December		2 December
16 December	16 December	
	2005	
13 January		13 January
3 February		3 February
17 February		
3 March		3 March
17 March	17 March	
7 April		7 April
21 April		
4 May (Berlin)		4 May
19 May		
2 June		
16 June	16 June	
7 July		7 July
21 July		
4 August		
1 September		1 September
15 September	15 September	
6 October (Athens)		6 October
20 October		
3 November		3 November
17 November		
1 December		1 December
15 December	15 December	

Source: ECB.

A.2. – ECB OBSERVER – *recent publications*

Number	Title and content	Date of publication
No. 7	**Towards a "more neutral" monetary policy** *Content: 1. A critical look at ECB staff inflation projections. – 2. Asset price inflation – a cause of concern for monetary policy. – 3. Impact of short-term rates on stock market returns. – 4. ECB rate and euro inflation outlook.*	16 September 2004
No. 6	**Liquidity on the rise** Content: *1. A case against ECB FX market interventions. – 2. "Price gaps" and US inflation. – 3. "Price gaps" and euro area inflation. – 4. ECB rate and euro inflation outlook.*	2 February 2004
No. 5	**Challenges to ECB credibility** Content*: 1. Fundamentals of ECB credibility. – 2. ECB strategy review – increasing the bank's open flank. – 3. Uncertainty – pressure for easier monetary policy. – 4. ECB policy review and outlook.*	8 July 2003
No. 4	**International coordination of monetary policies – challenges, concepts and consequences** *Content: 1. International coordination of monetary policies. – 2. Does the ECB follow the Fed? – 3. Stock prices – a special challenge for monetary policy. – 4. ECB monetary policy review and outlook.*	19 December 2002
No. 3	**The Fed and the ECB – why and how policies differ** Content*: 1. The US Federal Reserve System and the European System of Central Banks – selected issues under review. – 2. The reaction functions of the US Fed and ECB. – 3. The influence of monetary policy on consumer prices. – 4. ECB rate policy and euro area inflation perspectives.*	24 June 2002
No. 2	**Can the ECB do more for growth?** Content: *1. Should the ECB assign a greater role to growth? – 2. Government finances and ECB policy – a discussion of the European Stability and Growth Pact. – 3. "Price gap" versus reference value concept. – 4. Assessment of current ECB policy and outlook.*	19 November 2001
No. 1	**Inflationsperspektiven im Euro-Raum** Content: *1. Warum die EZB-Geldpolitik glaubwürdig ist. – 2. EZB-Strategie – Stabilitätsgarant oder überkommenes Regelwerk? – 3. Stabilitätsrisiken der Osterweiterung. – 4. Zinspolitik der EZB in 2001 und 2002.*	17 April 2001

A.3. – ECB OBSERVER – *objectives and approach*

The objective of ECB OBSERVER is to analyse and comment on the conceptual and operational monetary policy of the European System of Central Banks (ESCB). ECB OBSERVER analyses focus on the potential consequences of past and current monetary policy actions for the future real and monetary environment in the euro area. The analyses aim to take into account insights from monetary policy theory, institutional economics and capital market theory and are supplemented by quantitative methods. The results of the analyses are made public to a broad audience with the aim of strengthening and improving interest in and understanding of ECB monetary policy. ECB publishes its analyses in written form on a semi-annual basis.

A. 4. – ECB OBSERVER – *team members*
www.ecb-observer.com

Professor Dr. *Ansgar Belke*, born 28 March 1965. 1991 Diploma in Economics, University of Münster; 1995 Ph.D. in Economics, University of Bochum; 1997 Research Fellow at the Center for Economic Research, Tilburg/Netherlands, Visitor at the Centre for European Policy Studies, Brussels; 2000 Habilitation in Economics and Econometrics, University of Bochum; 2000 Visiting professor (C4) at the University of Essen, 2000 Full Professor of Economics, University of Vienna (C4); since 2001: Full Professor of Economics (C4), Head of 'Research Center for European Integration', and board member 'Eastern Europe Center', University of Hohenheim; since 2004: Research Fellow at the Institute for the Study of Labour (IZA), Bonn. Fields of interest: International Macroeconomics, Monetary Economics, European Integration, Venture Capital Finance. Publications in journals such as North American Journal of Economics and Finance, Open Economies Review, Public Choice, Scottish Journal of Political Economy, World Economy. Referee for journals like European Economic Review, Open Economies Review, Public Choice, and for the German Science Foundation, Volkswagen Foundation, German Economic Association, FEMISE Network (Forum Euro-Mediterranéen des Instituts Economiques). Presentations at international conferences such as 'Annual Econometric Society European Meeting', 'European Economic Association Congress', 'International Seminar on Macroeconomics (EEA and NBER)'. E-mail: belke@uni-hohenheim.de.

Professor Dr. *Martin Leschke*, born on 2 March 1962 in Oberhausen, Germany. From 1983 to 1989 studied economics at the Westfälische Wilhelms-University. From 1989 to 1993 assistant to professorship for economics, specialising in monetary economics (professor Dr. Manfred Borchert). Dissertation in 1993 at the University of Münster. 1994 research fellowship at the Center for Study of Public Choice, George Mason University, Fairfax, VA, USA (sponsored by DFG). Habilitation in 1998. From 1999 to February 2002 assistant professor at the University of Münster. Since March 2002, professorship of economics at the University of Bayreuth. Research focus: money theory and monetary policy, European integration, institutional economics, macro-economic issues.
E-mail: martin.leschke@uni-bayreuth.de.

Professor Dr. *Wim Kösters*, born on 26 November 1942 in Greven, Germany. From 1963 to 1968 studied economics at the Westfälische Wilhelms-Universität Münster. From 1968 to 1969 stipendium at the Florida State University and Harvard University. From 1969 to 1982 assistant to Prof. Dr. Hans K. Schneider in Münster and Cologne. Dissertation in 1972 at the University in Münster. Habilitation in 1982 at the Universität in Cologne. From 1982 to 1991 Professor of macroeconomics at the University of Münster. Since 1991 professorship in theoretical economics I (Jean Monnet professorship) at the Ruhr-University Bochum. Memberships: Council for Economic and Social Policy – Verein für Socialpolitik, Working Group International Economic Relations and Working Council German Domestic Market of the List Association, Working Group Economic Policy and Development, Working Group Europe Policy and Science of the Konrad Adenauer-Stiftung, Brussels Initiative, Latin America Centre of the University of Münster (corresponding), Presidium of the Working Group European Integration, European Community Studies Association/USA. Research focus: monetary theory and monetary policy, macro-economics and stabilisation policy, labour market theory and policy, integration theory and policy with a special emphasis on monetary integration, international trade policy. E-mail: wim.koesters@ruhr-uni-bochum.de.

Dr. *Thorsten Polleit*, born 4 December 1967 in Münster, Germany. From 1988 to 1993 studied economics at the Westfälische Wilhelms-Universität Münster. 1995 dissertation with Professor Dr. Manfred Borchert, professorship for monetary economics, specialising in monetary theory and policy. From 1997 to March 1998 ABN AMRO (Deutschland) AG, Frankfurt, Institutional Investor Equity Advisory. From April 1998 to September 2000 Chief Economist (Germany) at ABN AMRO (Deutschland) AG and ABN AMRO Asset Management GmbH. Since October 2000 at Barclays Capital in the Economics and Strategy Division. Since the end of 2002, he is a member of the Handelsblatt / Wall Street Journal Europe sponsored ECB Shadow Council. Responsibilities: German and euro zone economics, ECB monetary policy. Thorsten is active in the fields of financial market and monetary policy theory research. In March 2003, he was appointed Honorary Professor at the Business School for Finance and Management (HfB), Frankfurt, lecturing Monetary and Financial Market Economics. Research focus: monetary theory and policy, and capital market theory.
E-mail: thorsten.polleit@barcap.com.