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Research Report

Credit crisis - causes and solutions

ECB Observer, No. 10

Provided in Cooperation with:

ECB Observer

Suggested Citation: Belke, Ansgar; Kösters, Wim; Leschke, Martin; Polleit, Thorsten (2008) : Credit crisis - causes and solutions, ECB Observer, No. 10, ECB Observer, s.l.

This Version is available at:

<https://hdl.handle.net/10419/48522>

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ECB Observer

www.ecb-observer.com

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

Credit crisis – causes and solutions

No 10

14 February 2008

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SUMMARY

PART 1

Credit crisis – symptoms, causes and solutions

Our analyses suggest that central banks' overly expansionary monetary policies are (in great part) to be held responsible for the credit crisis. Too much credit and money at too low an interest rate have distorted market prices and encouraged investor ignorance of risk. Cutting interest rates in response to the credit crisis – as has been called for by various political quarters – would, we believe, increase inflation, thereby making the potential fallout of the credit crisis worse. We argue for a non-interventionist monetary policy, supported by free market forces, as a recipe for solving the credit crisis.

PART 2

Euro money market: fuelling excessive money growth

The ECB's effort to stabilize money market rates in times of crisis seems to fuel excessive money creation and, as a result, higher future inflation in the euro area. By trying to keep money market rates close to the policy rate of 4%, the ECB fully meets banks' rising base money demand. The increased demand for base money, however, appears to be driven by banks' credit and money creation – rather than by an increase in banks' demand for excess reserves caused by elevated financial market uncertainty.

PART 3

“Global liquidity” drives (asset price) inflation

We analyse the relationship between global excess liquidity and asset prices on a global scale. We find that a rise in global liquidity leads to permanent increases in the global GDP deflator and in the global house price index. Moreover, we find that there is a subsequent spill-over to consumer prices. However, we are not able to find empirical evidence in favour of the hypothesis that the stock market (MSCI World index) significantly reacts to changes in global liquidity. We conclude that global liquidity is a useful indicator for inflationary pressure at a global level – and that it needs to be taken into account by monetary policy.

PART 4

Rising inflation in the euro area

There is strong empirical evidence that (trend M3) money growth drives (trend) CPI inflation in the euro area. The excessive rise in M3 in the last years argues for an ongoing upward drift of inflation in the years to come. For 2008, we estimate consumer price inflation to be 3.1% on average, followed by 2.7% in 2009. If credit and money supply growth does not slow-down substantially, however, the risk is for even higher inflation in the future.



Zusammenfassung

TEIL 1

Kreditkrise – Symptome, Ursachen und Lösungen

Unsere Analyse kommt zu dem Schluss, dass die laxen Geldpolitiken der letzten Jahre die Kreditkrise (mit-)verursacht haben. Die Niedrigzinspolitik hat zuviel Kredit und Geld in Umlauf gebracht und so Preissignale verzerrt und eine Vernachlässigung der Risiken provoziert. Zinssenkungen – wie bereits vielfach gefordert – könnten die Inflation weiter anheizen und so die möglichen negativen Effekte der Kreditkrise auf Produktion und Beschäftigung verschärfen. Wir empfehlen eine nicht-interventionistische Geldpolitik und das Setzen auf das freie Spiel der Marktkräfte zur Bewältigung der Krisenfolgen.

TEIL 2

Euro-Geldmarkt: Exzessives Anwachsen der Liquidität

Das Bestreben der EZB, den Geldmarktzins im Zuge der Kreditkrise bei 4% zu halten, scheint ein exzessives Ausweiten der Geldmenge zur Folge zu haben. Die EZB bedient derzeit jede Nachfrage der Banken nach Zentralbankgeld. Diese Nachfrage ist jedoch keine, die mit dem Halten von erhöhten Überschussreserven verbunden ist, sondern sie ist vielmehr Ausdruck der überaus hohen Bankencredit- und Geldschöpfung. Ein Fortführen dieser Politik dürfte den Inflationsdruck weiter erhöhen.

TEIL 3

„Globale Liquidität“ und (Vermögenspreis-)Inflation

Die „globale Liquidität“ erweist sich als höchst bedeutsam für die globale (Vermögenspreis-)Inflation. Ein Ansteigen der Liquidität führt zu permanent höheren Häuserpreisen und BIP-Deflatoren sowie einer Aufwärtsbewegung der Konsumentenpreise. Eine Beziehung zwischen globaler Liquidität und den globalen Aktienmärkten lässt sich jedoch nicht aufzeigen. Die globale Liquidität ist ein Indikator für die Inflation – und muss von der Geldpolitik systematisch berücksichtigt werden.

TEIL 4

Steigende Inflation im Euroraum

Das Geldmengenwachstum bestimmt maßgeblich die Konsumentenpreis-inflation im Euroraum. Das exzessive Anwachsen der Geldmenge in den letzten Jahren spricht nun für eine deutliche Aufwärtsdrift bei der Inflation. Für das laufende Jahr dürfte die Jahresinflation der Konsumentenpreise bei durchschnittlich 3,1% liegen, in 2009 bei 2,7%. Wenn das Kredit- und Geldmengenwachstum sich nicht deutlich verlangsamt, besteht das Risiko, dass die Inflation noch stärker steigt.



PART 1

Credit crisis – symptoms, causes and solutions

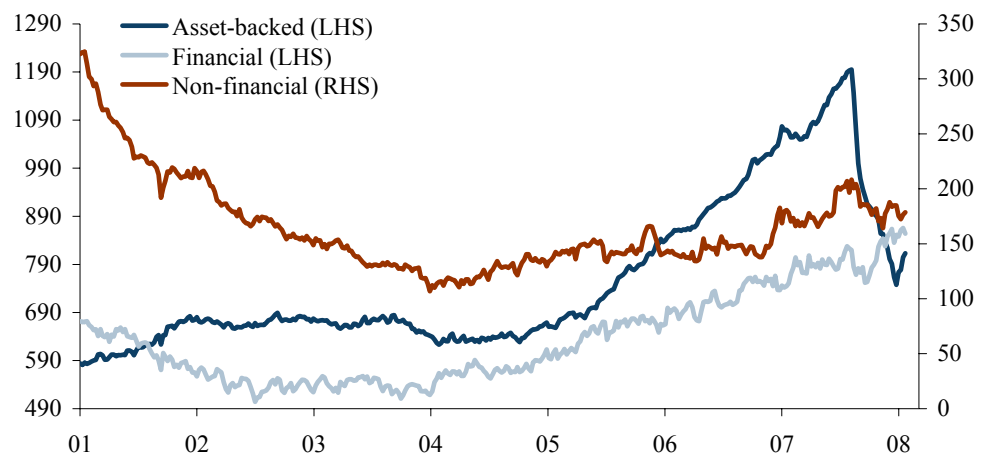
CONTENT: 1.1 Symptoms of the credit crisis. – 1.2 Causes of the credit crisis. – 1.3 Solutions for the credit crisis.

SUMMARY: *Our analyses suggest that central banks' overly expansionary monetary policies are (in great part) to be held responsible for the credit crisis. Too much credit and money at too low an interest rate have distorted market prices and encouraged investor ignorance of risk. Cutting interest rates in response to the credit crisis – as has been called for by various political quarters – would, we believe, increase inflation, thereby making the potential fallout of the credit crisis worse. We argue for a non-interventionist monetary policy, supported by free market forces, as a recipe for solving the credit crisis.*

1.1 Symptoms of the credit crisis

A rise in arrears in the US subprime mortgage market, which caught the public's attention around the middle of last year, has translated into what is now called an "international credit crisis": developments in the US have been increasingly affecting credit markets around the world.

Fig. 1.1. – US commercial paper market, outstanding, sa, US\$bn



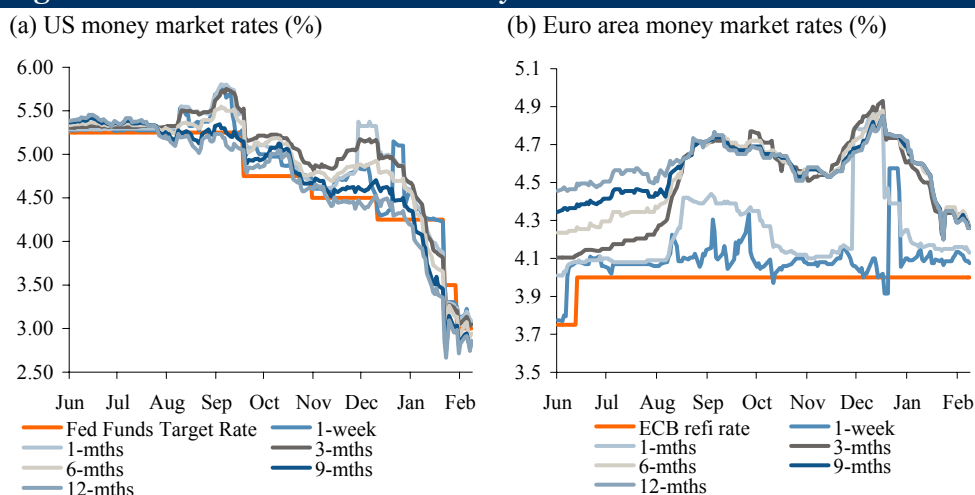
Source: US Federal Reserve.

At an early stage of the crisis, investors shunned the US asset back commercial paper (ABCP) market. From August 2007 to 25 February 2008, the outstanding volume of ABCP declined by a mas-

sive US\$382bn (Fig. 1.1). This, in turn, forced ABCP issuers to tap bank credit lines. Banks had to look for additional funding.

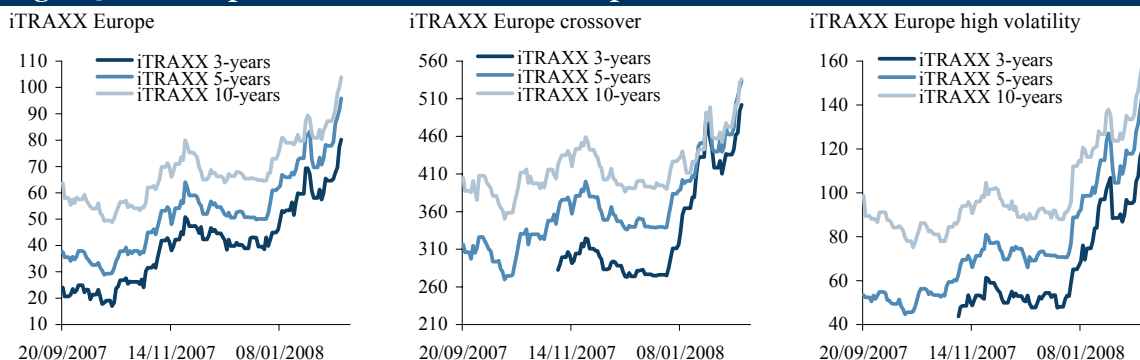
With rising uncertainty about potential losses in credit (related) products, investors became increasingly concerned about the financial solidity of the banking sector, as evidenced by an unusual rise in spread levels between money market and official central bank rates (Fig. 1.2 (a) and (b)). In the euro area, for instance, elevated spread levels persisted from the beginning of August to the beginning of December 2007, despite a temporary decline in October.

Fig. 1.2. – US and euro area money market rates



Source: Thomson Financial.

Fig. 1.3. – European credit derivative swap indices



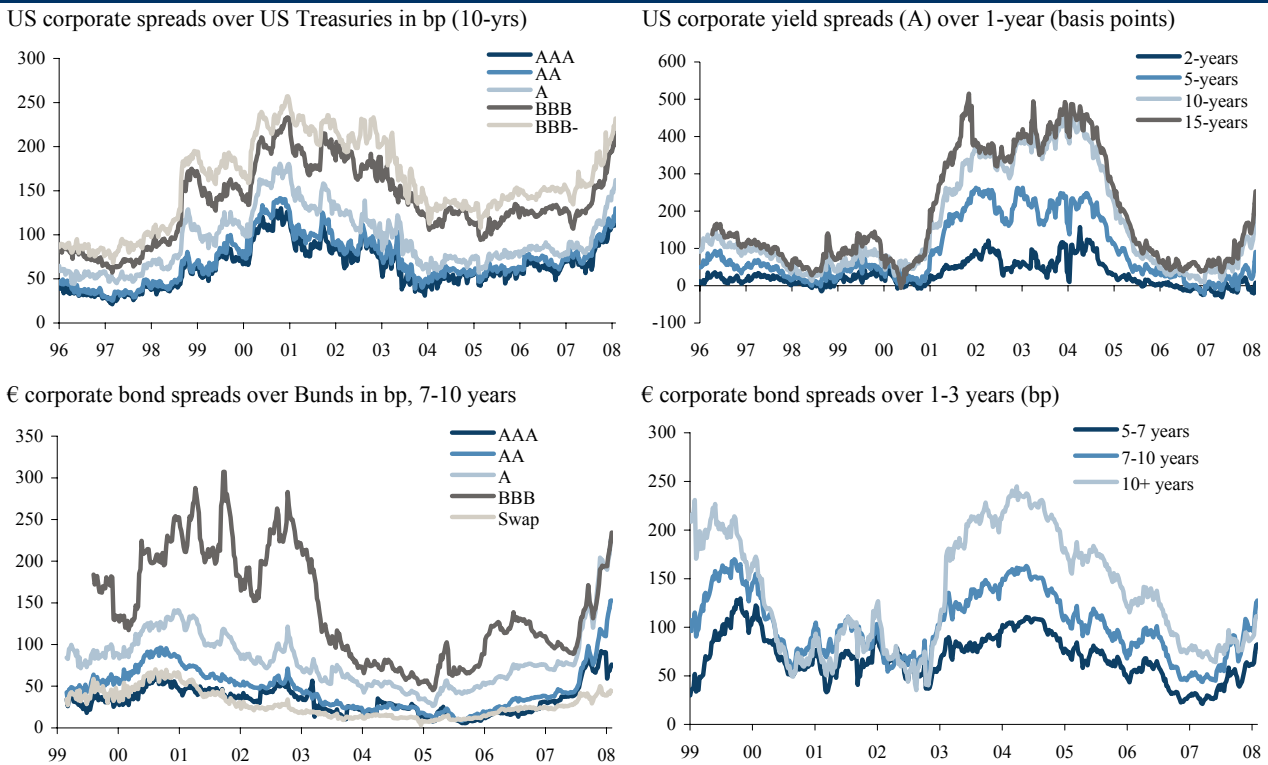
Source: Bloomberg. – The iTraxx Europe index is composed of the most liquid 125 CDS referencing European investment grade credits (subject to certain sector rules as determined by the IIC and the SEC). The high volatility index is a subset of the main index, consisting of what are seen as the most risky 30 constituents at the time the index is constructed. The crossover index is composed of 45 sub-investment grade credits. The constituents of the indices are changed every six months.

Heightened investor risk aversion has spilled over into the corporate credit universe. Starting around the middle of October

2007, European credit default swap indices (such as, for instance, iTRAXX) have been widening considerably (Fig. 1.3). The increase in the indices can be interpreted as investors expecting rising default risk in the corporate credit market.

In the cash market, corporate credit spreads have started widening. Wider credit spreads can be observed actually across all credit qualities, with developments in the US being fairly similar to those in the euro area (Fig. 1.4). What is more, credit curves have steepened in recent months, also reflecting rising investor credit risk aversion.

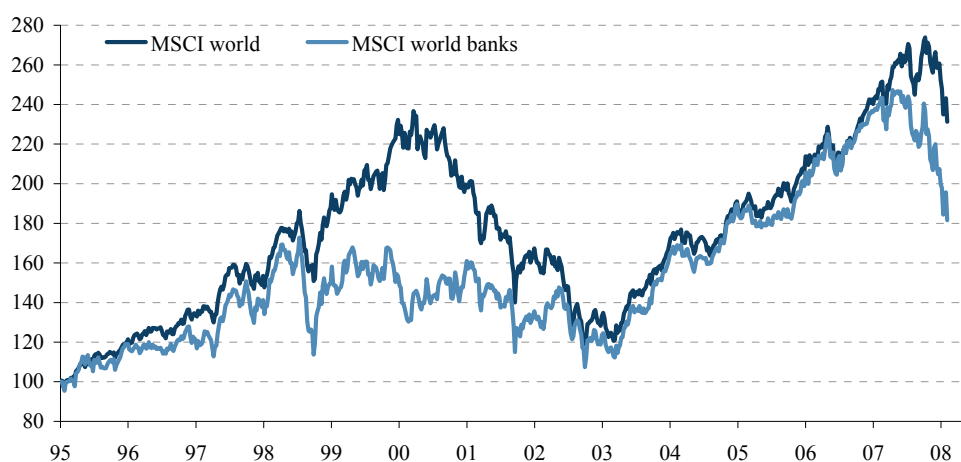
Fig. 1.4. – Corporate credit spreads (basis points)



Source: Thomson Financials, Bloomberg; own calculations.

Since around June 2007, banks' stock market valuations have been declining markedly, presumably reflecting growing investor concern about the financial health of the financial industry (Fig. 1.5). Since October last year, corporate stocks have been declining too. The fall in stock prices seems to reflect investor concern about a forthcoming global slowdown, driven by the consequences of a repricing of credit risk.

Fig. 1.5. – Global stock market



Source: Bloomberg, own calculations. Indexed: January 1995 = 100, weekly data.

1.2 Causes of the credit crisis

What has caused the international credit crisis? Finding an answer to this question is essential when it comes to evaluating policies aimed at dealing with the consequences of credit crisis. While it may be too early to come up with a full assessment, it is nevertheless worthwhile reviewing a number of potential explanations for the crisis.

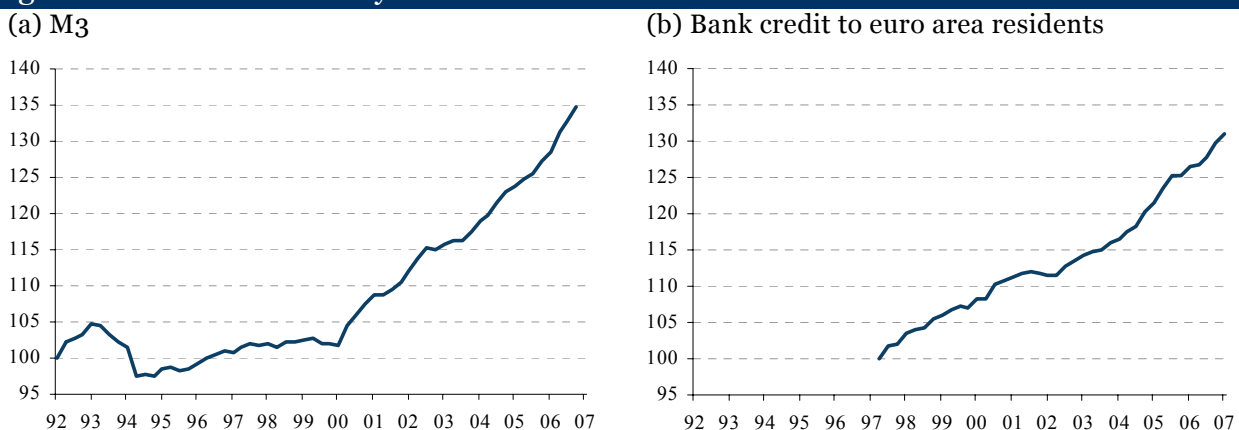
POTENTIAL EXPLANATIONS

- ***Irrational exuberance***: Investors might have underestimated the risks inherent in innovative financial products. In an attempt to earn a *yield pick up*, investors have increasingly diversified in risky assets without demanding an appropriate compensation. Lenders, in turn, have embarked upon a rather loose and imprudent loan policy.
- ***Lack of transparency***: There was a gap between the information available to originators and end-investors of credit related products. Marked-to-market losses on assets linked to these products have heightened uncertainty about the composition and value of all structured credit products, having spilled-over into other types of credits. This, in turn, has put pressure on the intermediation function of the financial sector.
- ***Moral hazard created by central banks***¹: Due to increasingly growth-oriented monetary policies, investors seem to expect central banks to *bail-out* financial markets *free of charge*. This provokes an overly aggressive risk taking on part of investors and a loose credit supply policy on the part of lenders.

¹ Moral hazard arises when someone can reap the rewards from his actions when things go well but do not suffer the full consequences when things go badly.

- **Price distortions caused by regulation:** A growing set of regulations could have made investors complacent as far as credit risk is concerned: Economic efficiency can be impaired, as un-economic investments are undertaken with the implicit assumption that losses have become less and less likely in highly regulated markets.
- **Political pressure:** Government policies of favouring easy access to credit financed (housing) purchases may have made creditors and debtors complacent about the risks of rising debt levels on the part of borrowers.
- **Overly expansionary monetary policies:** Central banks have pursued too expansionary a monetary policy in the last years. Excessively low (real) interest rates have stimulated credit demand. Excessive liquidity supply has inflated *asset prices* – such as, for instance, stocks, housing and credit products –, having provoked a misallocation of scarce resources on a grand scale. Against this backdrop, the key challenge is to *draw a clear distinction between symptoms and causes of the credit crisis*. To us, the symptoms listed above suggest that central banks, via pursuing an overly expansionary monetary policy for many years, have created a “credit and money glut”. Central banks have provoked a *credit boom*, of which the current credit crisis is actually an economically necessary correction of *bad decisions* made in the past.

Fig. 1.6. – Euro area money and credit relative to nominal GDP*



Source: Thomson Financial, ECB, own calculations. – *All series indexed, 1997-Q4 = 100. – Quarterly data, nominal GDP annualised. – Credit series starts in 1997-Q4. – Period: 1992-Q1 to 2007-Q3.

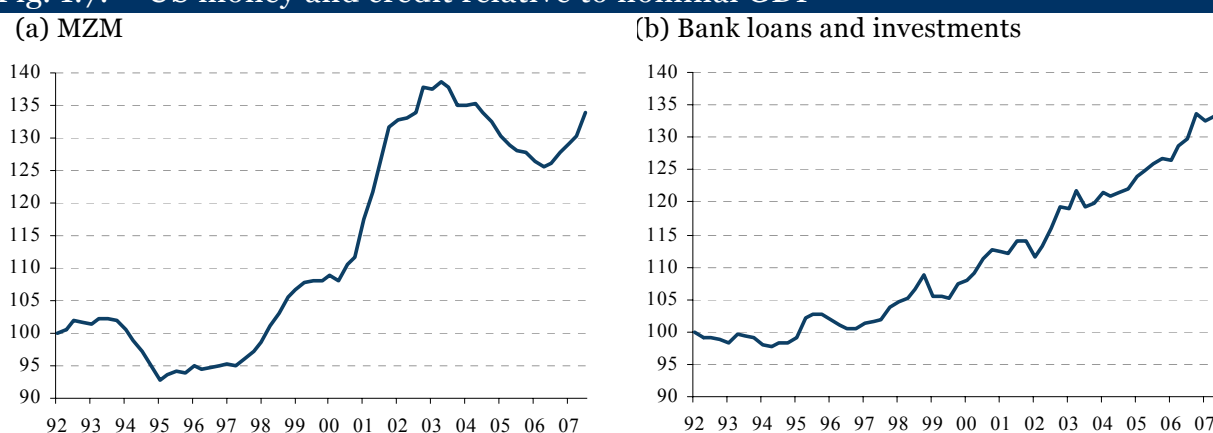
THE “CREDIT AND MONEY GLUT”

To form a view about the stance of monetary policy in recent years, one may want to take a look at the relation between money and credit expansion relative to nominal output gains. Fig. 1.6 (a) shows the development of the money stock M3 relative to nominal GDP in the euro area. In the period 1997-Q4 to 2007-Q3, M3 rose by a rate

35% stronger than output. Likewise, the stock of bank credit to euro area residents grew around 31% stronger than nominal GDP (Fig. 1.6 (b)).

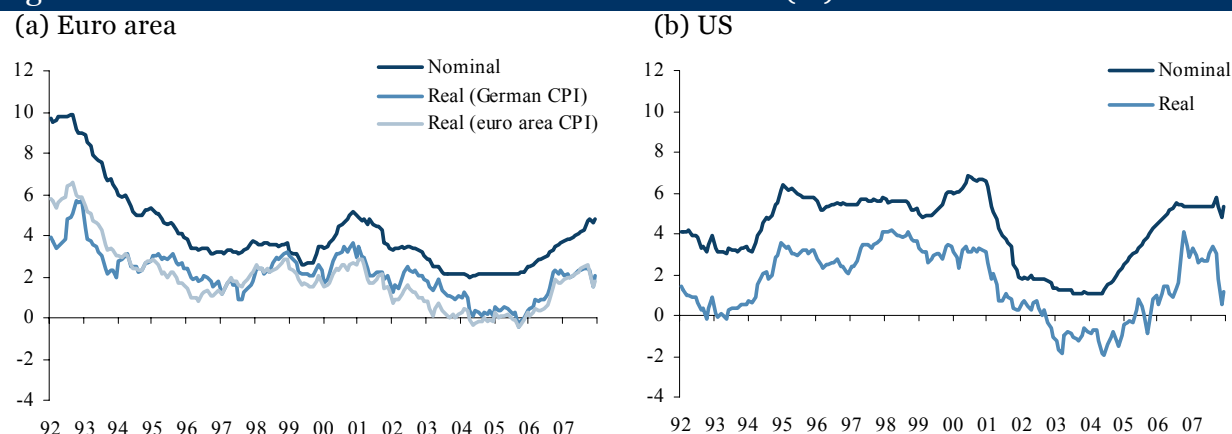
In the US, the money stock of MZM rose nearly 37% stronger than nominal GDP in the period 1997-Q4 to 2007-Q3 (Fig. 1.7 (a)), while bank loans and investments grew 30% stronger than nominal income gains (Fig. 1.7 (b)). That said, in the US, like in the euro area, money and credit expansion markedly surpassed real GDP and consumer price inflation.

Fig. 1.7. – US money and credit relative to nominal GDP



Source: Thomson Financial, Federal Reserve Bank of St. Louis, own calculations. – Quarterly data, nominal GDP annualised. – Period: 1992-Q1 to 2007-Q3.

Fig. 1.8. – Euro area and US short-term interest rates (%)



Source: Thomson Financial, own calculations. – Monthly data. Euro area and US: 3-mths rates (German rate until end of 1998, thereafter euro area rate). – Real rates were calculated by subtracting annual CPI inflation from nominal interest rates. Period: January 1992 to December 2007.

What is more, nominal and real short-term interest rates were lowered drastically in the euro area as from 2001. Real rates were actually zero from 2004 to the beginning of 2006 (Fig. 1.8 (a)). In the US, the US Fed lowered nominal short-term interest rates sub-

stantially, pushing real short-term interest rates into negative territory in the period 2003 to 2006 (Fig. 1.8 (b)).

The finding of (ultra-)low nominal and real short-term interest rates in recent years, accompanied by extraordinarily strong credit and money expansion relative to nominal output gains, suggest to us that central banks' monetary policies may have sown the seeds of the credit crisis, which set in at the end of July/beginning of August 2007 with the US subprime market debacle.

1.3 Potential solutions for the credit crisis

As a direct result of the US subprime crisis, the US Fed slashed interest rates from 5.25% in August 2007 to 3.0% on 30 January 2008. The Fed's moves put other central banks under pressure to reduce borrowing costs as well. However, would a policy of easing interest rates be an appropriate reaction to prevent potentially negative effects on output and employment?

THE ISSUE OF A DECLINING REAL EQUILIBRIUM INTEREST RATE

One may argue that a lowering of central bank interest rates is appropriate if the economy's *real equilibrium interest rate* has declined as a result of the credit crisis. Unfortunately, however, the real equilibrium interest rate cannot be observed directly.

For answering the question of whether the central bank's official interest rate is restrictive or expansionary, one may take a look at bank credit supply expansion. If official rates were too low (high), one would expect bank credit growth to expand (decline) strongly; such a viewpoint would actually correspond to Knut Wicksell's theory.²

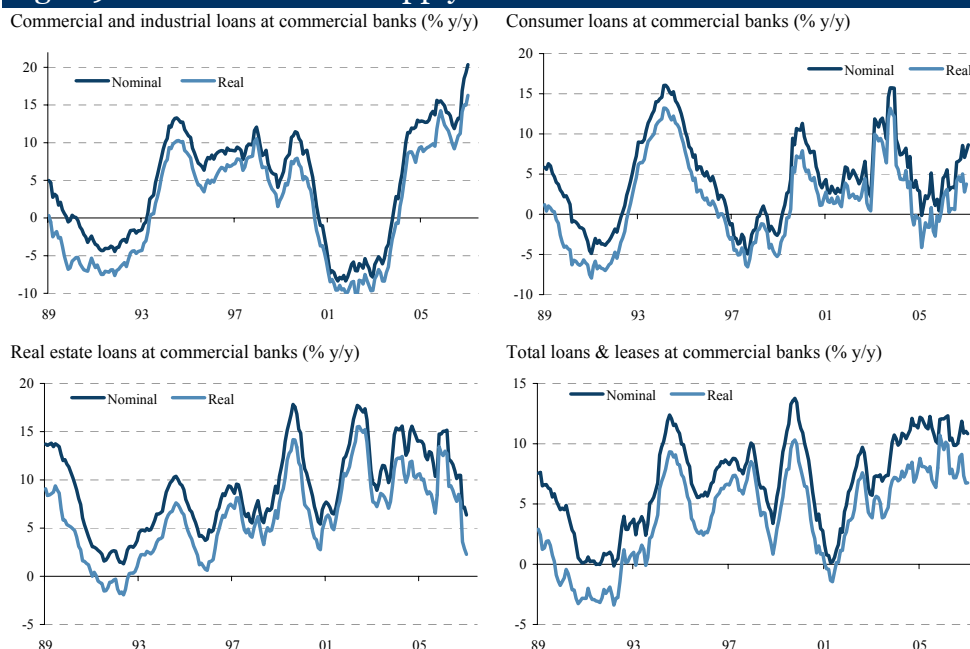
Looking at the data, however, US bank credit extension to non-banks has remained extraordinarily high (Fig. 1.9). For instance, US banks' commercial and industrial loans grew by 20.4% y/y in December 2007; total bank loans and leases increased by 10.8% y/y. By any standards, US bank credit supply growth rates do not seem to be restrictive.

In the euro area, bank lending has also remained fairly strong (Fig. 1.10). In December 2007, bank credit to euro area residents, for instance, rose by 10.0% y/y, while credit to other euro area residents was up by 12.7% y/y, with loans to the private sector expand-

² Wicksell made a distinction between the *natural* (or *neutral*) *interest rate* and the *market interest rate*. If, for instance, the former exceeds the latter, people can be expected to increase their demand for credit. That said, with the neutral interest rate being higher than the market interest rate, bank credit supply can be expected to increase. That said, a decline in credit supply would suggest that the market interest rate would exceed the natural interest rate – with the economy presumably experiencing a slowdown.

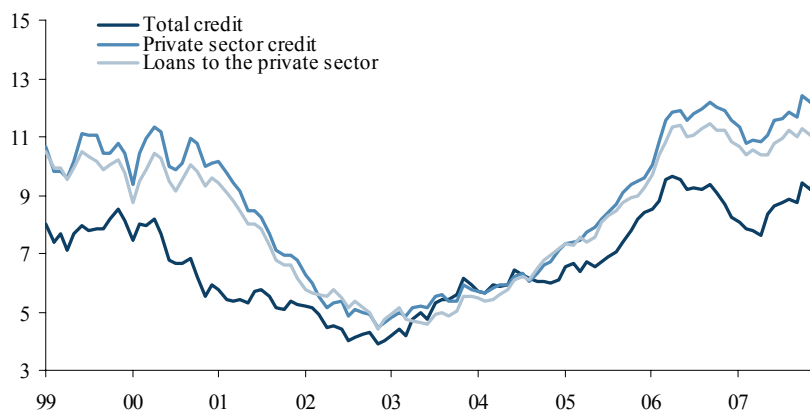
ing at a rate of 11.0% y/y. Perhaps most notably, bank loans to non-financial institutions rose by 14.4% y/y in December.

Fig. 1.9. – US bank credit supply



Source: Federal Reserve Bank of St. Louis, Thomson Financial; own calculations. Real rates were calculated by subtracting the annual change from the US CPI from nominal growth rates.

Fig. 1.10. – Bank lending in the euro area (% y/y)



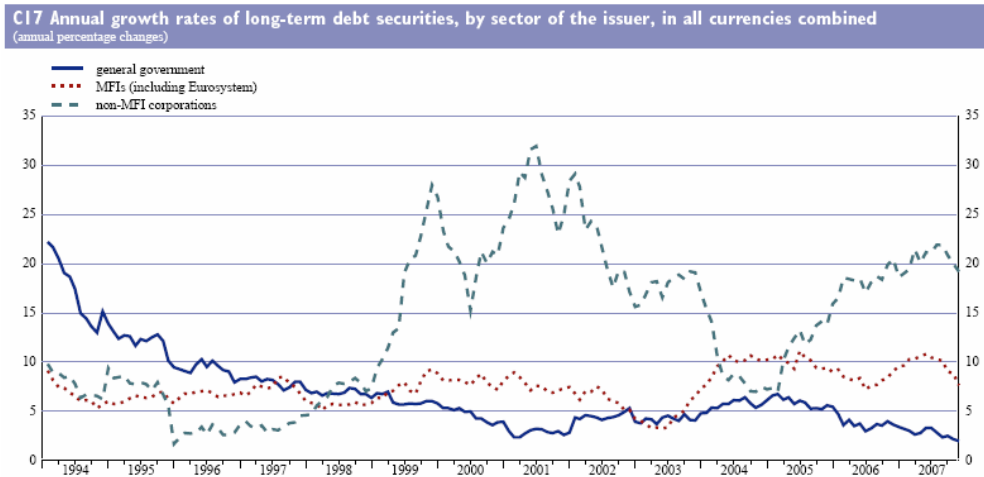
Source: ECB; own calculations.

Of course, one cannot exclude that the latest rise in bank lending represents a kind of *forced lending* as firms tap credit lines due to unfavourable conditions in debt capital markets. At the same time, however, one should take into account that issuance activities in the euro area capital market have held up reasonable well.

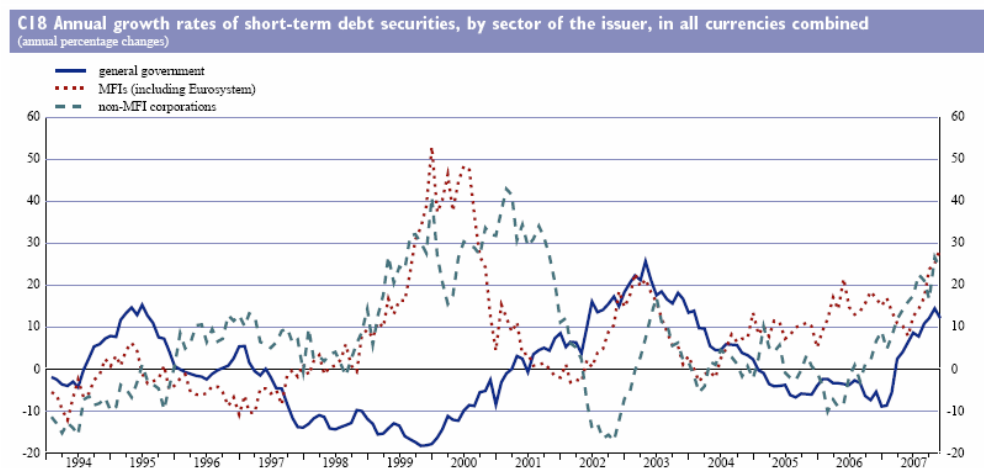
In November 2007 (latest available data point), total growth of securities (other than shares) issued by euro area residents rose 8.6% y/y (Fig. 1.11). MFI issuances rose 10.4% y/y, while non-MFI

issuances were up 8.8% y/y, with issuances of financial corporations other than MFIs up 25.5% y/y.

Fig. 1.11. – Issuance activities in the euro area



Source: ECB.



Source: ECB.

In sum, bank lending in the US and the euro area suggests that, at least for the time being, money creation has remained exceptionally strong. These findings would indicate that central banks' short-term interest rates have not been restrictive (relative to the *neutral interest rate*) of late, and that a lowering of central bank interest rates is not warranted.

THE ISSUE OF DELIVERING "SURPRISE INFLATION"

As Robert E. Lucas (1972) pointed out, monetary policy does not have any effect on real output if market agents are fully informed

about forthcoming changes in the money supply.³ In such a case the increase in the stock of money would only affect inflation, but it wouldn't exert any impact on production.

Only in the case of *surprise inflation* can the central bank affect real magnitudes. However, any such changes would be attributable to *bad decisions*, a consequence of *distorted relative prices*. As such, surprise inflation is unlikely to create any desirable economic activity. In view of the credit crisis, inducing inflation would in fact most likely make things even worse.

If inflation expectations rise, nominal market yields can be expected to increase too ("Fisher effect"). Borrowers would then have to cope with higher nominal – and, as monetary policy would lose its credibility – presumably also higher real borrowing costs (see box below). This, in turn, could increase debt defaults and thereby the woes of the financial industry in particular.

Inflation expectations and the real cost of loans

In our example, the economy's total loan volume outstanding in $t = 0$ is €100bn and has a maturity of 5 years. With a nominal interest rate of 5% p.a. (a real rate of 3% and inflation expectations of 2%), annual interest payments amount to €5bn.

We assume further that 20% of the total loan volume matures every year and needs to be refinanced. Now, monetary policy *surprises* the market in $t = 1$, increasing inflation to 4%. With an unchanged real rate, the nominal interest rate rises to 7%. As a result, the effective interest payment in $t = 1$ rises to 5.4% in nominal terms, implying real interest rate costs of 1.4%.

		Period					
		0	1	2	3	4	5
I.	Original loan (€bn)	100	80	60	40	20	0
II.	Revolving loan (€bn)	0	20	40	60	80	100
III. = I. - II.	Total loan (€bn)	100	100	100	100	100	100
IV.	Real rate (% p.a.)	3.0	3.0	3.0	3.0	3.0	3.0
V.	Inflation (% p.a.)	2.0	4.0	4.0	4.0	4.0	4.0
VI. = IV. + V.	Nominal interest rate (% p.a.)	5.0	7.0	7.0	7.0	7.0	7.0
VII.	Effective interest, nominal (% p.a.)	5.0	5.4	5.8	6.2	6.6	7.0
VIII. = VII. - V.	Effective interest, real (% p.a.)	3.0	1.4	1.8	2.2	2.6	3.0

Over time, however, the outstanding stock of loans gets refinanced at elevated market interest rates of 7% p.a. In $t = 5$ the effective interest costs on the loan stock has increased to a nominal rate

³ Lucas, Robert E. (1972), Expectations and the Neutrality of Money, in: Journal of Economic Theory, 4, pp. 103–124.

of 7%, implying a real rate of 3% – the real rate that prevailed in $t = 0$.

That said, surprise inflation can lower the real interest rate on outstanding loans in the short-term – but only at the expense of creditors. However, it would take ongoing surprise inflation to lower the real debt burden for new borrowers, but such a monetary policy would ultimately destroy the currency via *hyperinflation*.

What is more, the experience of surprise inflation could make investors demanding a higher *risk premium*, thereby increasing the real interest rate on loans. That said, if monetary policy is expected to pursue an inflation policy, the real interest costs on loans outstanding could actually rise (rather than fall).

While monetary policy must be held responsible for having (in great part) caused the credit crisis, it has hardly any power when it comes to solving the malaise it has created. It appears to us that gearing monetary policy towards keeping inflation low is presumably the best reaction to ongoing strain in credit markets; sowing the seeds of inflation would actually be dangerous, as such a policy runs the risk of causing further losses in credit markets, thereby negatively affecting output and employment.

A CASE FOR NON-INTERVENTIONISM AND FREE MARKET FORCES

A non-interventionist monetary policy, supported by free market forces, appears to be the appropriate recipe for solving the credit crisis. It is of the utmost importance that money remains a reliable and efficient means of exchange; an inflationary policy – especially in view of the credit crisis – would most likely be counterproductive.

Free market forces should be allowed to run their course. Lenders and investors should be required to write down assets to new valuation levels (if needed, over an extended period of time). All the more so, as there is currently no indication that (financial) firms would have difficulties in getting access to fresh equity capital.

Imposing an overly restrictive regulation regime on the financial industry could make it less attractive for investors putting their money in bank stocks. This, in turn, could increase the sector's capital costs, thereby imposing an additional burden on borrowers.

Raising official central bank rates in the US and the euro area would appear to be necessary if current credit and money growth rates don't slow down, thereby reducing upward pressure on (asset price) inflation.



PART 2

EURO MONEY MARKET: FUELLING EXCESSIVE MONEY GROWTH

CONTENT: 2.1 *The demand for central bank money.* – 2.2 *The effects of monetizing debt.* – 2.3 *The drawback of “interest rate steering”.*

SUMMARY: *The ECB’s effort to stabilize money market rates in times of crisis seems to fuel excessive money creation and, as a result, lead to higher future inflation in the euro area. By trying to keep money market rates close to the policy rate of 4%, the ECB fully meets banks’ rising base money demand. The increased demand for base money, however, appears to be driven by banks’ credit and money creation – rather than by an increase in banks’ demand for excess reserves caused by elevated financial market uncertainty.*

2.1 The demand for central bank money

In today’s government controlled paper money systems, central banks are the monopoly suppliers of *central bank money* (or *high powered money*, or *base money*). Central bank money can be defined as commercial banks’ sight deposits held with the central bank plus cash (coins and notes) outstanding.

Commercial banks demand central bank money for basically three reasons:

- *First*, banks are required to hold a certain portion of their liabilities vis-à-vis non-banks in the form of central bank money (*minimum reserves*).
- *Second*, banks need to keep central bank money balances for making payments in the inter-bank market (*working balances*).
- *Third*, people keep a certain portion of their bank deposits in the form of cash. To be able to meet the demand for cash (*cash drain*), banks need to hold central bank money.

Commercial banks create *additional money* when extending loans to non-banks.⁴ However, this very capacity depends on banks’ access to base money: commercial banks are required to keep a certain portion of their liabilities vis-à-vis non-banks in the form of

⁴ It should be noted that today’s system is rather different from the gold standard, which prevailed in former times. Here, a credit was typically a transfer of *existing* money balances.

central bank money – over which the central bank holds a supply monopoly.

To give an example of the relation between bank lending and the demand for central bank money, assume the central bank provides base money in the amount of €100 by accepting bonds as collateral (Fig. 1).

Fig. 1.

Assets	Consolidated balance sheet of the banking sector		Liabilities
Bonds	200		
	-100		
Base money	+100		
	Σ		Σ

Assuming a reserve ratio of 2% on sight deposits, the banking sector as a whole can then create additional loans and sight deposits in the amount of €5000, respectively (that is €100/0.02). In that case, the amount of base money is fully absorbed in minimum reserves (Fig. 2). The increase in base money would actually go hand in hand with banks' expansion of credit and money supply.

Fig. 2.

Assets	Consolidated balance sheet of the banking sector		Liabilities
Bonds	100		
Base money	+100		
thereof:			
Minimum reserves	+100		
Loans	+5000	Sight deposits	+5000
	Σ		Σ

MONEY MARKET INTEREST RATES IN TIME OF TURMOIL

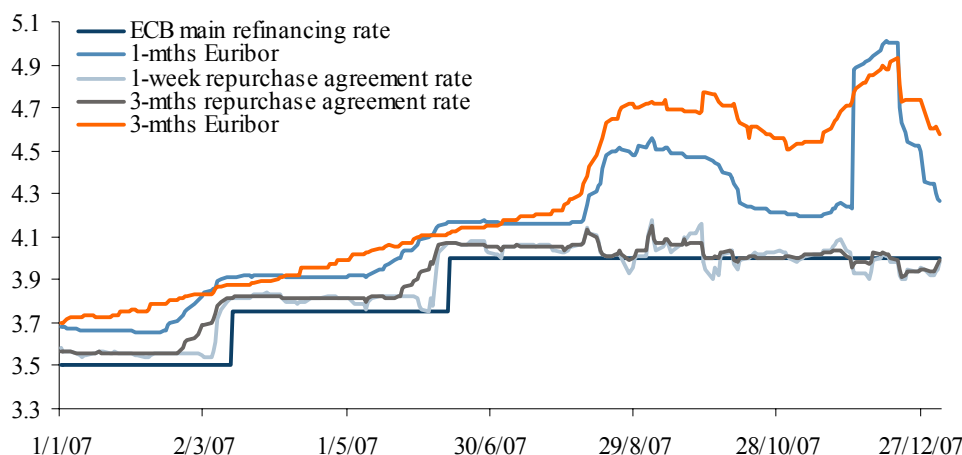
In the inter-bank market, base money is lent over various maturities, ranging from overnight to 12 months. In *normal times*, money market rates with longer maturities tend to deviate from the central bank's official interest rate by the expected change in the policy rate over the maturity of the contract (plus a term spread).

In *times of trouble*, however, price action in the inter-bank money market can change quite drastically. In early August 2007, inter-bank euro area money market rates rose strongly. Since then, the yield spread between *unsecured money market rates* and the ECB main refinancing rate has become exceptionally wide, while the spread between *secured money market rates* and the official rate has remained virtually unchanged (Fig. 2.1). What is the reason?⁵

⁵ Euribor rates are unsecured, while Eurepo rates (an index for rates on private sector repurchase agreements) are secured.

One explanation for elevated yield (maturity) spreads in euro area money markets may be found in the emergence of a *risk premium*: Heightened investor risk aversion, a direct result of the international credit market turmoil, would argue for upward pressure on inter-bank money market rates.

Fig. 2.1. – ECB, secured and unsecured money market rates (%)

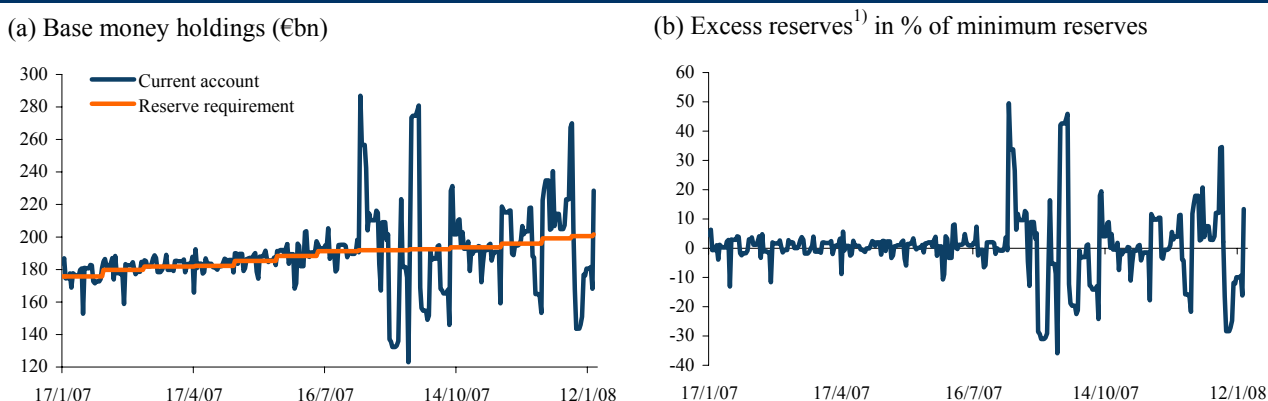


Source: Thomson Financial. Note that the time series include the end of the year period, a time span in which liquidity is traditionally expected to be tight(er).

WHAT DRIVES THE DEMAND FOR BASE MONEY?

Fig. 2.2 (a) shows banks’ *daily* current account holdings and reserve requirements in €bn. Since the end of July 2007, current account holdings have been fluctuating widely when compared with the reserve base. Excess reserves (defined as current account holdings over reserve requirements) in percent of minimum reserves have also been rather volatile (Fig. 2.2 (b)).

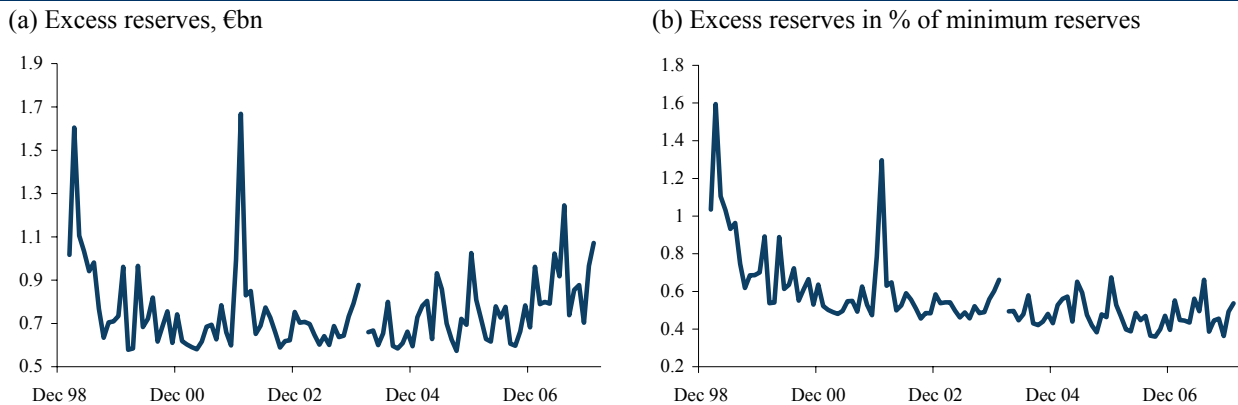
Fig. 2.2. – Base money in the euro area, daily data



Source : ECB, own calculations. 1) Current account minus minimum reserves.

Fig. 2.3 (a) shows the *monthly* averages of banks' excess reserves in €bn, which seem to have increased somewhat around the end of 2007. Fig. 2.3 (b) shows excess reserves in percent of reserve requirements. The latter have, if anything, been declining in recent years (though July 2007 saw a somewhat higher ratio).

Fig. 2.3. – Base money in the euro area, monthly averages



Source : ECB, own calculations. 1) Current account minus minimum reserves.

This finding may not come as a surprise. Banks do not want to hold *excess reserves*; in fact, banks take great efforts to keep excess reserves at a minimum.⁶ Even in times of crisis, banks' base money holdings have remained closely aligned with minimum reserves, suggesting that banks have *not* increased their (relative) excess reserve holdings (due to, for instance, the precautionary motive).⁷

CHANGE IN THE STRUCTURE OF BASE MONEY SUPPLY

In this context it should be noted that, in an effort to bring inter-bank money interest rates back to pre-crisis levels, the ECB started providing base money via *irregular overnight open market operations*.⁸ In addition, the bank increased longer-term refinancing operations to lower interest rates for longer-term interest rates, a policy practise that has gained momentum of late (Fig. 2.4).

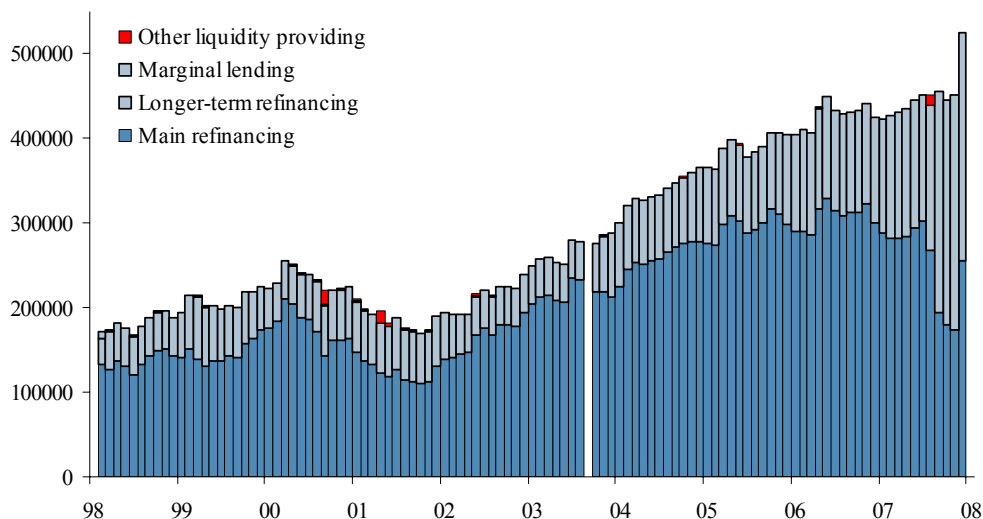
⁶ Excess reserves are costly and do not yield any return. Note that only minimum reserves are remunerated by the ECB, while no interest is paid on excess reserve holdings.

⁷ In the December 2007 Bulletin, the ECB writes (pp. 30): "The level of excess reserves (i.e. the daily average of current account holdings in excess of reserve requirements) remained broadly stable in the three periods under review at an average of €0.81 billion (...). This was broadly in line with the average (€0.75 billion) seen since the changes to the monetary policy implementation framework in March 2004."

⁸ For a brief overview about central banks' reactions in time of crisis, see, for instance, Bank for International Settlement (2007), Quarterly Review, December, pp. 12 – 13.

By doing so, the ECB has increasingly interfered with the pricing process in the base money market. In fact, it has increasingly acted as an “interest rate setter” in the base money market which, in turn, raises question to which extent monetary policy shall actively determine the price of base money for longer-term maturities.

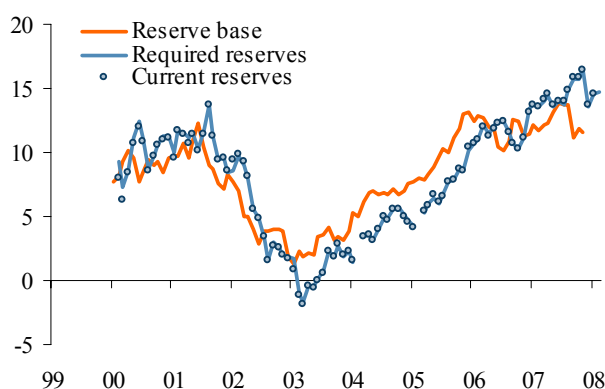
Fig. 2.4. – ECB liquidity providing operations (€mn)



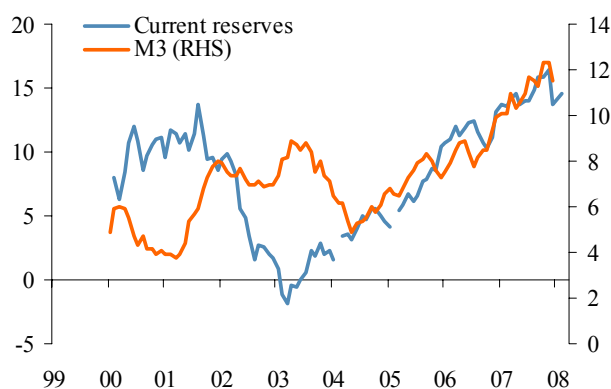
Source: ECB.

Fig. 2.5. – Base money and M3

(a) Base money supply (% y/y)



(b) Base money supply and M3 (% y/y)



Source: ECB, own calculations.

THE INCREASE IN BASE MONEY AND M3

In recent years, the growth rates of the reserve base and minimum reserves were extraordinarily high (Fig. 2.5 (a))⁹. What is

⁹ Note that banks have to hold their minimum reserves, determined in month t , in month $t + 1$. This explains why in Fig. 2.5 (a) the reserve base series lags the required reserves series by 1 month.

more, the expansion of base money was closely associated with the increase in the stock of M3 (Fig. 2.5 (b)).¹⁰

The close relation between base money and M3 expansion (and also bank loan growth) shows that, on the one hand, excessively strong M3 expansion has been financed by the ECB. On the other hand, it suggests that the fallout from the credit crisis, accompanied by the ECB's generous base money supply policy, may have the potential to increase the expansionary monetary policy further if and when banks start *monetizing debt*.

2.2 The effects of monetizing debt

To illustrate the effects of monetising debt on bank credit and money supply, let us use the example shown in Fig. 2. Assume that the central bank supplies additional base money supply in the amount of €50 (by accepting bonds as collateral) (Fig. 3).

Fig. 3.

Assets	Consolidated balance sheet of the banking sector		Liabilities
Bonds	50		
Base money	+150		
<i>thereof:</i>			
<i>Minimum reserves</i>	+100		
<i>Excess reserves</i>	+50		
Loans	+5000	Demand deposits	+5000
	Σ		Σ

With €50 excess reserves, banks can increase credit and money by an additional €2500, respectively. If, for instance, banks start buying bonds from the *secondary market*, and if the seller is a non-bank (pension funds, etc.), banks would increase the stock of money (*monetising financial assets*), while leaving the economy's total loan volume unchanged. If, however, bonds are bought in the *primary market*, banks would increase the economy's credit and money supply.

In our example (Fig. 4), banks are assumed to buy newly created debt issued by non-banks. The impact of an expanded base money supply is reflected in the increase in bank loans (including bond holdings) and the monetary aggregates M1, M2 and M3; in fact, our example shows that the expansion of base money and bank credit and money goes hand in hand.

¹⁰ See in this context also the ECB's assessment of "The impact of the financial turmoil on money and credit developments", Monthly Bulletin November 2007, pp. 17.

Fig. 4.

Assets	Consolidated balance sheet of the banking sector		Liabilities
Bonds	50		
Base money	+150		
<i>thereof:</i>			
<i>Minimum reserves</i>	+150		
<i>Excess reserves</i>	0		
Loans	+5000	Sight deposits	+7500
Bonds	+2500		
	Σ		Σ

FRICCTIONS IN THE SYNDICATED LOAN MARKET AND THEIR IMPACT ON CREDIT AND MONEY AGGREGATES

To show the impact frictions in the syndicated loan market exert on banks' credit and money supply and banks' demand for base money, we make use of another simple example (Fig. 5).

Let us assume that, in a *first step*, banks extend loans to non-banks in the amount of €1000. The loans are recorded on the asset side of the consolidated balance sheet of banking sector (1a) and, *uno actu*, sight deposits in the amount of €1000 are recorded on the liability side of the balance sheet (1b).

Fig. 5.

Assets	Consolidated balance sheet of the banking sector		Liabilities
1a) Loans to non-banks	1000	1b) Sight deposits	1000
2a) Other loans	-500	2b) Sight deposits	-500
	Σ		Σ

In a *second step*, banks sell off loans to non-banks in the amount of, say, €500.¹¹ The banking sector's balance sheet volume declines in the same amount (transactions (2a) and (2b) in Fig. 5). Our example therefore highlights three important facts:

- *First*, the practise of selling off loans to non-banks drives a wedge between officially recorded bank loans and the actual credit stock outstanding. In fact, such transactions make official bank loan aggregates *understating* the outstanding credit supply.
- *Second*, if selling off (newly originated) loans to non-banks is no longer possible, credit and money aggregates would show higher y/y growth rates (other things being equal).
- *Third*, failing to sell off credit to non-banks increases the banking sector's demand for base money: *sight deposits can no longer be destroyed*.

¹¹ By doing so, banks can free up equity capital and/or base money locked-in in minimum reserves for financing additional credit creation.

If the central bank increases the supply of base money in a situation in which banks can no longer sell off loans to non-banks it would de facto finance a *monetizing of debt*. This, in turn, increases the money stock in the hands of non-banks. Of course, the same holds true if banks' demand for base money increases as banks are required to extend credit to, say, special investment vehicles (SIVs).

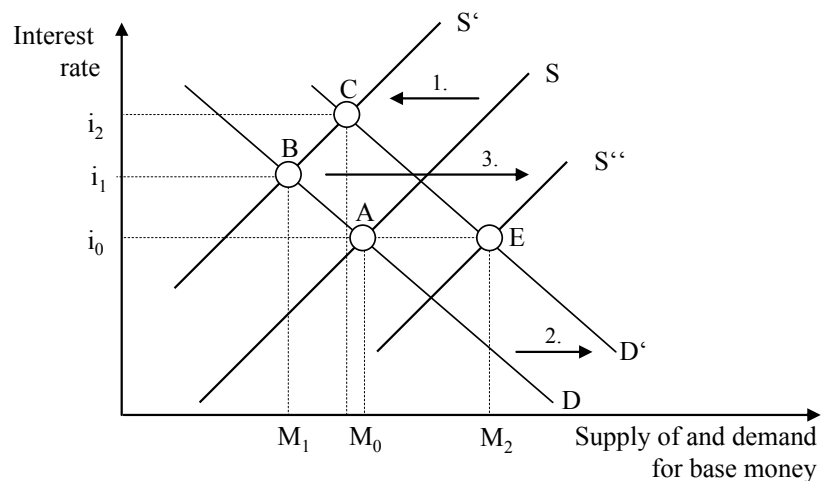
2.3 The drawback of interest rate steering

The overly generous expansion of base money supply in times of crisis is a direct outcome of the ECB's (implicit) *policy priority* of stabilizing money market interest rates over reigning in loan and M3 growth. This shall be illustrated with a simple example.

The inter-bank money market is in equilibrium in point A, where the interest rate is i_0 (the envisaged policy rate of the central bank), with the equilibrium base money stock being M_0 . Rising concerns about credit risk moves the supply curve S to S' (towards point B).

At the same time, an increase in the demand for base money (due to higher working balances and minimum reserves) moves the demand schedule D to D' , so that the new equilibrium is in point C.

Fig. 2.6. – A model for the base money market

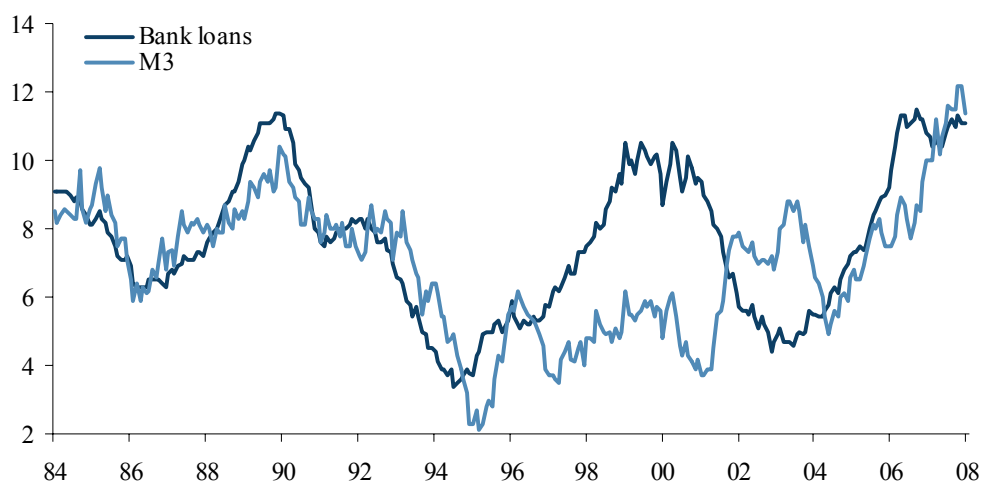


However, in point C, the interest rate is i_2 , exceeding i_0 . To restore i_0 , the central bank must increase the stock of base money, moving S' to S'' . The new equilibrium is in point E, where the interest rate has declined to i_0 and the stock of base money increased to M_2 ($> M_0$).

If, for instance, banks keep the additional base money supply ($M_2 - M_0$) in the form of excess reserves, there wouldn't be any impact on banks' credit and money aggregates. If, however, the additional base money supply is absorbed by reserve requirements – as

a result of banks' extending loans to non-banks –, the impact would clearly be expansionary.

Fig. 2.7. – Euro area bank loans and M3 (% y/y)



Source: ECB, own calculations.

In view of extraordinarily strong growth of bank loans and M3 (Fig. 2.7), we conclude that the ECB's monetary policy has been overly lax in recent years. The ECB's overly expansionary monetary policy is not only reflected in (still) rather low nominal and real short-term interest rates but also in rather high growth rates of banks' base money holdings.

Rising (credit) risk premia in inter-bank money market rates would imply a restrictive impulse as far as credit and money creation is concerned. In view of the latest growth rates of credit and money, however, the ECB's official interest rates seem still to be too low to reign in excessive liquidity creation in the euro area.



PART 3

“Global liquidity” drives (asset price) inflation¹²

CONTENT: 3.1 *The relation between money and asset prices.* – 3.2 *Theoretical considerations and empirical analyses.* – 3.3 *Conclusions.*

SUMMARY: *We analyse the relationship between global excess liquidity and asset prices on a global scale. We find that a rise in global liquidity leads to permanent increases in the global GDP deflator and in the global house price index. Moreover, we find that there is a subsequent spill-over to consumer prices. However, we are not able to find empirical evidence in favour of the hypothesis that the stock market (MSCI World index) significantly reacts to changes in global liquidity. That said, global liquidity is a useful indicator for inflationary pressure at a global level – and needs to be taken into account by monetary policy.*

3.1 The relation between money and asset price inflation

The quite expansionary monetary policy of the G3 countries (Euro area, US and Japan) in connection with foreign exchange interventions by many Asian countries - especially China with its dollar reserves now standing at 1.5 billion - has contributed to a significant increase of global money balances during the last years. Surprisingly enough, the strong monetary dynamics has not been accompanied by a concurrent rise in consumer prices so far. At the same time, however, a large part of OECD countries has experienced very sharp increases in asset prices, such as real estate or shares. Between 2001 and 2006, e.g., housing prices have strongly increased in the US (55%), the euro area (41%), Australia (59%), Canada (61%) and a number of further OECD countries.¹³ It cannot be ruled out that this development also has some connection with the abundant liquidity that exists worldwide. Many observers even interpret the increase in asset prices as the result of liquidity spill over to certain asset markets (Adalid and Detken (2007), Greiber and Setzer (2007)).

¹² This section heavily relies on Ansgar Belke and Walter Orth, Global excess liquidity and house prices – a VAR analysis for OECD countries, Ruhr Economic Papers No. 37, Essen, 31 December. We gratefully acknowledge valuable comments by Ralph Setzer, Deutsche Bundesbank, Juan Dolado, Universidad Carlos III de Madrid, and Daniel Gros, Centre for European Policy Studies, Brussels.

¹³ Notable exceptions are Japan where house prices stopped their 15-year fall not earlier than in 2007 and Germany.

So far, the relationship of money growth and asset prices has been little studied in an international context. In this section, we will address these issues more deeply and investigate the extent and some specific macroeconomic impacts of global liquidity in order to identify its interactions with global inflation and asset prices, as suggested by a number of authors, see Baks and Kramer (1999), Sousa and Zaghini (2006) and Ruffer and Stracca (2006). For this purpose, we estimate a VAR model including a measure of global liquidity, proxied by a broad monetary aggregate in the OECD countries under consideration (United States, Euro area, Japan, United Kingdom, Canada, Korea, Australia, Switzerland, Sweden, Norway and Denmark) and analyse the impact of a shock to global liquidity on a number of macroeconomic variables at the level of the world economy.

The emphasis is on a global model, i.e. we do not explicitly deal with spill-overs to national variables. We feel legitimised to do so because - according to recent research - inflation appears to be a global phenomenon. For instance, Ciccarelli and Mojon (2005) cannot empirically reject the existence of an error-correction mechanism between national and global inflation. Hence, one can conclude that deviations from the global inflation trend are not sustainable in the long run. Similarly, Borio and Filardo (2007) show that a more globe-centric approach to inflation is by far more adequate, because global factors have become increasingly relevant for empirical realisations of national inflation rates.

We come up with the conclusion that the liquidity the Western world has plenty of has – with an eye on the current debate about the subprime crisis not surprisingly – contributed to a lesser extent to the recent bull market on stock and bond markets than to an increase of house prices.

The remainder of this section is organised as follows: we first examine in section 2 some relationships with the existing literature and proceed with some theoretical considerations in chapter 3. In section 4 we turn to a more detailed econometric analysis using the VAR technique on a global scale. To ensure robustness we then augment our benchmark model with further variables. Chapter 5 concludes.

Overview of the literature

The concept of "global liquidity" has attracted considerable attention in recent years, although the empirical literature regarding this topic is still quite scarce. One of the first important studies in this field is Baks and Kramer (1999) who use different indexes of liquidity in seven industrial countries to explore the dimension of the relationship between liquidity and asset returns. The authors find evidence that there are important common components in G7 money growth

and that an increase in G7 money growth is consistent with higher G7 real stock returns and lower G7 real interest rates.

Recently, a number of studies have applied VAR models with data aggregated on a global level. Ruffer and Stracca (2006) estimate a VAR model with aggregated G5 data using the same macroeconomic variables as used here in the benchmark specification. They identify and address the "price puzzle", i.e. the initial increase of consumer prices as a reaction to a more restrictive monetary policy, and cannot solve it even when accounting for the impact of commodity prices. They also augment their model with a real asset price index that incorporates property and equity prices. The main difference in their findings compared to those contained in this section of the ECB Observer Report is that the response of the price level to a global liquidity shock is even more distinctive, while the real asset price index does not show any significant reaction to global liquidity.

Sousa and Zaghini (2006) also estimate a VAR model for the G5 with aggregated data. Moreover, they include a commodity price index and deviate from the standard Cholesky identification scheme in restricting the structural equations. Once again, the price puzzle is not solved by the commodity price index. Sousa and Zaghini also find a significant and long-lasting response of the price level to a global liquidity shock. One caveat with respect to a sound interpretation of their findings may be that their sample period for estimation ends already in 2001. It is by now well-known that in the post-2001 period the relationship between money and consumer prices was less stable than before - a finding which might challenge the stability of their results.

A prominent role for housing prices among other specific kinds of asset prices in the same context is also found at a global scale by Giese and Tuxen (2007). These authors find significant cointegration relationships which indicate a positive impact of global liquidity on house prices and more general inflation. However, their study is still in progress and so we might be cautious with an interpretation of their results.

One of the most recent country-level studies in this field is Roffia and Zaghini (2007). Using probit regressions for 15 countries, the authors find evidence in favour of the hypothesis that periods of strong monetary growth are likely to turn into periods of high inflation, especially if they are accompanied by asset price inflation. Given the fact that both conditions fit quite well to the situation observed on the world financial markets at least until spring 2007, this scenario has most probably contributed to the more recent positive trend of inflation rates observed in the second half of 2007 for instance in the Euro area.

3.2 Theoretical considerations and empirical analysis

THE GLOBAL PERSPECTIVE

Not only with respect to global liquidity but also with an eye on global inflation performance, available evidence becomes increasingly stronger that the global instead of the national perspective is more important when monetary transmission mechanisms have to be identified and interpreted. For instance, Ciccarelli und Mojon (2005) apply a factor analysis to macroeconomic data of 22 OECD countries and establish that seventy percent of the variance of the inflation rates of these countries can be traced back to a common factor. Moreover, the same authors find some pieces of empirical

evidence in favour of a robust error-correction mechanism, meaning that deviations of national inflation from global inflation are corrected over time. They finally conclude that inflation is to a large degree a global phenomenon.

The study by Borio and Filardo (2007) delivers a similar result. Referring to their empirical results, they argue that (a) the traditional way of modelling inflation is too country-centered, (b) a global approach is more adequate and that (c) the importance of global factors has increased significantly more recently. One important global factor, for instance, is certainly represented by the mounting pressure enacted by the ever higher degree of competition on the international goods and labour markets - a phenomenon which has to be mainly ascribed to globalisation. It appears fair to say that it is exactly the globalisation process which certainly has contributed to the decrease of inflation rates since the eighties (and that this puts the contribution of central banks on the agenda again). It goes without saying that we do not take the view that the national perspective is completely negligible. Instead, we emphasize in this section that a global model, as estimated in the econometric part of this section, may deliver additional relevant insights which certainly cannot be gathered if one concentrates solely on the national level and fades out global liquidity developments.

Note, however, that some other questions remain unresolved in this section. If one, for instance, considers the development of global liquidity over time, the question is often raised whether and to what extent global factors can be made responsible for it. Ruffer and Stracca (2006) investigate this aspect for the G7 countries in the framework of a factor analysis and conclude that around fifty percent of the variance of a narrow monetary aggregate can be traced back to one common global factor. As one prominent example of such a global factor for instance the extremely lax monetary policy stance of the Bank of Japan (BoJ) during the last years should be mentioned here. It has been characterised by a significant accumulation of foreign reserves and by extremely low interest rates – at some time even approaching zero. By means of carry trades, financial investors took out loans in Japan which they invested in currencies with higher interest rates. Such kinds of capital transactions, of course, have an impact on the development of monetary aggregates beyond Japan. In this section of the report, the focus is not on quantitatively disentangling the origins – global or national – of global liquidity shocks.

In addition, we focus on global instead of national liquidity since national monetary aggregates have become more difficult to interpret due to the huge increase of international capital flows (Papademos (2007)). Sousa and Zaghini (2006) argue that global ag-

gregates are likely to internalize cross-country movements in monetary aggregates - due to capital flows between the different regions – that may make the link between money and inflation and output more difficult to disentangle in the single country case. Moreover, Giese and Tuxen (2007) stress the fact that in today's linked financial markets shifts in the money supply in one country may be absorbed by demand elsewhere, but simultaneous shifts in major economies may have significant effects on worldwide goods price inflation.

MONETARY POLICY AND HOUSE PRICES

While there is some literature available on the impact of house price developments on the macro-economy¹⁴ and on the role of fundamental factors other than monetary policy for house price developments (Catte et al. (2004), Égert and Mihaljek (2007)), studies specifically dealing with the impacts of monetary policy on house prices are still quite scarce. For instance, Goodhart and Hofmann (2007) show that one could use a baseline New Keynesian model as a theoretical benchmark, consisting of a Phillips curve to describe the supply side of the economy and an IS curve to describe the demand side. From a monetary policy perspective, the central parameters are the strength and the significance of the links in the monetary transmission process and the relative importance of backward-looking and forward-looking expectations in the Phillips and the IS curve. As is well-known by now, the empirical literature has delivered diverse and highly controversial results on both issues. Hence, in an extended specification, Goodhart and Hofmann include property prices in the case of the IS curve and show that this restores an empirically significant monetary transmission mechanism.

Mishkin (2007) stresses the user cost of capital as an important determinant of the demand for residential capital. In this context, lower interest rates in the wake of higher money growth should influence mortgage rates and thus by decreasing the user cost of capital should raise the demand for housing capital. A similar effect should work on the supply side where easier financing conditions tend to stimulate housing construction. However, Mishkin focuses on the effects of interest changes on house price changes and does not explicitly refer to monetary aggregates. He gains empirical evi-

¹⁴ Monetary policy driven house price booms may fuel consumer spending and thus, aggregate demand and inflation via balance sheet and credit-channel effects - more potential collateral meaning lower risk premia in this context via the Bernanke/Gertler financial accelerator framework. According to Gros (2007), the most direct link between housing prices and domestic demand might be construction activity and in particular the construction of houses (dwellings).

dence in favour of a stable relation between an interest rate shock and house price developments via the FRB/US model.

A SIMPLE MODEL OF PRICE ADJUSTMENT

Some insights into the relationship between money, house prices and consumer prices can be derived from the dynamic price adjustment to a liquidity shock across the housing sector and the goods market. In the short term, an expansionary monetary policy providing the markets with ample liquidity may trigger an immediate price reaction in the housing sector, but a more subdued price reaction in the consumer goods market. Over time, however, consumer prices also adjust to the new equilibrium by proportional changes of the consumer price level, i.e. it is plausible to argue that in the long term changes in money supply do not lead to any real effects in money or output. As will become clear below, the possibility of different dynamic adjustments of house prices and consumer prices to a monetary shock may also provide an explanation for the recent shift in relative prices between housing and consumer goods.

In order to formalize these considerations, the quantity theory of money might serve as a starting point:

$$(1) \quad m_t v_t = p_t y_t ,$$

where m denotes the money stock, v represents the velocity of money, whereas p and y stand for the price level and real output, respectively. Equation (1) is simply an identity and is valid for all time periods t . Money can be spent either for housing (y^H) or a consumption good (y^C) with prices p^H and p^C , respectively. The distinguishing features of y^H and y^C are different price elasticities of supply. On the one hand, housing is generally assumed to be restricted in supply and cannot be expanded (Japan) and/or all real estate transactions involve high costs (continental Europe) and each piece of real estate is a different case and at least slightly different from even the adjacent plot.¹⁵ Hence, the elasticity of housing supply vis-à-vis house price changes should be quite limited. On the other hand, consumption has infinite price elasticity so that additional demand can be satisfied without any price increase. This assumption is motivated with an eye on recent developments in international trade. The emergence of low-cost producers in emerging markets and developing countries may have prevented firms from increasing consumer prices in response to a liquidity shock while supply in housing markets was subject to natural constraints. The

¹⁵ For a detailed discussion of the relevance of these arguments see Gros (2007), OECD (2005) and Shiller (2005)).

general price level is then a weighted combination of the prices of both goods:

$$(2) \quad p_t = \lambda p_t^H + (1 - \lambda) p_t^C,$$

with $0 < \lambda < 1$.

Similarly, output consists of the production of both housing and consumer goods.

$$(3) \quad y_t = \lambda y_t^H + (1 - \lambda) y_t^C.$$

In the following, the effects of a one-off increase (of μ percent) in money supply in period $t+1$ are analysed against this background. Assuming that v is constant and has a value of one, the relationship between money and the general price level in period $t+1$ can be written as follows:

$$(4) \quad (1 + \mu) m_t = p_{t+1} y_{t+1} = (1 + \mu) p_t y_t.$$

Due to high competition in international goods markets and the vast supply of cheap labour in many emerging regions in the world, which weighs heavily on the prices of manufactured goods, consumer price inflation remains unaffected by the increase in aggregate demand.

$$(5) \quad p_{t+1}^C = p_t^C$$

Rather, the liquidity shock fully translates into an increase in output:

$$(6) \quad y_{t+1}^C = (1 + \mu) y_t^C$$

By contrast, housing is in short supply which drives prices upwards as a result of the liquidity shock, but keeps output in the housing sector constant:

$$(7) \quad p_{t+1}^H = (1 + \mu) p_t^H$$

$$(8) \quad y_{t+1}^H = y_t^H$$

Combining equations (1) to (8), the money-price relationship in period t can be described as follows:

(9)

$$(1 + \mu) m_t = \left[(1 + \mu) \lambda p_t^H + (1 - \lambda) p_t^C \right] \left[\lambda y_t^H + (1 + \mu) (1 - \lambda) y_t^C \right] = (1 + \mu) p_t y_t$$

In the long term, however, the theoretical proposition of long-run neutrality must hold, i.e. the increase in money supply affects prices without changing long-run equilibrium real values:

$$(10) \quad p_{t+2}^C = (1 + \mu) p_t^C$$

$$(11) \quad y_{t+2}^C = y_t^C$$

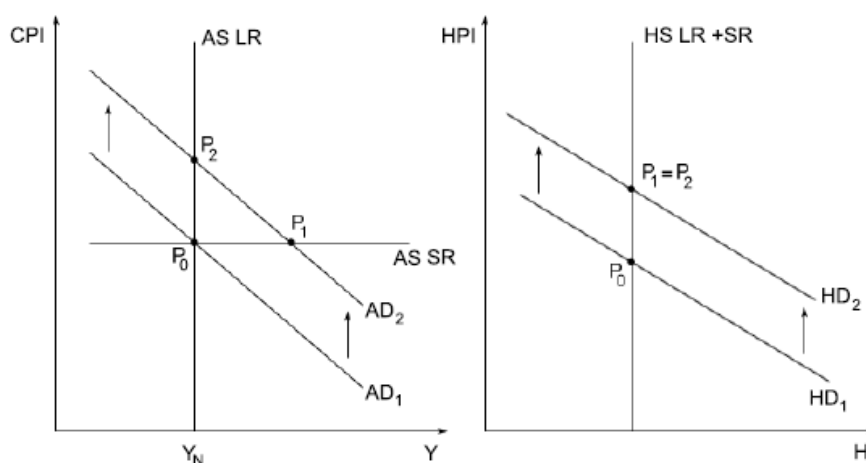
$$(12) \quad p_{t+2}^H = (1 + \mu) p_t^H$$

$$(13) \quad y_{t+2}^H = y_t^H$$

$$(14) \quad (1 + \mu) m_t = p_{t+2} y_{t+2} = (1 + \mu) p_t y_t.$$

Figure 1 illustrates the price-quantity changes in the housing and consumer goods markets when aggregate demand changes. On the goods market (left graph), one would expect an increase in the production of consumer goods, if the demand for consumer goods increases as a result of a positive liquidity shock. In contrast, housing supply is insensitive to price changes and thus the additional demand for housing is fully reflected in a rise of house prices (right graph). In the long term, the neutrality of money holds; i.e. any change in the money supply is met with a proportional change in the price level that keeps real money and real output in both sectors unchanged.

Figure 1: Short- and long-run impact of a liquidity shock to house prices (right-hand side) and consumer prices (left-hand side)



DATA DESCRIPTION AND AGGREGATION ISSUES

In the following empirical analysis, we use quarterly time series from 1984Q1 to 2006Q4 for the United States (US), the Euro area, Japan, United Kingdom (UK), Korea, Australia, Switzerland, Sweden, Norway and Denmark, so that in our analysis 72,2% of the world GDP in 2006 and presumably a considerably larger share of global financial markets are represented.¹⁶ For the aforementioned countries, we gather real GDP (Y), the GDP deflator (P), a short term money market rate (IS), a broad monetary aggregate (M), and, as asset prices, a house price index (HPI) and the MSCI World price index (MSW). The monetary aggregate is $M2$ for the US, $M3$ for the Euro Area, $M2$ plus cash deposits for Japan, $M4$ for the UK and mostly $M3$ for the other countries. The data stem from the IMF, the

¹⁶ Own calculations based on IMF data.

BIS and the ECB and are collected seasonally adjusted where available and otherwise applied to the X12-ARIMA procedure.¹⁷

In the next step, we aggregate the country series to obtain global series taking the principles mentioned by Beyer, Doornik and Hendry (2000) into account and employing the method as used by Giese and Tuxen (2007) in the same context. First, we calculate variable weights for each country by using PPP exchange rates to convert nominal GDP into a single currency.¹⁸

The weight of a country i in period t is therefore:

$$(15) \quad w_{i,t} = \frac{BIP_{i,t} e_{i,t}^{PPP}}{BIP_{agg,t}}$$

Secondly, we take the growth rates of the variable in domestic currency and aggregate these to global growth rates by using the weights calculated above:

$$(16) \quad g_{agg,t} = \sum_{i=1}^{11} w_{i,t} g_{i,t}$$

Aggregate levels can now be obtained by choosing an initial value (e.g. 100) and multiplying with the global growth rates. Hence, the level of the variable v is:

$$(17) \quad index_{v,T} = \prod_{t=2}^T (1 + g_{agg,t})$$

This method is applied to all variables except the MSCI World, which already represents shares on a global level. Moreover, for the interest rate variable, aggregation is performed directly without calculating growth rates.

Regarding the monetary aggregate which plays a central role in our analysis this method lowers the bias resulting from different national definitions of broad money which obviously exist. Building a simple sum of national monetary aggregates - a method frequently applied in the related literature - would under-represent countries with narrower definitions of the monetary aggregate and vice versa. A second problem that is avoided is the "dollar bias" resulting from converting national monetary aggregates with actual exchange rates into USD and building a simple sum to obtain global money. In this case, the recent fall of the dollar would otherwise contribute to an overestimation of global monetary growth.¹⁹

To illustrate the development of global liquidity since 1984, Figure 2 shows global monetary aggregates in absolute and relative

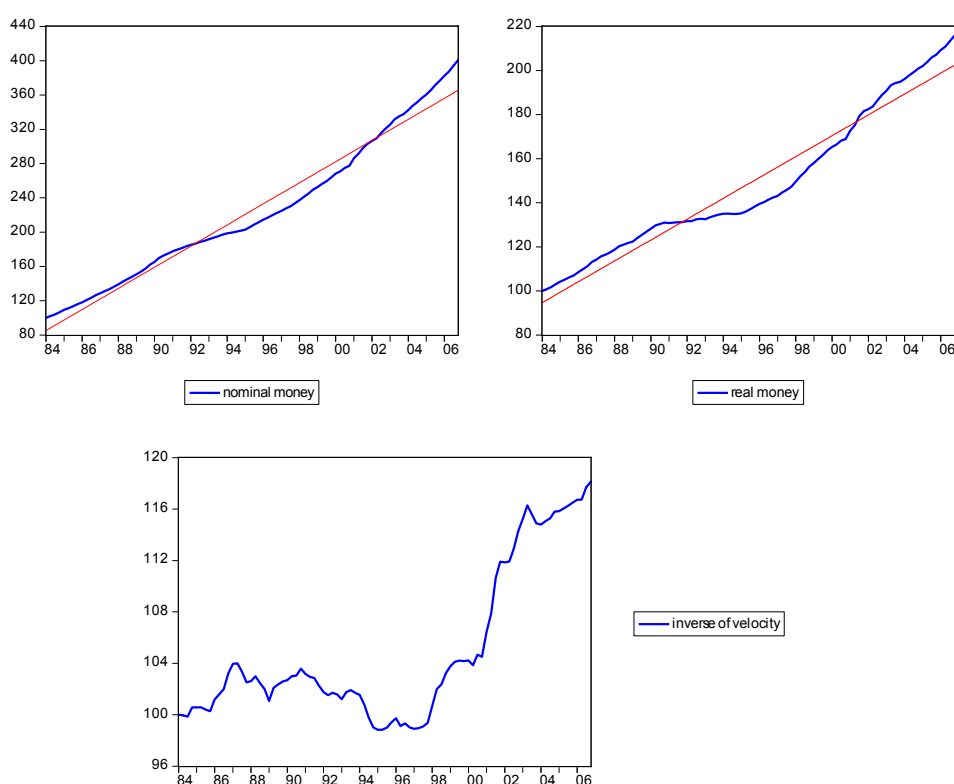
¹⁷ House prices stem from Sebastian Schich und Mark Weth, Deutsche Bundesbank, who collected house price data from several national institutions for their project "demographic changes and real house prices".

¹⁸ 1999 is our base year for the PPP exchange rates.

¹⁹ See Commerzbank Economic & Commodity Research (2007), p. 3.

terms. For nominal and real money, a simple regression on an intercept and a linear time trend is performed. Both series are above their time trend since about 2001 when the rapid downturn in stock markets caused households and investors to increase the share of safe assets like money in their portfolios. Monetary growth remained strong afterwards, as indicated by the persistent growth of the ratio of nominal money to nominal GDP, a measure commonly used as an indicator of excess liquidity.²⁰

Figure 2: Development in global liquidity since 1984



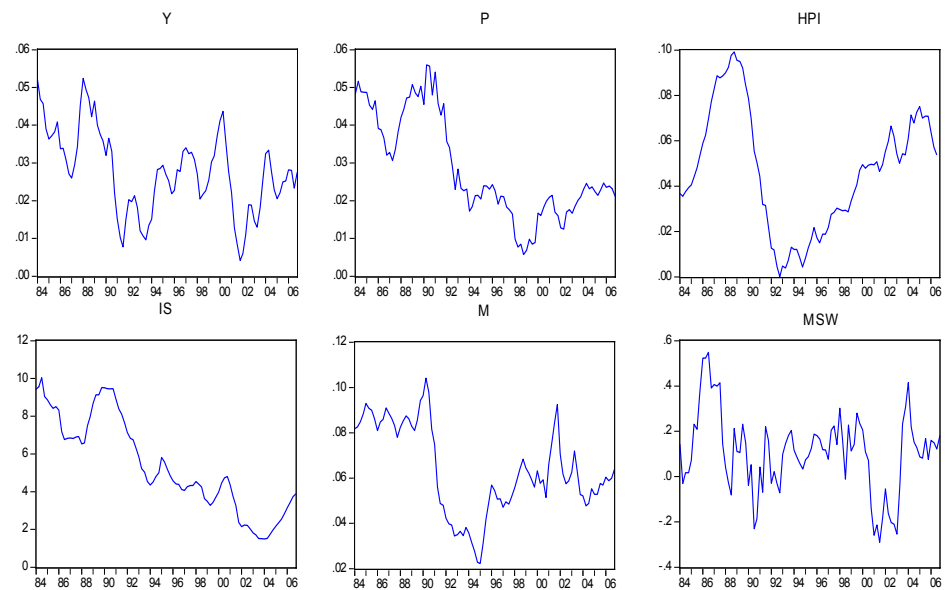
As this series is equal to the inverse of the income velocity of money, it seems obvious that global velocity is not trend-stationary, a phenomenon which has appeared on a country level as well and has contributed to the instability of national money demand equations. Overall, the series confirm our prior that global liquidity is indeed at a high level and that the term excess liquidity ought to be justified for the most recent period.

Figure 3 shows the whole array of global time series investigated in this section. The price level series clearly elucidates the moderate inflation which begun around the mid-90s and has persisted in the recent years of global excess liquidity. House prices have shown a distinct and increasing appreciation especially in the

²⁰See inter alia Belke et al. (2004) or Ruffer and Stracca (2006).

last 5 years giving support, to some extent, to the popular asset price inflation hypothesis in the real estate sector. Global short-term interest rates were at a historically low level from 2002 to 2005, as the monetary policy stance was extremely loose in this time.²¹

Figure 3: Global series, 4-quarter moving average of growth rates (except interest rate series)



The VAR Methodology

The econometric framework employed is a vector autoregressive model (VAR) which allows us to model the impact of monetary shocks to the economy while taking care of the feedback between the variables since all of them are treated as endogenous.²² Consider first the traditional reduced-form VAR model:

$$(18) \quad \Gamma(L)Y_t = CZ_t + u_t$$

where Y_t is the vector of the endogenous variables and $\Gamma(L)$ is a matrix polynomial in the lag operator L for which $\Gamma(L) = I + \sum_{i=1}^p A_i L^i$, so that we have p lags.

Z_t is a vector with deterministic terms and the corresponding matrix of coefficients C , and u_t is the vector of the white noise residuals where serial correlation is excluded, so that:

$$(19) \quad E(u_t) = 0$$

$$(20) \quad E(u_t u_s^l) = \begin{cases} \Sigma & : t = s \\ 0 & : t \neq s \end{cases}$$

²¹ One might regard the deviation from a Taylor rate as a more accurate measure in this respect. However, these numbers create a similar picture. See International Monetary Fund (2007), Chapter 1, Box 1.4.

²² Of course, one could model exogenous variables as well, but this option is not used here.

Since Σ is not a diagonal matrix, contemporaneous correlation is allowed. In order to model uncorrelated shocks, a transformation of the system is needed. Using the Cholesky decomposition $\Sigma = PP'$, taking the main diagonal of P to define the diagonal matrix D and pre-multiplying (18) with $\Psi := DP^{-1}$ yields the structural VAR (SVAR) representation:

$$(21) \quad K(L)Y_t = C^*Z_t + e_t$$

$$(22) \quad K(L) = \Psi + \sum_{i=1}^p A_i^* L^i$$

The contemporaneous relations between the variables are now directly explained in Ψ , which is a lower triangular matrix with all elements of the main diagonal being one. The innovations e_t are by construction uncorrelated since

$$E(e_t e_t') = \Psi \Sigma \Psi' = \Psi P P' \Psi' = D P^{-1} P P' P^{-1'} D' = D D'.$$

Similarly, the Cholesky decomposition is used to construct orthogonal innovations out of the moving average representation of the system which is the cornerstone of the impulse response analysis and the forecast error variance decomposition carried out later.

Furthermore, the use of the Cholesky decomposition implies a recursive identification scheme which involves restrictions about the contemporaneous relations between the variables. These are given by the (Cholesky) ordering of the variables and might considerably influence the results of our analysis. Therefore, different orderings are used to prove the robustness of the results.

To compute standard errors for the impulse responses and the forecast error variance decomposition which are not relying on any specific assumptions, in particular concerning the distribution of the coefficients, Monte Carlo techniques are an appropriate way to construct the desired confidence intervals.²³

Since the macroeconomic variables included in the analysis are likely to be non-stationary, the question arises whether one should take differences of the variables in order to eliminate the stochastic trend. Here, we follow Sims, Stock and Watson (1990) and estimate the VAR model in levels which, due to its simplicity, might be the more appropriate technique, too.

EMPIRICAL FINDINGS

The basic model without asset prices. - The conceptual approach of our VAR analysis is as follows. First, a benchmark model for the traditional macroeconomic variables Y, P, IS and M is estimated. Second, when the dynamics of the system is found to be plausible at the global level, this is considered by us as a confirmation of our global approach, and the asset price variables HPI and MSW will be added one by one. The basic specification is given by the following vector of endogenous variables (with the corresponding Cholesky ordering):²⁴

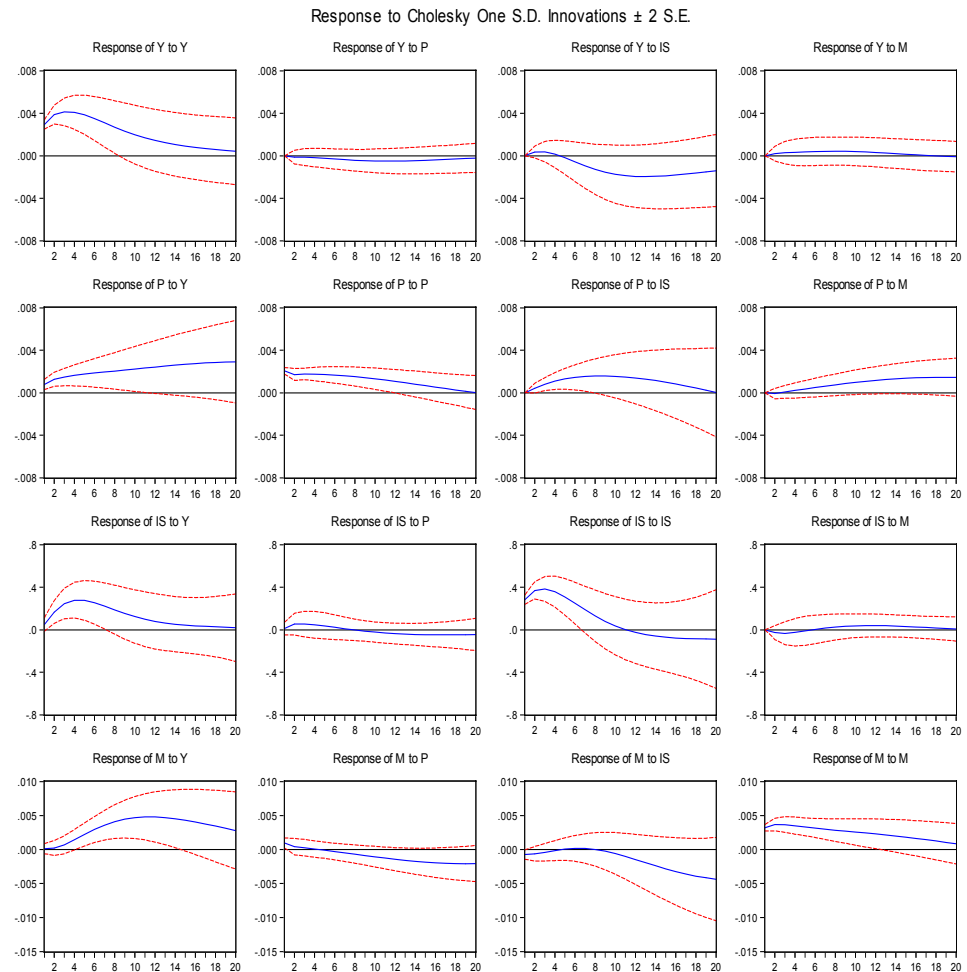
$$x_t = (y, p, IS, m)_t$$

The Cholesky ordering of the basic specification follows the principle that monetary variables should be ordered last, since they

²³ See Enders (2003), p. 277-278.

are supposed to react faster to the real economy than vice versa (Favero (2001)). Variables are taken in log-levels except the short-term interest rate, and a constant and a linear time trend are added to the model. The usual criteria are applied to determine the lag length.²⁵ Most of the criteria point at a lag length of 2, which is also sufficient to avoid serial correlation among the residuals and seems to be appropriate in order to estimate a parsimonious model where possible.²⁶ While this is true not only for the benchmark specification but also for the following models we will continue with 2 lags for the whole analysis.

Fig. 4. – Impulse response analysis; basic model



²⁴ Lower case variables are taken in logarithms.

²⁵ Explicitly, the Likelihood Ratio test, the Final Prediction Error, the Akaike information criterion, the Schwarz criterion and the Hannan–Quinn criterion are used.

²⁶ To test for autocorrelation of the residuals, we performed the Lagrange Multiplier test.

Fig. 4 shows the complete impulse responses obtained from the basic specification. Output declines with an interest rate shock and increases with a liquidity shock, which is in line with our expectations, but both effects are not significant at the 5% level. The GDP deflator P moves upwards through an innovation to the output variable which might give support to the consideration of the output gap in assessing inflationary pressures. The particularly interesting reaction of the GDP deflator to a global liquidity shock is only slightly significant after a few periods, but the significance (and the level of the impact) increases over time. We interpret this piece of evidence in favour of the hypothesis that the influence of money for inflation has a long-term character. In the case of the interest rate shock, the reaction of the price level yields the "price puzzle" which often occurs in the VAR analysis and was also faced by Ruffer and Stracca (2006) as well as Sousa and Zaghini (2006) in the same context.

Tab. 1. – Forecast error variance decomposition GDP deflator; basic model

Variance Decomposition of P:				
Period	Y	P	IS	M
2	23.2 (8.7)	74.8 (8.6)	1.9 (2.0)	0.1 (0.9)
4	31.4 (10.9)	59.2 (11.1)	9.1 (5.6)	0.3 (1.6)
8	37.5 (13.5)	41.6 (12.6)	18.5 (10.5)	2.3 (3.9)
16	50.2 (17.2)	23.3 (11.0)	17.4 (13.8)	9.1 (8.3)

Cholesky Ordering: Y P IS M
Standard Errors: Monte Carlo (1000 repetitions)

The appearance of the "price puzzle" is sometimes thought to be caused by the lack of a variable which captures inflation expectations. Monetary policy makers are supposed to raise interest rates when inflation expectations rise. When their policy cannot stop inflation from rising, the system may identify the rise of interest rates as a trigger of the increase in the price level. Therefore, it is recommended by Favero (2001) to use a commodity price index that might capture inflation expectations to some degree and solve this problem. However, considering this alternative and adding a commodity price index (or, alternatively, the oil price) into our system,

did not solve the "price puzzle".²⁷ There will be further discussion of the implausible reaction of inflation to interest rate changes in the context of the following models, where the house price index helps us to solve the "price puzzle".

The short-term interest rate moves up due to an output shock, but does not show a significant reaction to a price or a money shock. These results may occur, because either the system captures only the monetary policy stance in the short run which could be dominated by the business cycle or because the monetary policy instrument might be difficult to model from a global perspective where different central banks with different strategies exist. The responses of money show, in line with standard money demand considerations, a positive response of money to an output innovation and a decline of liquidity with growing interest rates. The latter effect might be caused by rising opportunity costs of money holdings and/or due to central bank driven shifts in the money supply.

Tab. 1 shows the forecast error variance decomposition of the GDP deflator. Liquidity matters again in the long run, while most of the variance of the price level is a result of fluctuations of the output variable. Notwithstanding the rather close long-run relationship between money and prices, in the short run, business cycle fluctuations seem to play the major role for price level volatility in the short run.

Overall, the results of the benchmark model provide a good starting point for the subsequent analysis in which the additional inclusion of asset price variables might add up to the explanatory power of the global model.

Augmenting the VAR with asset prices. The next step in our VAR analysis is to allow for the first asset price variable to enter the model. We start with the house price index (HPI), since - according to section 3 - house prices may play a crucial role in this context for several reasons. In the Cholesky ordering, we put house prices just behind the GDP deflator, so that we are working with the following vector of endogenous variables:

$$x_t = (y, p, hpi, IS, m)_t$$

Fig. 5 shows in the first row the effects emanating from a positive shock to the short-term interest rate. Like in the benchmark model, this kind of shock causes output and money to decline, while the latter becomes significant at the 5% level here. Moreover, the "price puzzle" disappears which supports the view that house prices

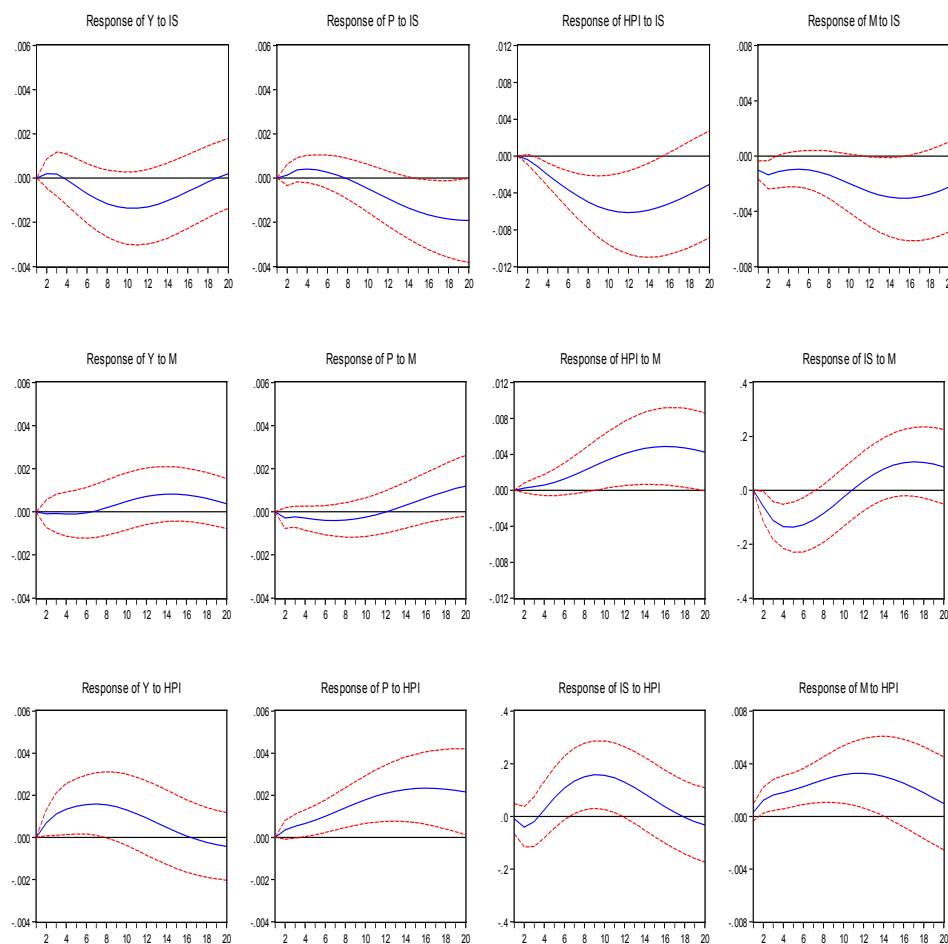
²⁷ The same finding appears in Ruffer and Stracca (2006) as well as in Sousa and Zaghini (2006).

are essential for our model and otherwise an omitted variable bias might occur.

Alternatively, one could argue that house prices and inflation expectations might be correlated, since the lack of an inflation expectation variable is often supposed to be the reason for the existence of the "price puzzle". The liquidity shock impact on the price level is slightly lower than in the basic model. However, by adding up both effects that may represent (recent) expansionary monetary policy (money and interest rate shock), we assess substantial upward pressures on inflation, while, once again, the long time lags of these effects have to be taken into account.

The responses of the house price index to the interest rate and to liquidity are significant over quite a long period. Both graphs support our view that loose monetary policy and ample global liquidity have contributed to the bull market in the real estate sector which is in line with our theoretical considerations.

Fig. 5. – Impulse response analysis; basic model augmented with house prices



Analysing a house price shock, which may be especially relevant in the present situation, gives some additional insights. A house price shock raises liquidity which may not least be due to rising credit demand. This evidence is not surprising given the cointegration relationship between money and house prices found by Greiber and Setzer (2007) for the Euro area and the US, and renders further support to the assumption that housing should be considered in money demand models. More surprisingly, a house price shock causes a rise in interest rates (row 3, column 3). Since it has not been commonly known until now that monetary policy makers are reacting directly to house price developments,²⁸ this again raises the question to what degree house prices are linked with inflation expectations or forecasts, respectively.

Tab. 2. – Forecast error variance decomposition; basic model augmented with house prices

Variance Decomposition of P:					
Period	Y	P	HPI	IS	M
2	18.5 (8.4)	78.7 (8.6)	1.6 (2.0)	0.2 (1.2)	1.0 (1.8)
4	25.0 (10.6)	66.2 (11.0)	5.3 (5.1)	2.1 (3.0)	1.4 (2.5)
8	33.2 (12.8)	45.4 (12.6)	17.4 (10.2)	1.6 (3.6)	2.4 (3.6)
16	23.4 (13.4)	18.8 (8.9)	44.5 (13.4)	11.3 (7.6)	1.9 (3.5)
Variance Decomposition of HPI:					
Period	Y	P	HPI	IS	M
2	0.0 (1.9)	0.9 (2.6)	98.0 (3.5)	0.7 (1.2)	0.3 (0.8)
4	0.3 (3.0)	3.2 (4.5)	87.8 (7.4)	7.9 (5.0)	0.8 (1.8)
8	0.5 (4.6)	6.3 (6.3)	66.4 (12.1)	23.3 (10.1)	3.4 (4.2)
16	0.2 (6.5)	9.0 (7.5)	41.7 (14.2)	34.3 (12.8)	14.7 (9.4)
Cholesky Ordering: Y P HPI IS M					
Standard Errors: Monte Carlo (1000 repetitions)					

²⁸ For now, the subprime crisis ought to contribute to a changing behaviour in this respect.

Tab. 2 displays the forecast error variance decomposition for the house price index and the price level. Over the long term (forecasting 16 quarters), the monetary variables (money and the interest rate) are responsible for nearly half of the volatility in the housing sector. This confirms the results of the impulse response analysis that both liquidity and interest rates are important determinants for pricing in the real estate sector. House prices themselves are causing a great percentage of price level forecast volatility, namely over 40% after 16 quarters. In combination with the corresponding impulse responses, this supports the existence of spill-overs from housing price inflation to consumer prices from an empirical angle. From a theoretical point of view these findings underline the relevance of wealth effects and the balance sheet channel, which probably contribute to these spill-overs.

The house price index in our model does not only solve the "price puzzle", it is also involved in many significant impulse responses and is a major factor in the forecast error variance decomposition of the price level. Therefore, the house price variable is too crucial to be omitted in the following. Consequently, we will augment our model with stock prices while still including the house price index.

We now add the log of the MSCI World index to our model to represent global stock markets. The vector of variables under consideration is therefore (in a Cholesky ordering):


$$x_t = (y, p, hpi, IS, m, msw)_t .$$


Fig. 6. – Impulse response analysis; model augmented with house prices and stocks

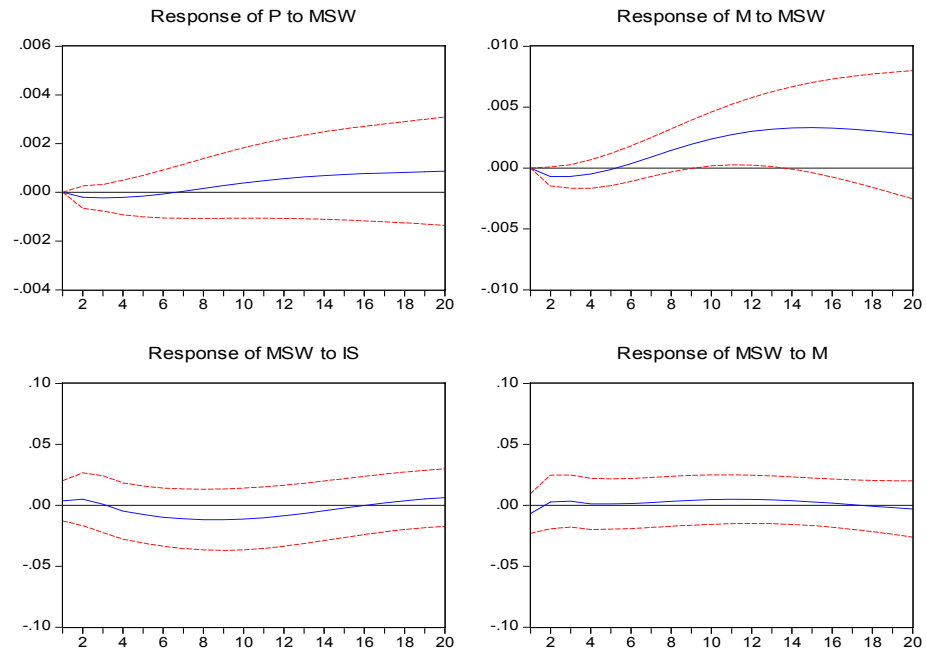


Fig. 6 shows a selection of the impulse responses representing the relationships that are of primary interest. No evidence can be found that either interest rate shocks or liquidity shocks fuel stock markets. Furthermore, no significant spill-overs from share prices to inflation occur in our model. However, there is a significant response of money to a stock market impulse. This may be due to wealth effects with respect to money demand. As rising share prices contribute to wealth, and with money demand depending more on wealth than on income, this effect makes sense from a portfolio-theoretical perspective.²⁹ These results are robust to an estimation of the model in which the house price index is excluded.

There may be different reasons for the insignificant reaction of stock prices to monetary conditions. First, stock prices may be mainly determined by fundamental criteria like future cash flow expectations or price earnings ratios assuming that the latter are independent of monetary policy. Second, the relationship between money and stock prices is theoretically not determined as, besides the above described wealth effect, there is also an opposing substitution effect which postulates that an (expected) rise in stock prices *ceteris paribus* renders this type of investment more attractive than holding money balances and causes a portfolio shift into equities and away from money.

²⁹ See European Central Bank (2007) for some recent empirical findings that show a close link between money and wealth in the Euro area.

Thus, the special role we found for house prices among asset prices in our theoretical considerations is clearly confirmed in our empirical investigation. Seen on the whole, thus, our small theoretical model is corroborated by our VAR analysis. On the goods market, there is an increase in the production of consumer goods, since the demand for consumer goods increases as a result of a positive liquidity shock. In contrast, housing supply proves to be insensitive to price changes. This is because the data tell us that the additional demand for housing is fully reflected in a rise of house prices. In the long term, the neutrality of money holds; i.e. the positive liquidity shock is met with a change in the GDP deflator.

ROBUSTNESS CHECKS

To check the robustness of our results, we estimated several alternative versions of our model. First, we changed the Cholesky ordering of the variables and, additionally, used generalized impulse responses.³⁰ For instance, the interest rate is often ordered behind the money variable in similar VAR models, so that we also tried this option with nearly no consequences for the results. The same is true for generalized impulse response analysis.

Second, additional variables were added to the model, namely a commodity price index (like already mentioned earlier), the oil price (as an alternative for the commodity price index) and a long-term interest rate (specified by 10-year government bond yields). Both former variables were involved in only very few significant impulse responses with the most interesting of them being a short-term rise of the interest rate to a commodity price shock. The other findings of our model again proved to be stable. As the commodity price index and the oil price did not solve the "price puzzle" and did not show significant effects on the price level, we dropped them in the analysis illustrated above not least in order to save degrees of freedom.

The long-term interest rate was added as a substitute for the short-term rate and as a complement of our system as well. In the former case, results were very similar to the use of the short-term rate. In particular, no evidence was found that global liquidity fuels bond markets. When using both rates signs of duplications were found. For instance, shocks to both rates caused a decline of the GDP deflator and the house price index. Notwithstanding the fact that the long-term interest rate might contain additional information, the relationship to the short-term interest rate seems to be

³⁰ See Pesaran and Shin (1998) for theoretical derivations of generalized impulse response analysis.

close enough such that the more parsimonious model may be more adequate in order to diminish over-parameterization.

As a third methodological innovation, different lag lengths were used. Particularly, the use of four lags in the VAR was tried, but the results did not change significantly.

3.3 Conclusions

The main empirical results of this section of the report can be summarized as follows. At a global level, we find further support to the conjecture that monetary aggregates may convey some useful information on variables such as house prices which matter for aggregate demand and hence consumer price inflation. Thus, we conclude that liquidity serves as a useful indicator of house price inflation and of a more generally defined inflationary pressure at a global level. Therefore, one could argue that global liquidity merits some attention in the same way as the worldwide level of interest rates has received in the recent intensive debate on the world savings versus liquidity glut, if not possibly more.

Against the background of our results, the still high level of global liquidity should be interpreted as a threat for future inflation and financial stability. Since global excess liquidity is found to be an important determinant regarding house prices there might be at least two implications. First, monetary policy has to be aware of likely spill-overs from housing to consumer prices resulting from the bull market in the real estate sector which might continue due to excess liquidity. Secondly, when house prices reach an unsustainable level and a potential bubble is created, this means risks not only for price stability but also for the economy as a whole - as seen in the current subprime crisis which apparently has partly spread from the US to other parts of the world. We also see some implications for policy makers. In the first place, our VAR analysis indicates that house prices might well serve as indicators of future inflationary pressures. Moreover, strong monetary growth might be a good indicator of emerging bubbles in the real estate sector.

We see two potential ways to reduce the world excess liquidity. The first is a tightening of monetary policy oriented at the development of the world's nominal income. This strategy will not solve the current problem immediately but should diminish the long-run risks. Moreover, fostering strong global economic growth will dampen negative effects especially with respect to potentially bursting bubbles.

As always, some important questions remain unanswered in this section of the report. Let us just enumerate two of them. First, over the last 30 years, the euro area index for real housing prices

has tended to follow that of the US quite closely, but with a lag of around 18 months. Given that the US market turned in mid-2006, one could thus expect that the Euro area market is likely to do the same as 2007 turns into 2008 (Gros (2007)). Will the world excess liquidity in the end be capable to stop this trend? Second, the focus of our analysis was solely on the global perspective. Still, with a view on recent findings that inflation might be an increasingly global phenomenon, the potential threats for future price stability which can be derived from the evidence of this section of the report and the related literature seem to be also relevant on a country level. Several country-level studies that include asset prices find empirical evidence in a similar direction.³¹ These studies basically support in some way one of the major findings of this section, namely that global liquidity fuels house price inflation and that there might be subsequent spill-overs to consumer prices.

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PART 4

Rising inflation in the euro area

CONTENT: 4.1 Money: to watch or not to watch? – 4.2. Money drives inflation. – 4.3 Forecasting euro area inflation.

SUMMARY: *There is strong empirical evidence that (trend M3) money growth drives (trend) CPI inflation in the euro area. The excessive rise in M3 in the last years argues for an ongoing upward drift of inflation in the years to come. For 2008, we estimate annual consumer price inflation to be 3.1% on average, followed by 2.7% in 2009. If, however, the ECB does not slow down credit and money supply growth substantially, the risk is for even higher inflation in the future.*

“[I]t would be unfortunate if the change in the way we talk led to the erroneous belief that we could turn Milton Friedman on his head, and think that ‘Inflation is always and everywhere a real phenomenon’.”

Mervin King (2002), No Money, no inflation, in: Bank of England, Quarterly Bulletin, p. 174.

4.1 Money: to watch or not to watch?

Whether money (growth) should play a role in day-to-day monetary policy making has remained a hotly debated issue.³² This may come as a surprise, given that Milton Friedman’s famous dictum “*inflation is always and everywhere a monetary phenomenon*” is perhaps the theoretically and empirically best-supported economic proposition. However, three key issues might explain why there tends to be a general reluctance on the part of policy makers to base interest rate decisions (solely) on money.

First, there are considerable time-lags with which changes in the stock of money affect nominal magnitudes, prices in particular. In fact, time-lags (which tend to vary) can blur considerably the relationship between changes in the stock of money and changes in prices. *Second*, central banks’ price stability objectives are based on keeping consumer price indices in check. Changes in asset prices (which are influenced by money growth) tend to be ignored as long as they do not show up in consumer prices.

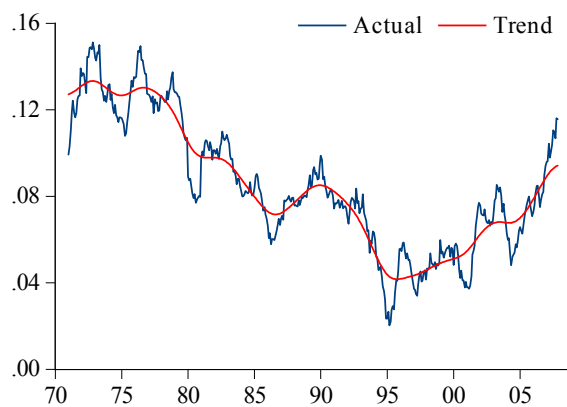
³² See, for instance, Fitzgerald, T. J. (1999), Money Growth and Inflation: How Long is the Long-Run?, in: Federal Reserve Bank of Cleveland, 1 August. Also, Dwyer, G. P. Jr., Hafer, R. W. (1999), Are Money Growth and Inflation Still Related?, in: Federal Reserve Bank of Atlanta, Economic Review, Second Quarter, pp. 32 – 43.

Third, monetary data tend to exhibit “noise” from month to month, from quarter to quarter and even from year to year. For instance, non-banks’ short-term portfolio shifts can, in the short- to the medium term, distort underlying monetary dynamics.

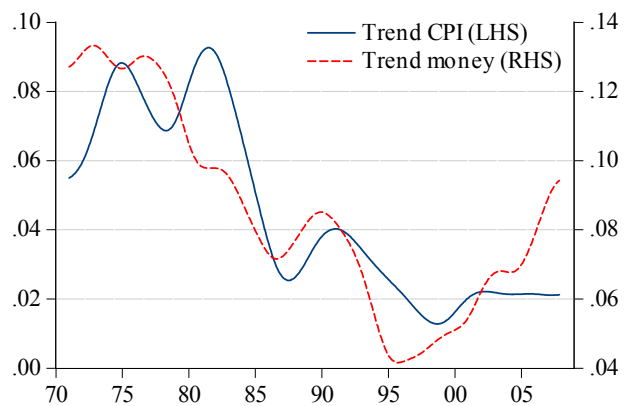
For instance, in periods of financial crisis, non-banks tend to increase their preference for liquid short-term bank deposits. In such circumstances, the stock of money aggregates may expand without necessarily indicating future inflation.³³ As a result, policy makers do not necessarily want to react to “headline” money growth.

Fig. 4.1. – Euro area CPI and M₃

(a) Actual and trend M₃ (% y/y)



(b) Trend M₃ and CPI (% y/y)



Source: Thomson Financial, own calculations. – Monthly data, 12th differences of log levels. – Trends were estimated applying the Hodrick-Prescott (HP) Filter to the series.

However, is such a conclusion justified for policy making in the euro area? Fig. 4.1 (a) shows actual and *trend* money growth for the period 1971 to November 2007, while Fig. 4.1 (b) plots trend money against trend inflation.³⁴ There is a pretty high correlation between trend money and trend inflation in the period under review. What is

³³ It should be noted, however, that any increase in the stock of money aggregates is actually willingly financed by central banks expanding the stock of base money. This is because for an increase in their liabilities (as represented by a rise in monetary aggregates), the banking sector as a whole needs additional base money (largely for keeping minimum reserves).

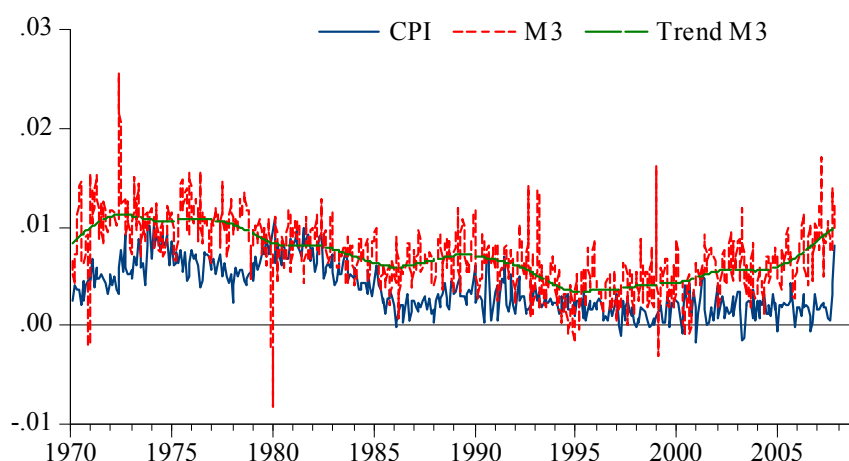
³⁴ In view of mounting critique as far as “headline” growth of monetary aggregates is concerned, measures of “core money” have been put forward. The concept of core money tries to eliminate the “noise” from the data, thereby providing a “pure” measure of inflation-relevant – or underlying – money supply growth. That said, core money growth can be understood as a smoothed, or filtered, series of money supply growth. For instance, Neumann and Greiber (2004) defined core money as “the long-lasting, low-frequency component of nominal money growth in excess of real money

more, money growth seems to lead CPI inflation. On the basis of this simple graph, trend M3 growth would suggest that annual euro area CPI inflation might be going up substantially in the years to come.

4.2 Money drives inflation

To form a better view about the relation between changes in the CPI and money in the euro area, Fig. 4.2 shows monthly changes in the euro area CPI and M3 and “Trend M3” (which actually represents a filtered series of M3). A visual inspection suggests that the swings in money expansion are related to those of the changes in the CPI. Since around 2001, however, that relation seems to have weakened somewhat. However, such a finding does not necessarily indicate that the relation between money growth and inflation has broken down, if the *time-lag issue* is taken into account.

Fig. 4.2. – Euro area CPI and money stock (% , m/m)



Source: Thomson Financial, own calculations. – Series are seasonally adjusted. First differences of log levels. – Trend M3 was calculated by applying the Hodrick-Prescott (HP) Filter to M3. – Period: January 1970 to November 2007.

To analyse the relation between CPI and money, we make use of the well-known transaction equation. It can be transformed as follows:

$$(1) \Delta m + \Delta v = \Delta y + \Delta p ,$$

where m = stock of money, v = income velocity, y = output and p = price level; small case letters represent logarithms and Δ represents first differences. Solving equation (1) for p yields:

$$(2) \Delta p = \Delta m + \Delta v - \Delta y .$$

Assuming that the trend change of v is zero (or constant), and that, in the long-run, y is a positive constant, one can write:

$$(3) \Delta p = \Delta m,$$

that is the change in the stock of money determines the change in the price level.

In what follows, we make use of a rather simple model for the long-run relation between euro area M3 growth and consumer price inflation. An empirically testable equation would be:

$$(4) \Delta p_t = \beta_0 + \beta_1 \Delta m_t + \varepsilon_t,$$

where Δp is the change in the (consumer) price index and Δm is the change in the stock of money, ε is the i.i.d. error term. Note that under the assumptions made above, the constant β_0 would reflect changes in income velocity and output.

Stationarity tests indicate that first differences of the log levels of the CPI, M3 and trend M3 appear to be $I(1)$ variables, which can therefore be analysed within the Johansen cointegration framework.

Fig. 4.3 – Tests for unit roots

	Null hypothesis	Alternative hypothesis	Test statistics	
			ADFa,b	PPa,b
lnM3	stationary	I(1)	-2.541	-1.978
	I(1)	I(2)	-1.938	-2.999**
Δ lnM3	stationary	I(1)	-1.938	-2.999**
	I(1)	I(2)	-8.634***	-18.885***
Δ lnM3core	stationary	I(1)	-2.1974	-1.093
	I(1)	I(2)	-1.419	-0.762
lnM1	stationary	I(1)	-1.154	-1.680
	I(1)	I(2)	-4.077***	-8.115***
Δ lnCPI	stationary	I(1)	-1.380	-1.849
	I(1)	I(2)	-6.281***	-18.371***
lnS	stationary	I(1)	-0.815	-0.545
	I(1)	I(2)	-5.139***	-11.576***
Δ (lnS-lnCPI)	stationary	I(1)	-0.624	-0.194
	I(1)	I(2)	-5.092***	-11.334***

Legend: * / ** / *** rejection of the null at the 10, 5 and 1 percent level (McKinnon (1991) values). – a ADF is the Augmented Dickey Fuller (1981) test (including up to the highest lag statistically significant at the 5% level); PP is the Phillips Perron (1988) test (with 3 truncation lags, as suggested by the Newey West criterion). – b Constant included in all the auxiliary test regressions, deterministic trend only if statistically significant at the 5% level. Source: Thomson Financials; own calculations.

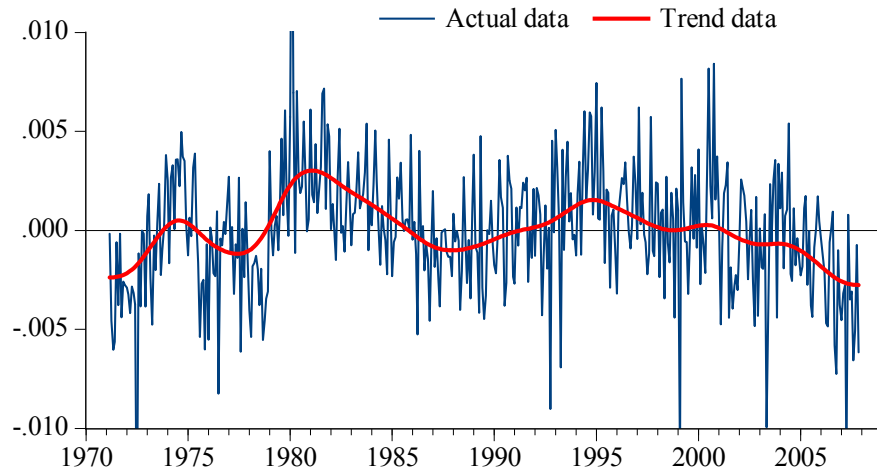
Fig. 4.4. – Long- and short run estimates for money growth on CPI inflation, 1970 - 2007

	[I.] M3	[II.] Trend M3
I. Lag lengths (quarters)		
AIC	12	13
SC	4	4
HQ	12	12
II. Johansen test, lag = 12 quarters		
Trace statistic $r = 0$	17.292*	18.003*
Critical value 0.05	15.494	15.495
Prob.	0.02	0.02
Max-Eigen. statistic $r = 0$	15.664*	14.734*
Critical value 0.05	14.265	14.265
Prob.	0.02	0.04
II. Johansen test, lag = 8 quarters		
Trace statistic $r = 0$	23.687*	16.511*
Critical value 0.05	15.495	15.495
Prob.	0.00	0.03
Max-Eigen. statistic $r = 0$	21.708*	11.800
Critical value 0.05	14.265	14.265
Prob.	0.00	0.11
III. Long-run relations (8 quarters)		
$\Delta \ln CPI_t$	1.000	1.000
$\Delta \ln M3_t$	-0.982 (0.177)	...
$\Delta \ln M3core_t$...	-0.792 (0.12)
Constant	0.0032	0.0018
IV. Error correction equations		
	ect _{t-1,1}	ect _{t-1,2}
$\Delta(\Delta \ln M3_t)$	0.116 [1.52]	...
$\Delta(\Delta \ln M3core_t)$...	0.000 [-2.19]
$\Delta(\Delta \ln CPI_t)$	-0.119 [-3.51]	-0.181 [-3.07]
R2	0.42	0.42

Legend: Period under review: January 1970 to November 2007. – AIC = Akaike information criterion, SC = Schwarz information criterion, HQ = Hannan-Quinn information criterion. – * denotes the rejection of the null hypothesis at the 0.05 level. – (.) standard errors, [.] t-values. – ect = error correction term, ln = natural logarithm, Δ = first difference, M3 = stock of M3, M3 core = filtered M3, CPI = consumer price index. – R2 = coefficient of determination for the first difference equations.

Source: Thomson Financial, ECB.

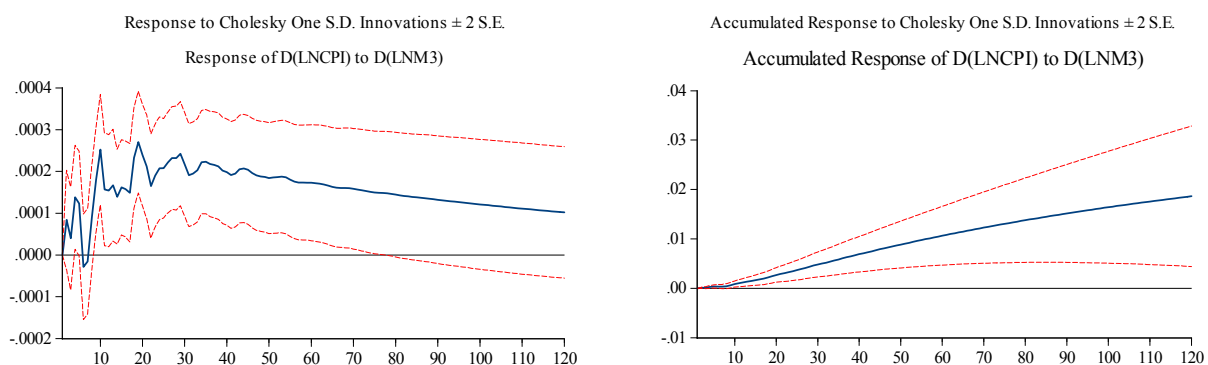
Fig. 4.5. – Results of the cointegration estimation (residuals of the long-run relation)



Source: Thomson Financial, own calculations. – A data point below (above) the zero line indicates upward (downward pressure) for CPI inflation.

Fig. 4.4 shows the estimation results, while Fig. 4.5 gives a graphical representation. We find that, *first*, a long-run relation exists between changes in the euro area CPI and money growth (both for M3 and Trend M3); both series are on the *same wavelength*. *Second*, an increase in M3 (Trend M3) by one percentage point translates into an increase in CPI inflation of 0.98 (0.79) percentage points. *Third*, it seems to be money growth that *causes* changes in the CPI, while the reverse causation cannot be detected.

Fig. 4.6. – Impulse-response functions



Source: Thomson Financial, own calculations.

To cross-check the estimation results, we applied a simple vector autoregressive (VAR) model, in which the changes in the CPI and M3 (Trend M3) enter the system as endogenous variables. The lag length was set at 12 months. Fig. 4.6 shows the impulse-response

functions. An increase in the money supply growth rate increases future inflation.

In sum, the findings above would suggest that money growth determines CPI inflation in the euro area. The impact of money growth on CPI inflation appears to materialise with quite some time delay, though. That said, the rather high growth rates of M3 over the last years argue for a persistent upward drift in euro area CPI inflation in the foreseeable future.

4.3 Forecasting euro area inflation

Our *forecast model* basically makes use of the well-known “P-star”, or “price gap”, model for inflation. The price gap, pg , can be expressed as the difference between the price level, p , and the equilibrium price level, p^* , so that

$$(1) \quad pg = p^* - p,$$

where small letter denote logs.

The long-run price level can be written as:

$$(2) \quad p^* = m + v^* - y^*,$$

that is money supply plus the trend value of velocity of money minus real GDP potential. As a result, the price gap can be expressed as:

$$(3) \quad pg = m - p + v^* - y^*.$$

When real money supply plus trend velocity exceeds potential output, equation (3) indicates that the price gap (and therefore inflation) will be positive, meaning upward pressure on prices.

For forecasting euro area inflation, we use a rather simple model containing the quarter-to-quarter changes in the annual inflation as the endogenous variable (D4DLNP) and variations in the price gap (D4LNPG), changes in the output gap (D4LNOPG), changes in the variations of the Euro-Dollar exchange rate (D4DLNEURO), changes in oil price inflation (D4DLNOIL) and dummies (DUM) as exogenous variables to take account for shocks.

ESTIMATIONS

The results of the estimation are shown in detail in Tab. 4.1, while Fig. 4.7 contains the graphical presentation of the estimated equation. The model fits actual inflation pretty well. It should be noted in this context that the estimation equation explains changes in the inflation, whereas the graph shows the estimated and actual inflation.

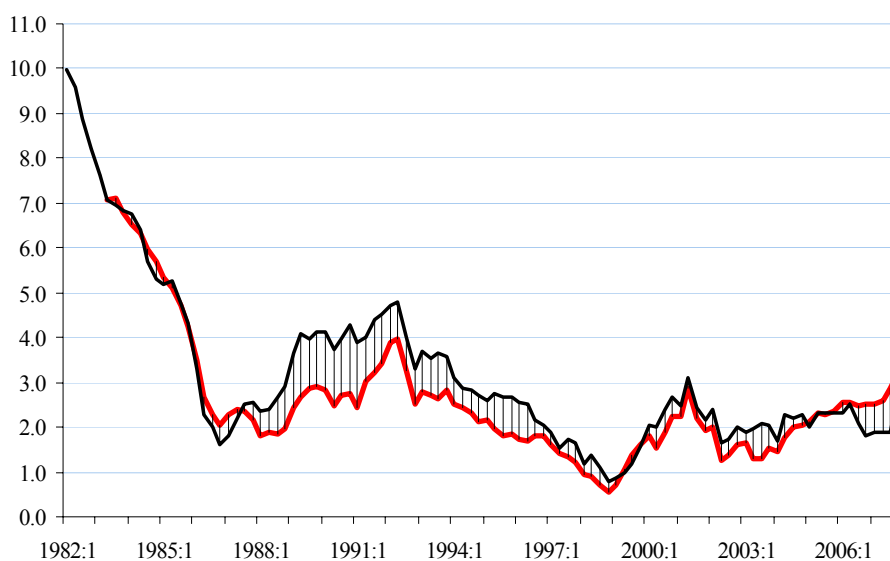
Tab. 4.1: Estimating Changes in the Inflation Rate in the Euro Area

Dependent Variable: D4DLNP

Sample (adjusted): 1982Q1 2007Q4

Included observations: 104 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.00082	0.000372	-2.20760	0.0297
DUM80 ₁₈₇₄	-0.00197	0.000594	-3.31924	0.0013
DUM0 ₁₂	0.007471	0.002375	3.145915	0.0022
DUM0 ₁₃	-0.00527	0.002292	-2.2991	0.0237
DUM0 ₂₂	-0.01097	0.002289	-4.79155	0.0000
D4DLNOIL	0.007423	0.001156	6.422524	0.0000
D4DLNEURO(-1)	-0.01882	0.003923	-4.79759	0.0000
D4DLNAU4(-4)	0.189218	0.093394	2.026022	0.0456
D4DPLM3(-4)	0.208735	0.059006	3.537531	0.0006
D4DLNP(-1)	0.125041	0.071899	1.739126	0.0853
R-squared	0.634091	Mean dep. var		-0.000700
Adj. R-squared	0.599057	S.D. dep. var		0.003527
S.E. of regr.	0.002233	Akaike info crit.		-9.279289
Sum squ. resid	0.000469	Schwarz criterion		-9.025020
Log likelihood	492.5230	F-statistic		18.09935
Durb.-Wats. stat	1.786551	Prob(F-statistic)		0.000000

Fig. 4.7. – Actual inflation (black line) and estimated inflation (red line) in the euro area in percent for the period 1982-Q1 to 2007-Q4

Estimation based on equation in table 6; quarters on the x-axis, Inflation rate in % on the y-axis.

An even more stable linkage between the price gap and inflation can be shown when the price gap is calculated on the basis of “trend

money” (M3T). As noted earlier, the concept of trend money tries to strip off any “noise” from the actual stock of money.³⁵ The results of the estimating changes in inflation by using the price gap on the basis of Trend M3 are shown in Tab. 4.2.

Tab. 4.2. – Estimating changes in the inflation rate in the euro area using trend money

Dependent Variable: D4DLNP

Sample (adjusted): 1982Q1 2007Q4

Included observations: 104 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.001245	0.000429	-2.904593	0.0046
DUM80 ₁₈₇₄	-0.00221	0.000557	-3.973146	0.0001
DUM0 ₁₂	0.007208	0.002358	3.056946	0.0029
DUM0 ₁₃	-0.00609	0.002265	-2.689391	0.0085
DUM0 ₂₂	-0.00997	0.002279	-4.376741	0.0000
D4DLNOIL	0.007013	0.001135	6.176281	0.0000
D4DLNEURO(-1)	-0.01632	0.003857	-4.231458	0.0001
D4DLNAU4(-4)	0.223085	0.093100	2.396187	0.0185
D4DPLM3T(-4)	0.297678	0.074439	3.998963	0.0001
R-squared	0.633063	Mean dependent var		-0.000700
Adj. R-squared	0.602163	S.D. dependent var		0.003527
S.E. of regress.	0.002225	Akaike info criterion		-9.295715
Sum squ. resid	0.000470	Schwarz criterion		-9.066873
Log likelihood	492.3772	F-statistic		20.48749
Durb.-Wat. stat	1.740059	Prob(F-statistic)		0.000000

The price gap on the basis of Trend M3 has a significant and rather high impact on inflation. It is more important for changes in inflation than the output gap. The relevance of M3T for inflation can be highlighted further by a simple regression, where inflation is the endogenous variable and the growth rate of Trend M3 and “time” are exogenous variables (Tab. 4.3 and Fig. 4.8).

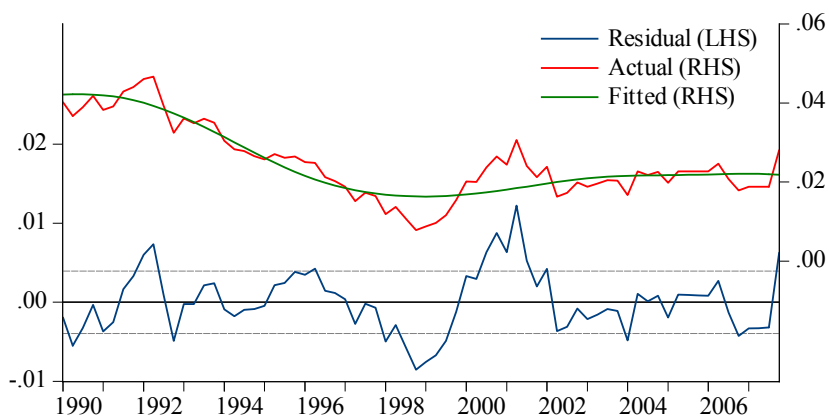
³⁵ We calculated trend money by using the Hodrick-Prescott Filter (HP Filter). Technically speaking, the HP filter is a two-sided linear filter that computes the smoothed series by minimizing the variance. For quarterly data value for the smoothing parameter λ should be 1.600 (the larger the λ the smoother the trend).

Tab. 4.3. – Estimating yearly changes (on quarterly basis) in inflation in the euro area using trend money growth

Dependent Variable: D4LNP
Sample: 1990Q1 2007Q4
Included observations: 72

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D4LNM3T(-6)	0.4196	0.032968	12.71371	0.0000
TIME	-0.000	2.28E-05	-10.41268	0.0000
C	0.014893	0.002977	5.002105	0.0000
R-squared	0.8243	Mean dependent var		0.024810
Adj. R-squared	0.8193	S.D. dependent var		0.009315
S.E. of regres.	0.0039	Akaike info criterion		-8.18454
Sum squ. resid	0.0011	Schwarz criterion		-8.08968
Log likelihood	297.64	F-statistic		161.9591
Durb.-Wat. stat	0.6217	Prob(F-statistic)		0.000000

Fig. 4.8. – Actual inflation (red line) and estimated inflation (green line) in the euro area in percent for the period 1990-Q1 to 2007-Q4



The estimation in Tab. 4.3 emphasizes that trend money growth has a strong influence on variations of inflation: 82 % of the variations of inflation can be explained by trend money growth (together with a trend figure), while “Time” accounts for the falling trend of the income velocity of money.

The sample 1990-Q1 2007-Q4 was chosen because of a structural break at the beginning of the 1990s: The regression coefficient of trend M3 declined from 2.0 to 0.42. This finding could suggest that (trend) money growth has started to increasingly affect asset prices.

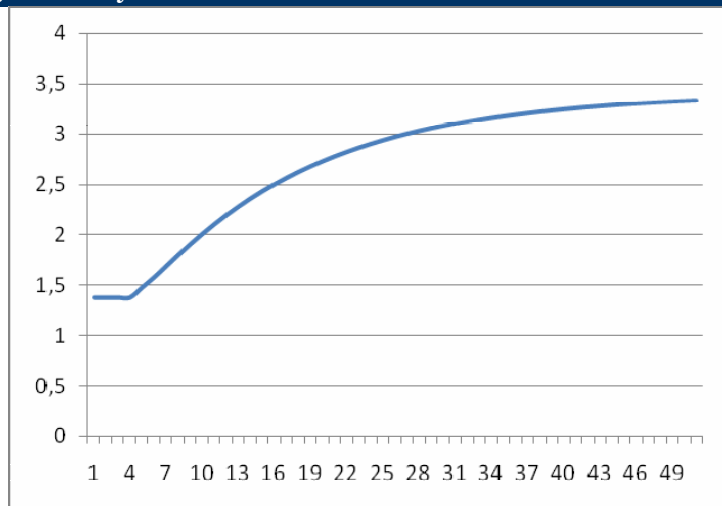
Fig. 4.8 shows the relation between inflation, Trend M3 and the time trend. The underlying trend of actual CPI inflation can be very well described by trend M3 growth (with a time lag of six quarters). This also emphasizes a rather simple message: **Money matters for inflation.**

SIMULATIONS

To what extent do changes in money growth and output affect inflation? These questions can be answered by running simulations that are based on the estimation results as shown in Tab. 4.1.

Fig. 4.9 shows the effect a permanent increase in M3 growth by 2 percentage points has on inflation assuming that all other independent variables remain constant. It translates into a 2 percentage point increase in inflation. 75 % of the adjustment occurs after a little more than four years, while 50% of the adjustment process occurs after 2 years. These results support the theory of the monetarist school (Fisher equation and Friedman's Quantity Theory of Money) and have remained closely aligned with the results which we presented in the ECB Observer Report No. 2.

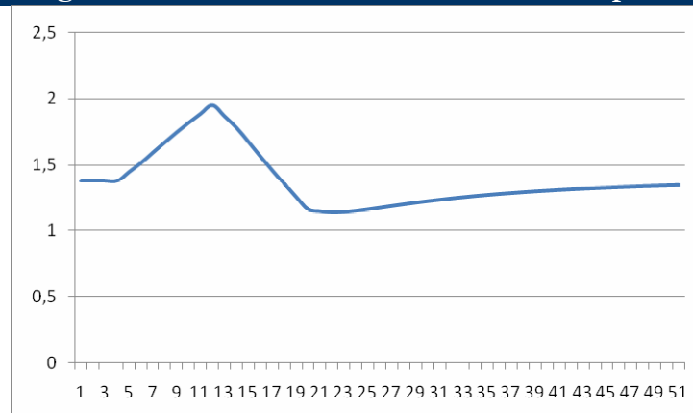
Fig. 4.9. – Simulation of an extension of the M3-growth by 2 % on the inflation rate in the euro area



Simulation based on estimation in table 2; quarters on the x-axis, inflation rate in % on the y-axis.

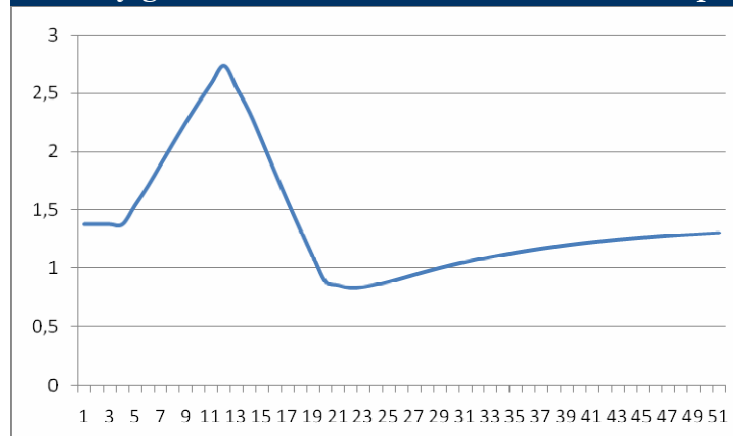
In order to outline the effect output variations exert on inflation, we run a simulation assuming that GDP growth exceeds the GDP potential growth rate for two years and then falls back to the long-term growth rate. Fig. 4.10 depicts the result. As can be seen, variations in the output gap of $\pm 2\%$ cause changes in inflation within a range of $\pm 0.5\%$.

Fig. 4.10. – Simulating the influence of GDP growth variations on inflation in Europe



Simulation based on estimation in table 2; quarters on the x-axis, inflation rate in % on the y-axis. First two years 2 % above long-term growth, second two years 2 % less than long-term growth.

Fig. 4.11. – Simulating the influence of GDP and money growth variations on inflation in Europe



Simulation based on estimation in table 2; quarters on the x-axis, inflation rate in % on the y-axis. first two years 2 % above long-term growth (of GDP and money, respectively), second two years 2 % less than long-term growth

It is interesting to note that this result (Fig. 4.10) will only occur if there is *no monetary alimentation*. If we assume, however, that money growth rises in line with GDP growth, the range of inflation variations will become much more pronounced, i.e. in the range of more than plus/minus 1% (Fig. 4.11). This leads us to the conclusion that output gaps will cause drastic variations in inflation only when monetary policy supports changes in the output gap via increasing the price gap.

INFLATION FORECAST

The forecast model for euro area inflation rests on the variables as shown in Tab. 4.4. Given these assumptions, **we expect annual inflation in the euro area to average 3.1% in 2008, to be followed by 2.7% in 2009.** These forecasts are a notch above competing forecasts (Tab. 4.5), presumably in great part due to our incorporating of money in the forecasting model.

Tab. 4.4. – Forecast assumptions

	GDP growth (% y/y)	GDP trend growth (% y/y)	M3 growth (% y/y)	M3 trend growth (% y/y)	Oil price (US\$ per bl.)	EURO- USD	ECB refi rate (%)
2008 Q1	2.0	2.0	10.0	7.5	75	1.5	4.0
2008 Q2	2.0	2.0	8.0	7.5	75	1.5	4.0
2008 Q3	2.0	2.0	7.0	7.5	75	1.5	4.0
2008 Q4	2.0	2.0	7.0	7.5	75	1.5	4.0

As from 2008 Q4: constant.

Tab. 4.5. – Market inflation forecasts (%)

	2008 Q1	2008 Q2	2008 Q3	2008 Q4	2008 (average)	2009 (average)
ECB- Observer	3.0	3.2	3.1	2.9	3.1	2.7
ECB ¹⁾	2.5	1.8
SPF ²⁾	2.1	2.0
CE ³⁾	2.0	-
OECD	2.5	2.0

1) ECB inflation projections (mid-points) Dec. 2007. – 2) Forecasts of the Survey of Professional Forecasters Oct. 2007. – 3) Forecasts of Consensus Economics.
Source: ECB.

Finally, it should be noted that if money growth does not slow down from current levels, the risk is clearly for even higher inflation in the euro area in the years to come. All the more so as, on the one hand, a number of *cost push factors* (in particular wages and commodity prices) would allow excess money translating into higher prices. On the other hand, there is a clear risk that inflation expectations start drifting higher – as result of actual inflation having moved above 2% with the central bank refraining from raising interest rates.



APPENDIX

A.1. – ECB's assessment according to Monthly Bulletin editorial

Date	Actual inflation	Inflation projections	Output growth	M3 ³⁾ and	Credit expansion	Final assessment	ECB rate ²⁾
December 2000	"... slightly below 2.5% in 2000."	2.3% in 2001 1.9% in 2002	"... the short-term outlook points to some moderation in growth ..." However, the underlying dynamism of growth continues to prevail."	5.5%	"... a continued high rate of growth in credit to the private sector ..."	"... the Governing Council judges the risks to price stability in the medium term under both pillars of the strategy still to be on the upside."	4.75%
June 2001	"... inflation remains above 2.0% in 2001 ..." "In 2002, inflation is likely to fall back below 2% ..."	2.5% in 2001 1.8% in 2002	Real GDP growth in the euro area in 2001 is expected to come down from the high level reached in 2000 to levels more in line with trend potential growth ..."	4.6% "... the indications from the first pillar are consistent with price stability over the medium term."	"... the annual rate of growth of credit to the private sector has continued to moderate over recent months ..."	"There is a need to remain vigilant as regards developments affecting the balance of risks to price stability."	4.50%
December 2001	"... annual inflation rates have remained above 2% during most of 2002 ..."	1.8% in 2003 1.6% in 2004	"It is expected, therefore, that economic growth will remain subdued in the coming months."	7.1% "There is ample liquidity in the euro area." "... it is unlikely at this juncture that this will translate into inflationary pressures."	"The recent moderation of the growth in loans to the private sector (...) supports this assessment."	"... the reduction in the key ECB interest rates on 5 December 2002 was guided by the assessment that prospects have strengthened for inflation to fall below 2% in the course of 2003."	3.25%
June 2002	"... inflation fell from 2.4% in April to 2.0% in May 2002. However, this decline is mainly due to a base effect ..."	2.3% in 2002 1.9% in 2003	"Overall, they suggest that real GDP growth in the euro area should again be in line with potential growth later this year."	7.4% "M3 growth still partly reflects the portfolio shifts to M3 ..."	"... annual growth rates of loans to the private sector have stabilised over recent months."	"To avoid inflationary pressure, (...) high wage increases must not spread across sectors and countries in the euro area."	3.25%
December 2002	"2002 inflation has been rather persistent despite the economic slowdown."	1.8% in 2003 1.6% in 2004	"The most likely scenario is that economic growth will gradually recover in the course of 2003 towards rates more in line with potential."	7.1% "There is ample liquidity in the euro area. However, particularly in the light of sluggish economic growth, it is unlikely at this juncture that this will translate into inflationary pressures."	"The recent moderation of the growth in loans to the private sector (...) supports this assessment."	"The key ECB interest rates have now reached a very low level by historical standards. The Governing Council will continue to monitor closely all factors that may affect the prospects for inflation in the euro area."	2.75%
June 2003	1.9% in May, "annual inflation rates are expected to hover broadly around this level for the remainder of 2003 and to fall significantly in 2004."	2.0% in 2003 1.3% in 2004	"... the latest data releases on real GDP growth have confirmed that economic activity in the euro area remained subdued ..."	8.7% "... growth in the broad monetary aggregate M3 remained strong. Consequently, the euro area economy has continued to accumulate liquidity significantly above the amount needed to sustain non-inflationary growth."	"... loans to the private sector increased at a much more moderate pace than M3."	"... the economic analysis indicates that inflation rates should decline to below 2% over the medium term (...). The monetary analysis indicates that the strong expansion of M3 should not, for the time being, adversely affect this outlook."	2.0%

Source: European Central Bank, Monthly Bulletins. – 1) Mid points. – 2) Numbers refer to the average growth rate of the last three months. – 3) Up to 21 June 2000, rate of the fixed rate tender; from 28 June 2000, rate of the variable rate tender at minimum bid rate.

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A.1. – ECB's assessment according to Monthly Bulletin editorial (cont'd)

Date	Actual inflation	Inflation projections	Output growth	M3 ¹⁾ and	Credit expansion	Final assessment	Rate ²⁾
December 2003	2.2% in November, "... inflation rates are likely to fluctuate around 2% over the coming months, a gradual and limited decline in inflation should take place later on."	1.8% in 2004 1.6% in 2005	"... euro area economic growth is likely to gradually recover over the next quarters, leading to a broader and stronger upswing in the course of next year and the year after."	7.5% "... should high excess liquidity continue to prevail once there is a significant strengthening of economic activity, it could lead to inflationary pressures in the medium term."	"The low level of interest rates has also supported the growth of credit demand."	"... the economic analysis indicates that the main scenario for price developments (...) continues to be in line with the definition of price stability. This picture is confirmed by cross-checking with the monetary analysis."	2.0%
June 2004	2.5% in May; "... these factors (...) should bring annual rates of consumer price inflation back to below 2% in 2005." "... there has been an increase in measures of long-term inflation expectations (...). ... the recent upward trend calls for particular vigilance."	2.1% in 2004 1.7% in 2005	"... the recovery in euro area economic growth is expected to continue over the coming quarters, leading to a broader and stronger upswing in the course of next year."	5.2% "... the low level of interest rates continues to fuel monetary growth and the amount of excess liquidity remains high in the euro area."	<i>No mentioning</i>	"... the economic analysis indicates that the main scenario for the outlook for price developments (...) remains in line with price stability. Cross-checking with the monetary analysis also supports the case for vigilance with regard to the materialisation of risks to price stability."	2.0%
September 2004	Looking ahead, however, there are no indications at present of stronger underlying inflationary pressures building up domestically."	2.2% in 2004 1.8% in 2005	"Looking ahead, the conditions for a continuation of the recovery remain in place."	5.7% "M3 growth remains resilient." "There remains substantially more liquidity in the euro area than is needed to finance non-inflationary growth."	"The low level of interest rates also seems to be fueling the growth of loans to the private sector ..."	"... while the economic analysis indicates that prospects are consistent with price stability (...), a number of upside risks need to be carefully monitored. Cross-checking with the monetary analysis also supports the case for strong vigilance with regard to the materialisation of risks to price stability."	2.0%
December 2004	"The short-term outlook for inflation remains worrisome."	2.2% in 2004 2.0% in 2005 1.6% in 2005	"The available survey information for October and November points to ongoing growth in the fourth quarter, albeit at a more moderate pace than in the first half of this year."	6.1% "As a result of the persistently high growth in M3 over the past few years, there remains substantially more liquidity in the euro area than is needed to finance non-inflationary economic growth. This could pose risks to price stability over the medium term."	"Growth in loans to nonfinancial corporations has picked up further in recent months."	"... the economic analysis suggests that underlying domestic inflationary pressures are contained, but a number of medium-term upside risks to price stability need to be monitored closely. Cross-checking with the monetary analysis supports the case for continued vigilance with regard to the materialisation of risks to price stability (...)."	2.0%

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A.1. – ECB's assessment according to Monthly Bulletin editorial (cont'd)

Date	Actual inflation	Inflation projections ¹⁾	Output growth	M3 ²⁾	Credit expansion	Final assessment	Rate ³⁾
March 2005	"In the coming months, annual inflation rates are likely to fluctuate around 2%."	1.9% in 2005 1.6% in 2006	"There are a number of reasons why the weaker real GDP growth in the second half of 2004 could be a transitory phenomenon."	6.6% "The latest monetary data confirm the strengthening of M3 growth observed since mid-2004." There is "substantially more liquidity in the euro area exists than is needed to finance non-inflationary economic growth."	"The exceptionally low level of real interest rates is also further stimulating private sector demand for credit."	"... the economic analysis confirms that underlying domestic inflationary pressures remain contained, while medium-term upside risks to price stability exist and will be monitored closely. Cross-checking with the monetary analysis supports the case for continued vigilance with regard to the materialisation of risks to price stability ..."	2.0%
June 2005	"Over the coming months, annual HICP inflation rates are expected to remain broadly around current levels."	2.0% for 2005, 1.5% for 2006	"Most recent indicators for economic activity remain, on balance, on the downside."	7.2% "... the increasingly liquid nature of monetary expansion, the accumulated stock of the broad monetary aggregate M3 may entail upside risks to price stability over the medium to longer term."	"... the euro area private sector's demand for MFI loans, in particular for house purchase, has remained strong."	"... the economic analysis suggests that underlying domestic inflationary pressures remain contained in the medium term. At the same time, it is necessary to underline the conditionality of this assessment and the related upside risks to price stability. Cross-checking with the monetary analysis supports the case for ongoing vigilance."	2.0%
September 2005	"Over the next few months, annual HICP inflation rates are expected to fluctuate around current levels, mainly due to recent developments in oil prices."	2.2% for 2005 1.9% for 2006	"The most recent survey indicators have, on balance, been supportive to the view that economic growth could improve in the second half of 2005, while higher oil prices continue to weigh on demand and confidence."	n/a "The liquidity situation in the euro area remains ample by all plausible measures, indicating risks to price stability over medium to longer horizons."	"Low interest rates are also fueling credit expansion, with the strengthening of the demand for loans broadly based across the private sector. The growth of mortgage borrowing remains very strong. In this context, price dynamics in the housing markets need to be monitored closely."	"... the balance of risks to the baseline inflation scenario is tilted to the upside. Cross-checking the economic analysis with the monetary analysis confirms the need for particular vigilance in order to keep medium-term inflation expectations firmly anchored at levels consistent with price stability."	2.0%
December 2005	"It is likely that annual HICP inflation rates will remain elevated in the short term."	2.2% for 2005 2.1% for 2006 2.0% for 2007	"... the outlook for economic activity remains subject to downward risks, relating mainly to higher than expected oil prices, concerns about global imbalances and weak consumer confidence."	7.3% "Liquidity in the euro area is ample by all plausible measures. The strengthening of monetary growth observed since mid-2004 has gained further momentum over the past months."	"Furthermore, the growth of borrowing – especially mortgage loans – remains very robust. In this context, price dynamics in a number of housing markets need to be monitored closely."	"... increased risks to price stability identified by the economic analysis have been confirmed by cross-checking with the monetary analysis. An adjustment of the ECB's monetary policy stance was therefore warranted."	2.25%

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A.1. – ECB's assessment according to Monthly Bulletin editorial (cont'd)

Date	Actual inflation	Inflation projections ¹⁾	Output growth	M3 ²⁾	Credit expansion	Final assessment	Rate ³⁾
March 2006	"In the short run, inflation rates are likely to remain at above 2%, with the precise levels depending strongly on future energy price developments,	2.2% for 2006 2.2% for 2007	"...the conditions remain in place for ongoing economic expansion	8.5% "Looking through the short-term effects generated by such portfolio behaviour, the trend rate of monetary expansion remains strong, reflecting the stimulative impact of the low level of interest rates."	"... growth rate of credit to the private sector has strengthened further over recent months, with borrowing by households – especially loans for house purchase – and non-financial corporations rising at a marked pace."	"... inflation rates are projected to remain elevated in 2006 and 2007, and the economic analysis indicates that risks to price stability over the medium term remain on the upside."	2.50%
June 2006	"... In the months to come and in 2007, inflation rates are likely to remain above 2%, the precise levels depending on future energy price developments."	2.3% for 2006 2.2% for 2007	"... the conditions remain in place for the euro area economy to continue growing at around the potential rate."	8.5% "... the latest developments confirm that the stimulative impact of the low level of interest rates remains the dominant factor behind the current high trend rate of monetary expansion."	"... The further acceleration of monetary and credit growth in this environment of already ample liquidity points to increased upside risks to price stability at longer horizons."	"... inflation rates are projected to remain elevated in 2006 and 2007, with risks to this outlook on the upside. Given the strength of monetary and credit growth and the ample liquidity situation, a cross-check of the outcome of the economic analysis with that of the monetary analysis confirms that upside risks to price stability over the medium term prevail."	2.75%
September 2006	"... inflation rates are likely to remain above 2%, the precise levels depending on future energy price developments. "	2.4% for 2006 2.4% for 2007	"... the conditions remain in place for the euro area economy to continue growing at around the potential rate."	8.5% "... liquidity in the euro area remains ample by all reasonable measures."	"Continued strong monetary and credit growth in the context of already ample liquidity points to upside risks to price stability over the medium to longer term."	"... inflation rates are projected to remain elevated in 2006 and 2007, with risks to this outlook continuing to be clearly on the upside. Given the ongoing dynamism of monetary and credit growth in an environment of already ample liquidity, ... upside risks to price stability prevail over the medium term."	3.0%
December 2006	"(...)overall inflation rates are likely to increase again in early 2007 and then hover around 2% in the course of that year (...)"	2.2% for 2006 2.0% in 2007	"Looking ahead, the conditions remain in place for the euro area economy to grow at solid rates around potential."	"(...) the rate of monetary and credit expansion remains rapid (...)"		"(...)a cross-check of the outcome of the economic analysis with that of the monetary analysis supports the assessment that upside risks to price stability prevail over the medium to long term."	3.50%

A.1. – ECB's assessment according to Monthly Bulletin editorial (cont'd)

Date	Actual inflation	Inflation projections ¹⁾	Output growth	M3 ²⁾	Credit expansion	Final assessment	Rate ³⁾
March 2007	"...annual inflation rates are likely to fall during the spring and summer before rising again towards the end of the year and then most likely hovering again at around 2%"	2.5% for 2007 2.4% for 2008	"Looking ahead, the medium-term outlook for economic activity remains favourable. The conditions are in place for the euro area economy to grow solidly."	"The monetary analysis confirms the prevailing upside risks to price stability at medium to longer horizons."	"At 10.6%, the annual growth rate of loans to the private sector also remained strong"	"Risks to the medium-term outlook for price stability remain on the upside, relating in particular to stronger than currently expected wage developments in a context of robust ongoing growth in employment and economic activity."	3.75%
June 2007	"At the policy-relevant medium-term horizon, risks to the outlook for price stability remain on the upside ..."	2.0% for 2007 2.0% for 2008	"... the risks surrounding this favourable outlook for economic growth are broadly balanced over the shorter term. At medium to longer horizons, the balance of risks remains on the downside, owing mainly to external factors."	"The monetary analysis confirms the prevailing upside risks to price stability at medium to longer horizons."	"The ongoing strength of monetary expansion is reflected as well [in] the still high level of credit growth."	"Risks to the medium-term outlook for price stability remain on the upside, relating in particular to the domestic side."	4.0%
September 2007	"...risks to this outlook [the ECB staff inflation projections] for price developments lie on the upside."	2.0% for 2007 2.0% for 2008	"Data on activity in the third quarter – from various confidence surveys and indicator-based estimates – remain favourable overall and support the assessment that real GDP is growing at sustained rates."	11.7% "The monetary analysis confirms the prevailing upside risks to price stability at medium to longer-term horizons."	"...higher short-term rates have led to some stabilisation in the growth of MFI credit to the private sector, albeit at double-digit annual rates ..."	"a cross-check of the information identified under the economic analysis with the outcome of the monetary analysis has confirmed the existence of upside risks to price stability over the medium term ..."	4.0%
December 2007	"...the HICP inflation rate is expected to remain significantly above 2% in the coming months, ..."	2.1% for 2007 2.5% for 2008 1.8% for 2009	"...the risks surrounding this outlook for economic growth lie on the downside."	12.3% "The monetary analysis confirms the prevailing upside risks to price stability at medium to longer-term horizons."	"... the sustained expansion of loans to the domestic private sector, which grew at an annual rate of 11.2% in October, points to the continued vigour of underlying monetary dynamics."	"...a cross-check of the outcome of the economic analysis with that of the monetary analysis fully confirms the assessment that there are upside risks to price stability over the medium term, ..."	4.0%

APPENDIX

A2. Schedules for the meetings of the ECB Governing Council and press conferences in 2008/2009

Governing Council meetings in 2008	Press conferences in 2008
10 January 2008	10 January 2008
7 February 2008	7 February 2008
21 February 2008	
6 March 2008	6 March 2008
27 March 2008	
10 April 2008	10 April 2008
24 April 2008	
8 May 2008 (Athens)	8 May 2008 (Athens)
21 May 2008	
5 June 2008	5 June 2008
19 June 2008	
3 July 2008	3 July 2008
17 July 2008	
7 August 2008	
4 September 2008	4 September 2008
18 September 2008	
2 October 2008	2 October 2008
23 October 2008	
6 November 2008 (Brussels)	6 November 2008 (Brussels)
20 November 2008	
4 December 2008	4 December 2008
18 December 2008	

Source: ECB.

Governing Council meetings in 2009	Press conferences in 2009
15 January 2009	15 January 2009
5 February 2009	5 February 2009
19 February 2009	
5 March 2009	5 March 2009
19 March 2009	
2 April 2009 (Rome)	2 April 2009 (Rome)
23 April 2009	
7 May 2009	7 May 2009
20 May 2009	
4 June 2009	4 June 2009
18 June 2009	
2 July 2009 (Luxembourg)	2 July 2009 (Luxembourg)
16 July 2009	
6 August 2009	
3 September 2009	3 September 2009
17 September 2009	
8 October 2009	8 October 2009
22 October 2009	
5 November 2009	5 November 2009
19 November 2009	
3 December 2009	3 December 2009
17 December 2009	

Source: ECB.

APPENDIX

A.3 – ECB Observer – recent publications

Number	Title and content	Date of publication
No. 10	Credit crisis – causes and solutions Content: 1. <i>Credit crisis – symptoms, causes and solutions.</i> – 2. <i>Euro money market: fuelling excessive money growth.</i> – 3. <i>Global liquidity drives (asset price) inflation.</i> – 4. <i>Rising inflation in the euro area.</i>	14 February 2008
No. 9	Money matters for inflation in the euro area Content: 1. <i>Challenges to ECB independence.</i> – 2. <i>A critical review of the “neutral interest rate” concept.</i> – 3. <i>Monetary policy and its impact on structural economic developments.</i> – 4. <i>ECB policy – review and outlook.</i>	29 November 2006
No. 8	Back to the rules Content: 1. <i>Rules for sound money.</i> – 2. <i>How the ECB and the US Fed set interest rates.</i> – 3. <i>A call for ECB Governing Council minutes.</i> – 4. <i>Euro area monetary policy and inflation outlook.</i>	27 September 2005
No. 7	Towards a “more neutral” monetary policy Content: 1. <i>A critical look at ECB staff inflation projections.</i> – 2. <i>Asset price inflation – a cause of concern for monetary policy.</i> – 3. <i>Impact of short-term rates on stock market returns.</i> – 4. <i>ECB rate and euro inflation outlook.</i>	16 September 2004
No. 6	Liquidity on the rise Content: 1. <i>A case against ECB FX market interventions.</i> – 2. <i>“Price gaps” and US inflation.</i> – 3. <i>“Price gaps” and euro area inflation.</i> – 4. <i>ECB rate and euro inflation outlook.</i>	2 February 2004
No. 5	Challenges to ECB credibility Content: 1. <i>Fundamentals of ECB credibility.</i> – 2. <i>ECB strategy review – increasing the bank’s open flank.</i> – 3. <i>Uncertainty – pressure for easier monetary policy.</i> – 4. <i>ECB policy review and outlook.</i>	8 July 2003
No. 4	International coordination of monetary policies – challenges, concepts and consequences Content: 1. <i>International coordination of monetary policies.</i> – 2. <i>Does the ECB follow the Fed?</i> – 3. <i>Stock prices – a special challenge for monetary policy.</i> – 4. <i>ECB monetary policy review and outlook.</i>	19 December 2002
No. 3	The Fed and the ECB – why and how policies differ Content: 1. <i>The US Federal Reserve System and the European System of Central Banks – selected issues under review.</i> – 2. <i>The reaction functions of the US Fed and ECB.</i> – 3. <i>The influence of monetary policy on consumer prices.</i> – 4. <i>ECB rate policy and euro area inflation perspectives.</i>	24 June 2002
No. 2	Can the ECB do more for growth? Content: 1. <i>Should the ECB assign a greater role to growth?</i> – 2. <i>Government finances and ECB policy – a discussion of the European Stability and Growth Pact.</i> – 3. <i>“Price gap” versus reference value concept.</i> – 4. <i>Assessment of current ECB policy and outlook.</i>	19 November 2001
No. 1	Inflationsperspektiven im Euro-Raum Content: 1. <i>Warum die EZB-Geldpolitik glaubwürdig ist.</i> – 2. <i>EZB-Strategie – Stabilitätsgarant oder überkommenes Regelwerk?</i> – 3. <i>Stabilitätsrisiken der Osterweiterung.</i> – 4. <i>Zinspolitik der EZB in 2001 und 2002.</i>	17 April 2001

APPENDIX

A.4. – 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.

APPENDIX

A.5. – ECB Observer team members



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 at the University of Essen, 2000-2001: Full Professor of Economics, University of Vienna (C4); 2001-2007: Full Professor of Economics, University of Stuttgart-Hohenheim; since 2004: Research Fellow at the Institute for the Study of Labour (IZA), Bonn. 2005: Research Professor at the Oesterreichische Nationalbank (OeNB), Vienna. Since 2007: Full Professor of Macroeconomics at the University of Duisburg-Essen. Fields of interest: International Macroeconomics, Monetary Economics, European Integration, Time Series Analysis. 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 'American Economic Association Annual Meeting', 'Annual Econometric Society European Meeting', 'European Economic Association Congress', 'International Seminar on Macroeconomics (EEA and NBER)'. E-mail: ansgar.belke@uni-due.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. Thorsten is active in the fields of financial market and monetary policy theory research. In March 2003, he was appointed Honorary Professor at the HfB – Business School for Finance and Management, Frankfurt, lecturing Monetary and Financial Market Economics. Research focus: monetary theory and policy, and capital market theory. E-mail: thorsten.polleit@barcap.com.