

## **Benoît Cœuré: The monetary policy of the European Central Bank**

Speech by Mr Benoît Cœuré, Member of the Executive Board of the European Central Bank, at Barclays' European Conference, Tokyo, 26 March 2012.

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### **Introduction**

It is my pleasure to be here at Barclays' European Conference in Tokyo.

Today I would like to provide a simple yet comprehensive description of the ECB's actions during the crisis. Faced with severe turbulence, all central banks had to take measures in real time and switch from central banking in "standard operating mode" to "risk control and crisis management" mode. We did so by keeping an eye fixed on our objective. This helped us to stay on course and provided continuity.

I will start by presenting a simplistic model of monetary policy transmission. This is the sequence of events through which central banks' decisions transmit to economic magnitudes which have an impact on people's welfare. I will then review the effectiveness of ECB's monetary policy prior to the financial crisis, when the transmission mechanism was functioning according to the textbook definitions. This period was tranquil, economically speaking, although macroeconomic imbalances were quietly building up beneath the surface.

I will then portray the crisis as a creating a break in the transmission mechanism. The crisis however was more than that: at some point we all feared that the whole financial system would stop functioning. But I will analyse it from the perspective of its implications for the chain of events on which monetary policy action depends. Here, I will argue that the *standard* tool of central banks – changes to the short-term interest rate – can lose some of its potency if the sudden unravelling of imbalances threatens financial stability and impairs the transmission mechanism. But I will also claim that new untested instruments were deployed which largely replaced standard monetary policy interventions. This is perhaps the most relevant lesson we can draw from the crisis.

### **Monetary policy transmission**

Let me briefly elaborate on the transmission mechanism of monetary policy. You can see here on slide 2 why the monetary transmission mechanism is so important for central banks. The ECB has a statutory objective of price stability, which has been defined as a year-on-year positive inflation rate below 2%. Within that range, the Governing Council aims at an inflation rate not too far from 2%. We say: "an inflation rate below, but close to, 2%". However, in order to exert an influence on agents' decisions which affect prices and inflation, the ECB has to start from the top of this chart and try to reach out to the bottom. The path that connects the two extremes – starting from the policy interest rate that the ECB controls through its monetary policy operations – is long and convoluted. This is the transmission mechanism: a long and uncertain chain of events during which various asset prices react to actions taken by the ECB – on the top layer of decisions in this chart – to change the overnight rate at which banks lend to each other in the money market.

Long-term interest rates form important links in this chain. Aggregate demand is a function of credit market conditions, and credit market conditions are a function of medium to long-term interest rates: interest rates on mortgages, on non-financial corporations' loans funding long-term investment projects, and so on. The interest rate channel of monetary policy is the specific transmission path – marked in orange – that starts from the overnight rate that the ECB can manipulate by its policy operations; it works by way of long-term rates.

The first equation on my next slide [3] describes how long-term interest rates and the overnight rate are connected. Long-term rates ( $\hat{r}_t$ ) reflect the average expected overnight rate set by monetary policy (which is indicated by  $\hat{r}_t^{MP}$ ) plus a premium to reward long-term investment and lenders' exposure to uncertainty ( $pr_t$ ).

To influence long-term interest rates the central bank has two levers. These levers correspond to the two terms on the right-hand side of equation (1). The first term in parentheses denotes the component of the long-term interest rates that is determined by the *expectations* of the policy rate. Basic arbitrage conditions ensure that the financial reward on a long-dated security today ( $\hat{r}_t$ ) is at least as large as the average of the financial return that investors can expect to reap by holding a short-dated security and rolling it over for as many periods as the maturity of the long-dated security.

The central bank can act on those expectations. It can do so by anchoring the current and future policy rate at levels that – if solidly incorporated in agents' expectations – can be conducive to price stability. This is the central bank's first lever on the transmission process. The way the central bank can influence expectations of its policy behaviour in the face of macroeconomic shocks is critical here. It works through the credibility of the central bank's governance and through the way in which the central bank is seen – month after month – reacting systematically to the changing economy. In this way, agents start internalising this systematic behaviour in their expectations. But this process – easy as it sounds – is in fact very complex and reversible.

No policy rule or macro-model can do justice to the complexity of these interactions. So, it is only for the sake of clarity that I am using the stylised policy rule stated in equation number two on my slide. According to this simplistic representation, the central bank changes the overnight policy interest rate by considering two conditions. First, it considers whether inflation is expected to be in line with levels consistent with its quantitative definition of price stability. Here the term ( $E_t \pi_{t+1} - \pi^*$ ) denotes the difference between expected inflation and its steady state value, in our case below but close to 2%: if inflation expectations exceed the objective, the central bank – all other things being equal – is likely to raise its policy rate. A second factor that influences the policy stance is monetary conditions. If the volume of money and credit that is created by financial intermediaries exceeds a trend that is consistent with price stability in the long run, the central bank is also expected to increase its policy rate, because excess money and credit creation can herald risks to price stability. In this simple policy rule, excess money and credit growth is denoted by  $m_t$ . The coefficients  $\alpha$  and  $\lambda$  capture the strength of the central bank's reaction. This is of course a simplified model and a full representation of the ECB decision-making should include a broad set of variables which are leading indicators of future inflation. If consistently followed through, a policy behaviour that – as in this rule – resists inflationary pressures and counters exuberance in the monetary sector can anchor expectations of inflation and, through that channel, of the future path of the policy rate. Ultimately, this anchoring contributes to low and steady long-term rates.

I mentioned the risk premium. The second lever that central banks can operate to try to influence the long-term rates is via the risk premium,  $pr_t$ . Now, the risk premium itself can be decomposed into three elements, as stated in the third equation on my slide. Two elements reflect macroeconomic uncertainty – as measured by the variance of inflation and the variance of real economic activity. If the variance of inflation and the variance of real growth are large, the quantum of macroeconomic uncertainty is high, and lenders will charge a higher premium on long-term finance as a remuneration for their risk.

The quantum of macroeconomic uncertainty that the premium compensates for can be influenced by the central bank. By avoiding erratic behaviour – again, by following a steady and predictable pattern of reaction to the evolving state of the economy – the central bank can push volatility out of the system and contribute to a lower premium.

But the premium includes a third element which is beyond the control of the central bank. I'm calling this component "d", because it is associated with credit default risk. But I'll leave the "d" factor aside for now and I will come back to it at the end.

## Measures of performance

How well has the ECB managed the transmission mechanism and the macroeconomy?

Since the inception of the single currency the ECB has fulfilled its price stability mandate. Taking the long-term average as a performance indicator, inflation rates in the euro area have been on average a few basis points above 2%. You can see their exact evolution over time on this slide [4]. The slight overshoot relative to our aim – close to, but below, 2% – is due to the recent renewed pressures on volatile components of the price basket. It certainly remains within the strictest tolerance bands.

Simultaneously, the ECB has managed to compress the *volatility* of inflation in the euro area. Slide 5 shows a breakdown of the volatility of headline inflation into the volatility of core inflation which central banks can influence over the medium term – the solid yellow bars – and the volatility of food and energy prices – in blue and grey respectively. The left-hand chart indicates the results for the euro area. You see that since the launch of the euro, overall inflation volatility has decreased despite a substantial increase in energy and food price volatility. During the same period of time, inflation volatility in the US has actually increased, as the drop in core inflation volatility was not offset by the surge in the variance introduced by energy inflation.

Did systematic compression of inflation volatility come at the price of more erratic real activity? Let me move on to my next slide [6]. Here, each dot represents a major economy: it gives information on the standard deviation of inflation and the standard deviation of output growth which each economy has experienced since 1999. In this space, you want to be as close as possible to zero. Why? Because the lower-left part of the chart is populated by economies with low macroeconomic instability, i.e. low inflation volatility and low growth volatility. Indeed, you can see that the euro area has been closer to zero than any other economy except one, Switzerland – the dot to its left. The low variance of inflation rates in the euro area did not come at the expense of unsteady economic growth.

Low macroeconomic volatility has meant lower long-term interest rates and lower inflation compensation in financial contracts. My next slide [7] illustrates a standard technique to disentangle long-term euro area bond yields into premia remunerating investors for the risks they bear on long-dated securities.<sup>1</sup> Two facts are noteworthy. The first fact is a steep decline – since pre-monetary union times – in the nominal yield paid on average by euro area governments to borrow at a ten-year maturity. This is the blue line in the chart. The second fact is that such a steep fall in ten-year yields has resulted from the three components which determine nominal interest rates: the real rate, the inflation expectation – which compensates investors for the average expected inflation over the life of the security – and the inflation risk premium – which compensates investors for inflation volatility. The real rate is the red line, and the two risk premia are visible as wedges between the nominal and the real rate. Borrowing money in the euro area is cheaper today – in real and nominal terms – than it was a decade and a half ago, and the lower cost of borrowing is largely related to a less uncertain and a more predictable macroeconomy.

The euro area has been a stable economy, not a static one. My next slide [8] shows the real per capita income progression of the euro area and the US since 1999. Contrary to long-standing beliefs, the euro area's dynamism has not lagged that of the US.

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<sup>1</sup> See García, J.A. and T. Werner (2010), "Inflation risks and inflation risk premia," ECB Working Paper No 1162.

I would conclude that the euro and its guardian, the ECB, have made a solid contribution to low and stable borrowing conditions, and – through that channel – to moderate fluctuations and economic prosperity. The data that I have shown you are in fact even more noteworthy, since they cover the long and difficult upheaval suffered by financial markets after the demise of Lehman Brothers in the fall of 2008.

I would now like to consider that particular period.

### **The first phase of the crisis**

The financial panic that followed Lehman's collapse undermined the ability of markets to price financial assets. The resulting turmoil disrupted the mechanism which, in normal times, central banks use to transmit policy signals to the broader economy. The interest rate channel ceased operating (see slide [9]). The impact of our policy rate on the interest paid on securities of different maturities via expectations control was weakened: this is visible in the left-hand chart on this slide [10]. The euro area money market froze – as shown by the surge of the cross-sectional standard deviation of overnight rates across Member States. (See the right-hand chart on slide 10). Banks located in different jurisdictions could no longer obtain liquidity on the unsecured money market at comparable costs. Likewise, parts of the euro area banking system had problems obtaining long-term funding on the financial markets. Slide 11 shows the results of the ECB's Bank Lending Survey for 2008. Throughout 2008, but increasingly as the year elapsed, banks reported difficulties accessing the wholesale market for virtually all maturities, with the very short-term money market being less affected.

To address downside risks to price stability, the ECB responded to the shock with a forceful application of its standard policy tool, as did many other central banks. We reduced policy rates to an all-time low of 1%. (See slide 12).

At the same time, the disappearance of market arbitrage was a challenge that interest rate action could not tackle in full. We therefore started acting as market makers and we played an intermediation role which the market was unwilling or unable to perform. We tried to get round the obstructions facing the standard transmission mechanism by following a new route, the liquidity channel. (See slide 13). It worked by being a confidence-boosting measure: enough central bank liquidity would be forthcoming in case market liquidity dried up.

Our system – centred on overnight and term credit to banks, rather than outright purchases of securities – was tailor-made to be used as an instrument to fend off a banking crisis. In the event, it was flexible enough to be activated, with only limited adjustments, in emergency conditions. We had to tackle the collapse of private arbitrage, which meant that the market could not distribute liquidity across institutions and over time. This was the rationale for two main features of our extraordinary credit support. The full, unlimited accommodation of banks' demands for central bank credit at our policy interest rate stepped into the breach when inter-bank lending collapsed. The extension of central bank credit provision to longer maturities, up to one year in June 2009, replaced market inter-temporal trading, which had largely disappeared. (See slide 14).

Important for the design was the structure of euro area, where small and medium-sized enterprises are particularly important for growth and job creation and banks provide most of the financing. The importance of banks in the flow of credit to the real economy in the euro area can be seen here (slide 15). Fully accommodating the overall higher liquidity needs of banks and alleviating bank funding stress is, therefore, essential to support the wider economy. Equally important for the design is the institutional set-up of euro area – comprising 17 sovereign states sharing a single currency. Offering unlimited liquidity at the discretion of banks makes it possible to target exactly those parts of the banking system which are subject to particularly high funding stress. This, in turn, contributes to a uniform

cross-border transmission so that households and businesses throughout the euro area enjoy credit conditions that are largely homogeneous.

The impact of this action is evident here [slide 16]; it shows the Eurosystem balance sheet as a consequence of the increased lending assistance to our counterparties. As you can see, actual liquidity demand exceeded the levels necessary for minimum reserve requirement purposes: look at the significant volumes of cash deposited overnight with the ECB by counterparties on the liabilities side of the balance sheet.

The measures stabilised the economy. Slide 17 depicts the economy's plunge after the Lehman shock, with the bell-shaped distributions of market forecasts for the year 2009 GDP growth rates revised downward from one update to the next by a few annual percentage points.<sup>2</sup> This was an unprecedented experience for the ECB and for the national central banks. From the second half of 2009, growth prospects resumed and macroeconomic uncertainty – measured by the dispersion of those forecast distributions – declined significantly. The densities become “thinner” as a larger probability mass concentrates around the mean, while the mean growth forecast itself turns positive.

### **The second phase of the crisis**

As I mentioned already, the “d” factor is the loose end in the transmission mechanism. It is an important determinant of long-term interest rates. But it is not controlled by the central bank. (See slide 18).

Between October 2009 and May 2010 the “d” factor – which had remained dormant for a long time after monetary union – became destabilised. Fiscal sustainability concerns exacerbated credit risk perceptions and prompted investors to seek higher credit risk compensation. The debt markets of sovereign issuers in precarious fiscal conditions found themselves under attack. Starting in the summer of 2011, market distress spread more broadly. In the end, a massive credit risk re-appreciation took place which affected bank and non-bank borrowing with pervasive effects on the viability of the transmission mechanism. Banks' creditworthiness as measured via CDS premia correlated strongly with their lending to countries under stress (See slide 19, left-hand chart). At times, this correlation was reinforced by the perception that governments bore significant contingent liabilities linked to “too-big-to-fail” financial institutions. In response to stressed funding conditions and in anticipation of a worsening macroeconomic outlook, banks tightened credit supply standards sharply.<sup>3</sup> (See slide 19, right-hand chart).

Once more, private financial intermediation was threatened. In the money market, confidence was rapidly draining away and trades were becoming rare. The market for government paper was seriously impaired. It was against this background that, in May 2010, the ECB announced its intervention in debt markets. As our focus in that phase was to preserve normal conditions for asset pricing in the markets for securities, we called our policy the “Securities Markets Programme”.

Among fixed-income securities, government bonds are very important for three reasons. First, low liquidity and uncertain prices for government bonds have a degrading effect on the value and acceptability of collateral which is used in secured finance. The growing role of secured lending in financial markets means that financial intermediation would suffer enormously from any paralysis in sovereign bond transactions. Second, sharply lower bond prices can cause significant losses in the portfolios of financial and non-financial institutions.

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<sup>2</sup> Forecasts were based on different vintages of Eurozone barometer forecast results.

<sup>3</sup> See ECB Bank Lending Surveys for October 2011 and January 2012, <http://www.ecb.int/stats/money/surveys/lend/html/index.en.html>

For banks, this would reduce their ability to provide loans to the economy. Third, interest rates on government bonds influence the level of interest rates that firms have to pay when issuing their bonds and that banks use to price their loans. Government bond yields are the basis for the pricing of all assets, from fixed-income instruments to equity.

The decision to intervene was a decision to support the discovery of prices in markets which are key to transmitting our policy intentions and which had become highly dysfunctional.

As tensions grew in the summer and autumn of 2011, we strengthened our response further. (See slide 20). In our first three-year longer-term refinancing operation in December last year we provided around €489 billion of stable funding to 523 banks in the euro area. In the second one – conducted on 29 February this year – we supplied €530 billion to 800 banks. Both long-term credit operations aimed to break a vicious circle in which sovereign funding stress impedes bank access to longer-term financing and ultimately disrupts the flow of credit to households and companies. It's worth noting that the second operation reached a much wider group of banks – among them many small banks providing funds specifically to small and medium-sized enterprises. Its effect was heightened by an expanded range of collateral, which particularly facilitated the participation of small and medium-sized banks. Importantly, risks related to the expansion of collateral have been mitigated by stringent risk control measures. For instance, the haircuts on additional credit claims are very high so as to make the riskiness of these additional credit claims about the same as that of the rest of the collateral, for which the haircuts are lower. We are confident that wider participation by banks can lead to a broader dissemination of credit to small and medium-sized borrowers.

The right half of this picture shows the impact of the new measures on the Eurosystem's balance sheet. (See slide 21).

At present, we are seeing some encouraging, albeit early, signs of normalisation across financial market segments. Broad money growth increased in January, as did loan growth to private sectors. We are also seeing lower stock market volatility (slide 22, left-hand chart). Money market credit spreads have edged lower recently (slide 22, right-hand chart). Similarly, corporate bond credit spreads for both financial and non-financial enterprises have decreased (slide 23). These developments remain to be confirmed and we are closely monitoring them.

I want to stress one important principle which has guided us consistently, particularly over the second phase of the crisis. We did not try to influence the “d” factor: we could not possibly have done so. The “d” factor originates elsewhere, outside the monetary policy sphere of influence. It is not the role of the ECB to cure the root cause of the malaise: weak fiscal institutions and concerns about fiscal sustainability, reinforced by diverging competitiveness among euro area countries and low growth potential in a wide range of countries due to delayed structural reforms. Monetary policy is not and cannot be a substitute for sustainable fiscal policies, structural reforms and adequate governance. These policies are indeed in the remit of governments.

Governments did not remain inactive – they have contributed to the normalisation. Some of them have taken important steps towards addressing the root cause of market malfunctioning. Collectively, at euro area level, several initiatives are under way or have been implemented. I would like to mention only the most recent ones regarding euro area governance. The so-called “six-pack” introduces a macroeconomic surveillance procedure which will detect and correct divergences at an early stage. Fiscal surveillance has been strengthened and procedures for correction have been made more automatic and dependable. A so-called “fiscal compact” will introduce fiscal rules in binding national legislation. In the pipeline is the so-called “two-pack” that is expected to strengthen surveillance mechanisms in the euro area even further and might become the first step towards a fully-fledged fiscal union. Fiscal federations impose strict controls on regional budgets and on this basis – and only on those conditions – they build mechanisms for cross-regional financial solidarity. This is the route that euro area governments are following now.

Structural reforms promoting growth and job creation will ease pressure on government finance. Similarly – as recommended by the European Banking Authority – the build-up of capital buffers by banks will reassure markets of the resilience of the banking system and create the conditions for a more stable financial industry in Europe. Stronger fiscal institutions combined with reforms boosting the long-term growth and competitiveness of euro area economies and a more resilient banking system are the right way to address the “d” factor.

### **The overarching principles guiding monetary policy**

Knowing that monetary policy does not cure structural economic malaise is one of the overarching principles guiding central banks. Equally important are price stability – as a clear overriding objective – as well as central bank independence and credibility. Let me elaborate on these principles and on how they have supported the ECB’s monetary policy in recent times.

Independence is essential for central banks, particularly in periods of sovereign funding stress. Whenever state finances are unsustainable, the likelihood of governments exerting pressure on central banks to monetise their debts increases. In a monetary union founded on monetary independence and a clear mandate for the central bank, this temptation is ruled out. In such a union, shocks to the “d” factor can even have desirable collateral effects. They can provide incentives to sovereigns to pursue sustainable state finances and to undertake the necessary structural reforms. Switching this mechanism off would weaken incentives to conduct the right economic policies.

Monetary policy committed to price stability and conducted independently and credibly will not only deliver low inflation rates but also contribute to financial stability. I deliberately use the word “contribute” as price stability is a necessary but insufficient condition for financial stability. Financial stability is the joint outcome of:

- sound prudential regulation, supervision and oversight of financial intermediaries, financial markets and financial market infrastructures, and of
- sound macroeconomic policies – comprising monetary policy and fiscal policy.

Nevertheless, its contribution to financial stability can be significant. In particular, a timely exit from non-standard measures and a return to a less accommodative policy stance – once the economic conditions are ripe – are essential for several reasons. First, because monetary policy accommodation for prolonged periods of time might fuel excessive risk-taking, leverage and asset price bubbles. Second, it might discourage banks, companies and governments from strengthening their balance sheets and therefore create a dependence on low rates.

Let me develop here how exit can take place. All the ECB’s crisis-response measures involving liquidity provision over long horizons share an important feature: credit is granted at a *low but adjustable rate*. We have already been explicit about the fact that the exact interest rate on long-term liquidity will be determined *ex post*, and be equal to the average policy rate prevailing over the life of the respective open market operation. We have also given banks the option of reversing the long-term repurchase operation in advance, after one year, if the conditions that had warranted the long maturity of central bank credit are no longer in place. In any case, we can withdraw the ample liquidity created as a side effect of the long-term operation whenever the Governing Council deems liquidity conditions are excessive in view of the outlook for price stability. All the tools necessary for large-scale liquidity withdrawal are already in place or will be readily available when needed.

This is consistent with our monetary policy strategy. It emphasises the monitoring of monetary and credit developments, which are linked to both financial imbalances and threats to price stability over longer horizons. It ensures a more symmetric policy with respect to

financial misalignments and some “leaning against the wind” if monetary trends signal inflationary pressures over and beyond what standard conjunctural analysis and macroeconomic projects imply.<sup>4</sup>

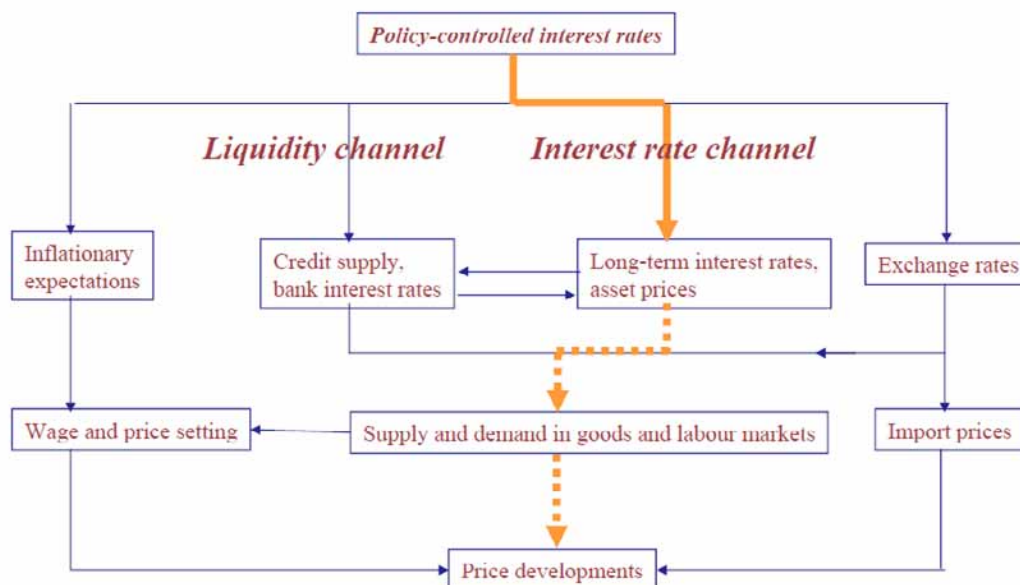
## Conclusion

In conclusion, I return to where I started: the transmission mechanism and how a stability-oriented strategy can influence its multiple paths (see slide 24). The most important link in the long chain is the monetary policy strategy. Clarity about the objective and about the key indicators can anchor expectations and empower monetary policy decisions. As you know, adjustments to expectations can amplify any action taken by a credible central bank.

Our strategy has supported this mechanism in normal times. In crisis times, as markets ceased to transmit price signals, our tools had to change. The Eurosystem’s response has been timely; all non-standard measures have been temporary and tailored to the special features of the euro area. Our tools have changed but our strategy has not – it is in fact supporting a gradual process of normalisation.

The euro area is an economic and monetary union (EMU). Its monetary pillar has performed well so far and will continue its work in the future. The economic pillar is now being considerably strengthened. The new fiscal framework should now be promptly ratified and forcefully implemented under the leadership of the European Commission; as a complement, growth initiatives will be welcome, insofar as they address the long-term growth potential.

## Transmission Impairments



<sup>4</sup> See Fahr, S., R. Motto, M. Rostagno, F. Smets and O. Tristani (2011) “Lessons for monetary policy strategies from the recent past” In “Approaches to monetary policy revisited – lessons from the crisis”, ed. M. Jarocinski, F. Smets and C. Thimann, pp. 26–67, European Central Bank.



## A Model of the Transmission Mechanism

- **Long-term Interest Rates:**
  - Expectation of Future Monetary Policy Interest Rate
  - Plus a Risk Premium

$$(1) \quad i_t^L \simeq \text{average} (i_t^{MP} + E_t i_{t+1}^{MP} + E_t i_{t+2}^{MP} + \dots + E_t i_{t+L}^{MP}) + pr_t$$

- **Monetary Policy Interest Rate:**
  - Inflation Objective

$$(2) \quad i_t^{MP} \simeq r^* + \pi^* + \alpha (E_t \pi_{t+1} - \pi^*) + \lambda m_t$$

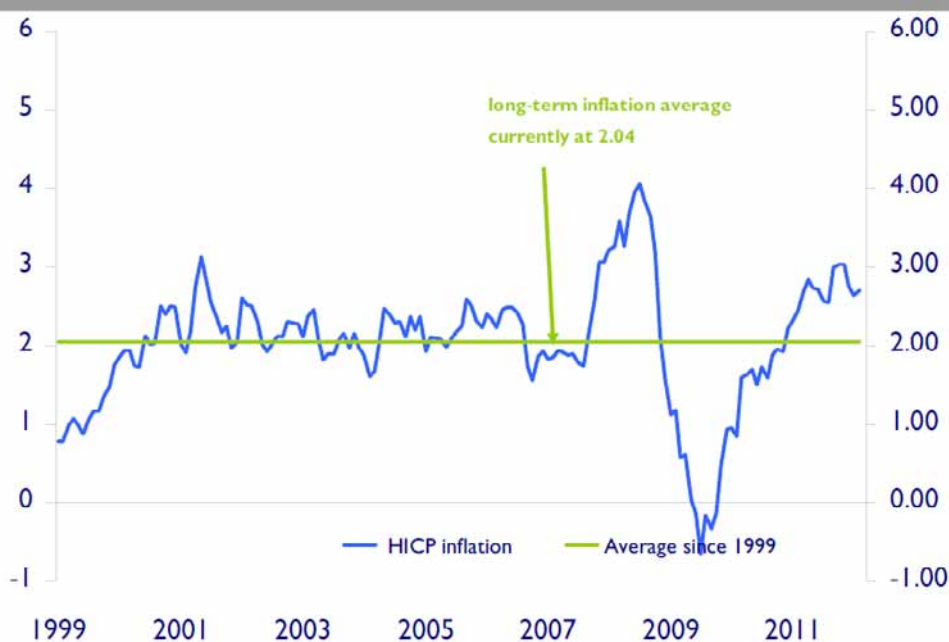
- **Risk Premium:**
  - Volatility of Inflation and Volatility of Real GDP
  - Credit Risk Premium

$$(3) \quad pr_t \simeq \beta \text{var} (\pi_t) + \gamma \text{var} (y_t) + d_t$$

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## Inflation



Source: Eurostat

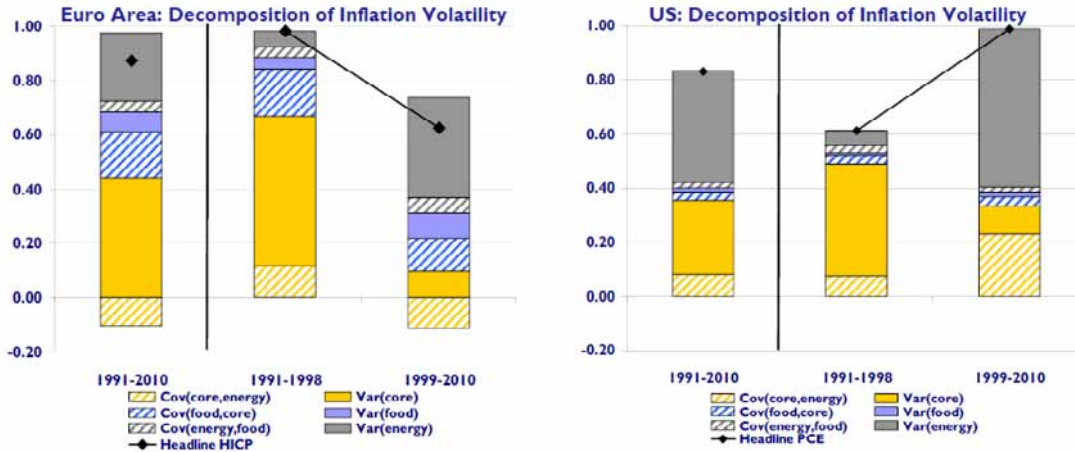
Note: Annual percentage changes in headline HICP; monthly data not seasonally adjusted

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# Inflation Volatility

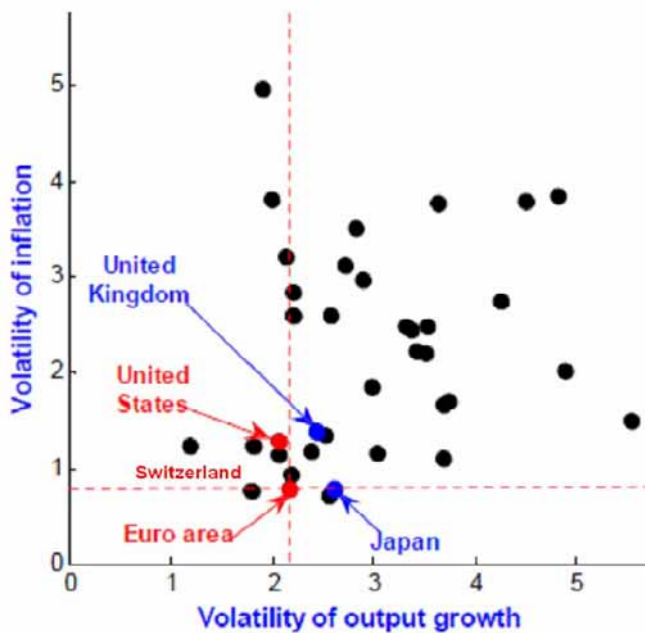
## Energy Price Shocks and Inflation Volatility



**Inflation volatility falls despite larger energy price volatility**

**Larger energy price volatility boosts inflation volatility**

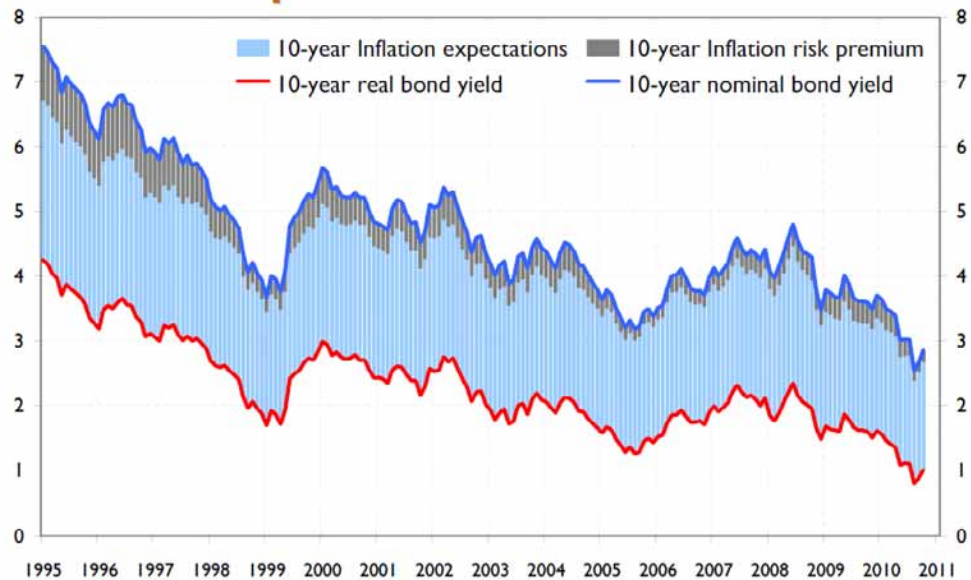
# Inflation / Growth Volatility Space



Source: ECB calculations.

## Long-term Interest Rates

### Point Expectations and Risk Premium



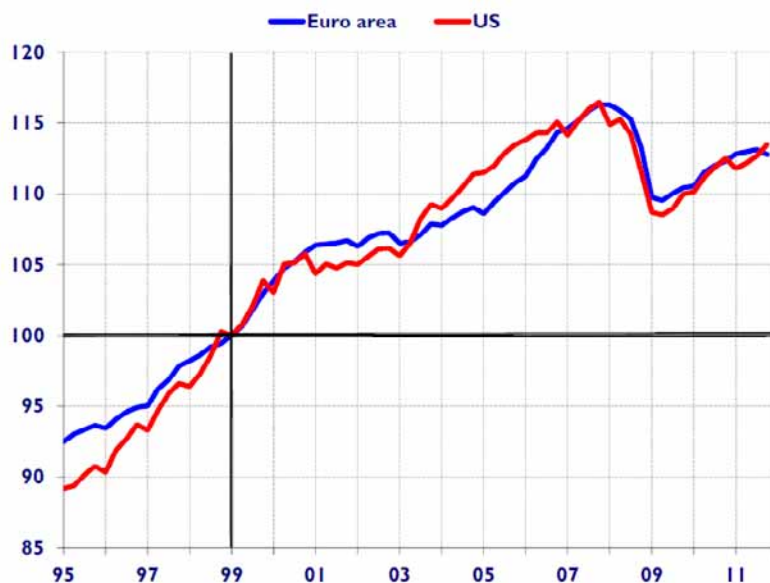
Source: García, J.A. and T. Werner (2010), "Inflation risks and Inflation risk premia", ECB Working Paper No 1162.  
 Note: Inflation expectations are BEIR. Last observation: October 2010.

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## Growth

### GDP per capita growth



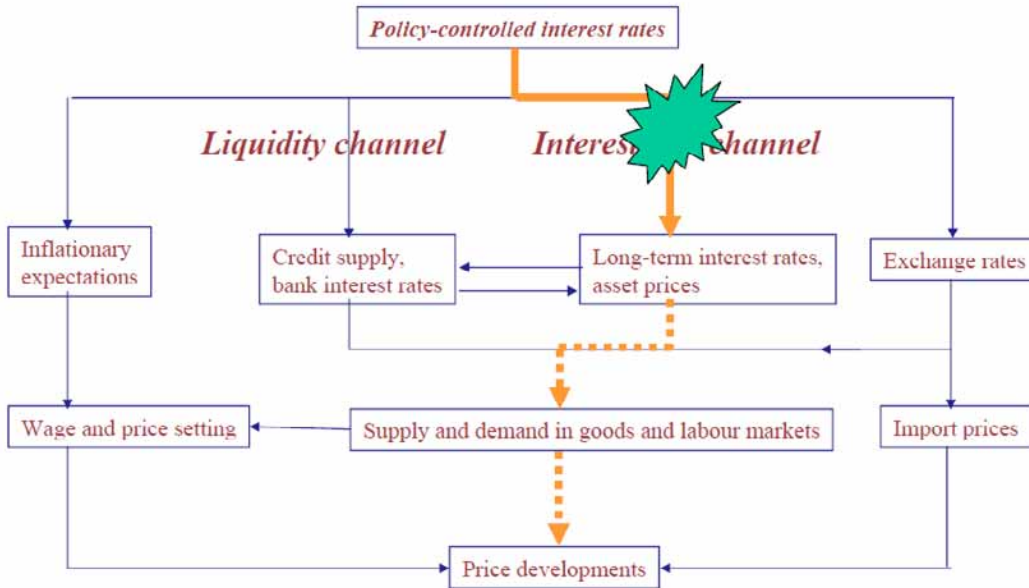
Stability in euro area achieved with comparable average per-capita growth performance to the US.

Sources: BEA, Eurostat. Notes: 1999Q1 = 100. Last observation: 2011 Q3.

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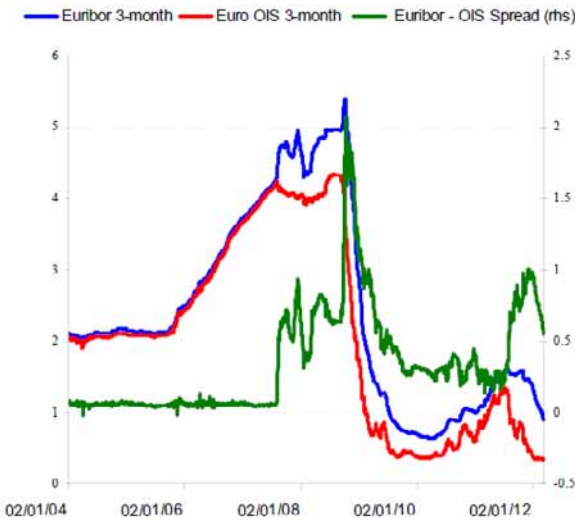
# Transmission Impairments



# Money Market Segmentation

## 3-m EURIBOR and EONIA/OIS

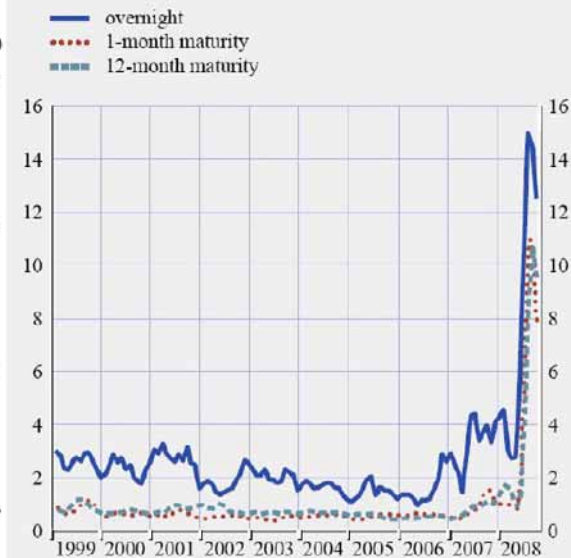
(in percentage points)



Sources: ECB, Bloomberg

## Cross-country standard deviation of unsecured interbank lending rates

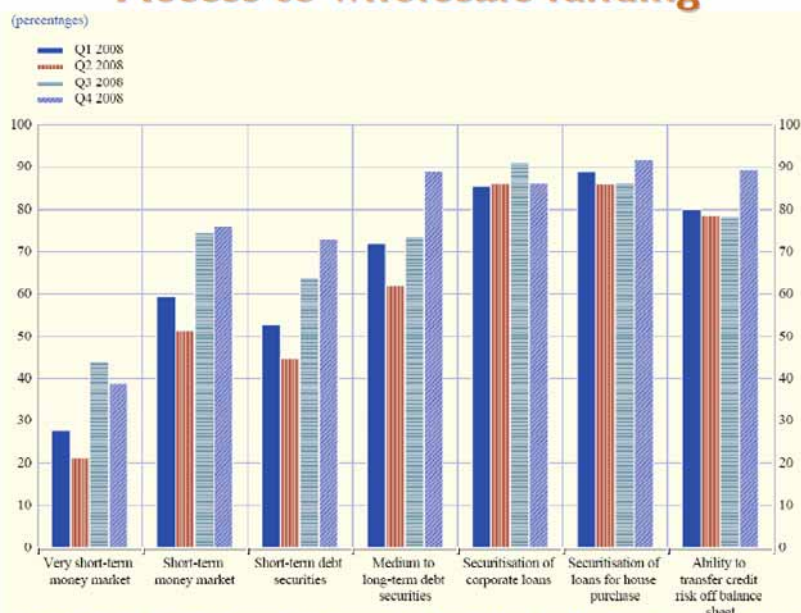
(61-day moving average, basis points)



Source: ECB Financial Integration Report April 2009, page 14

# Bank Funding Stress

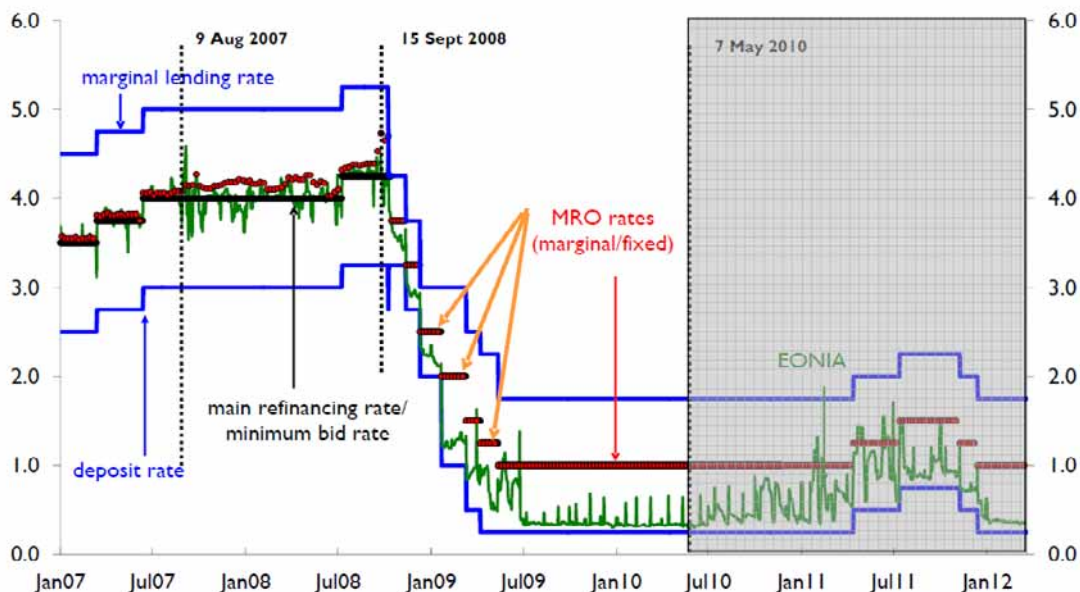
## Access to wholesale funding



Source: ECB Monthly Bulletin February 2009, page 29; Result from Bank Lending Survey Q4 2008  
 Notes: Figures indicate the percentage of banks reporting that access to particular sources of wholesale funding have been hampered.

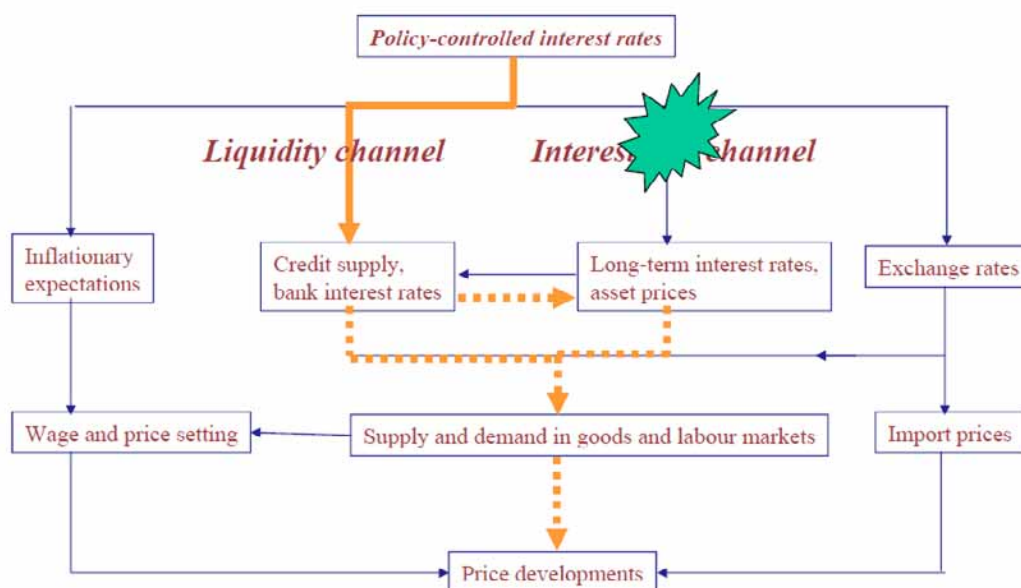
# Monetary Policy in the First Phase of the Crisis

## Post-Lehman: Monetary Policy Response



Note: data in percent. The lower and the upper bound are the deposit facility and the marginal lending facility rate respectively. Last observation: 19 March 2012.

## Transmission Plumbing

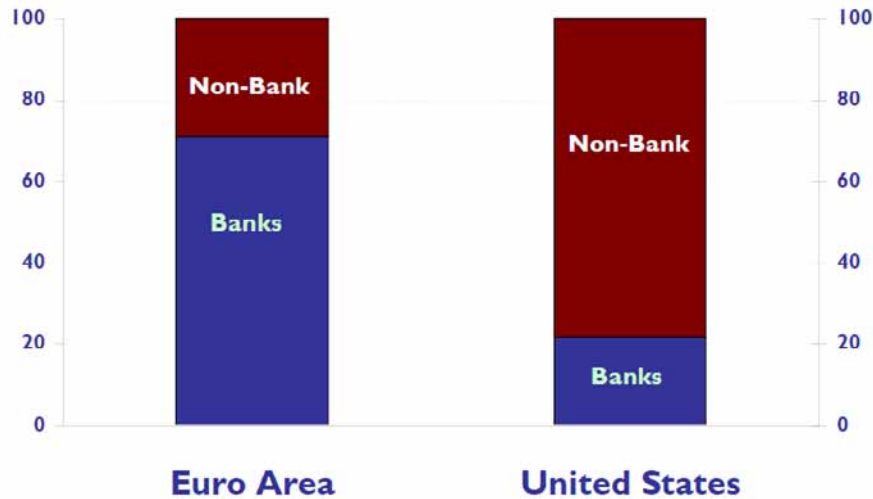


## Monetary Policy Measures in the Euro Area

### First Phase of the Crisis:

- Full accommodation of liquidity needs at a fixed rate
- Extended range of collateral for open market operations with stringent risk control
- Extended range of maturities for open market operations up to 1 year
- Provision of foreign currency denominated liquidity
- Outright purchases of covered bonds

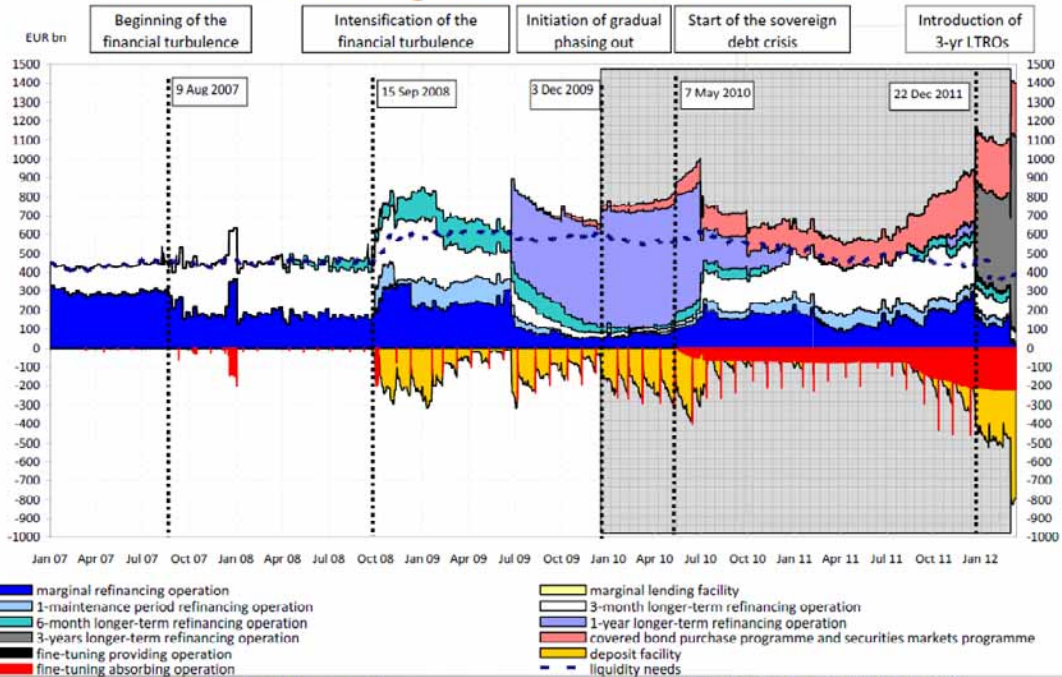
# External Financing for Non-financial Corporations



Source: ECB Monthly Bulletin April 2009  
 Note: Breakdown of the sources of external financing of non-financial corporations, in percent, average 2004 – 2008

# Monetary Policy in the First Phase of the Crisis

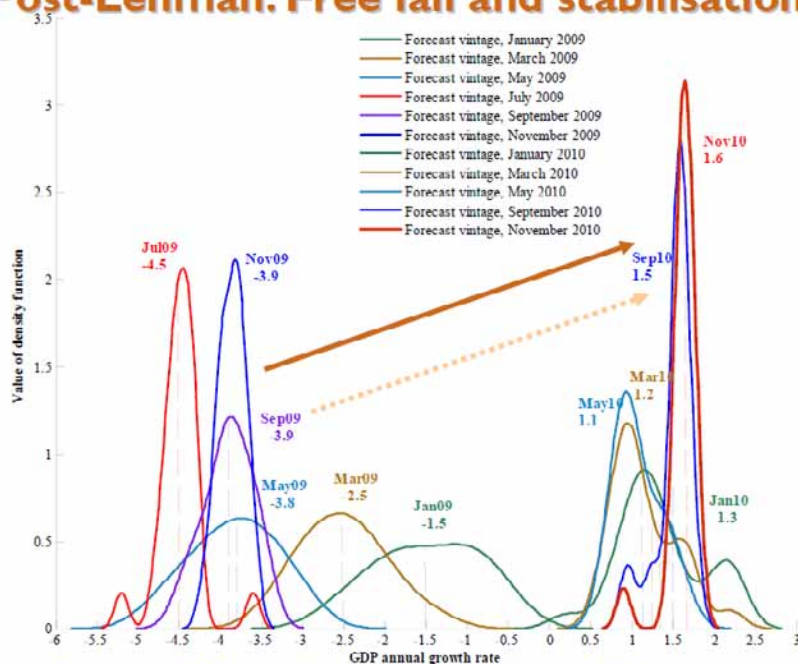
## The Eurosystem Balance Sheet



Source: ECB. Last observations: 11 March 2012.

# Monetary Policy in the First Stage of the Crisis

## Post-Lehman: Free fall and stabilisation



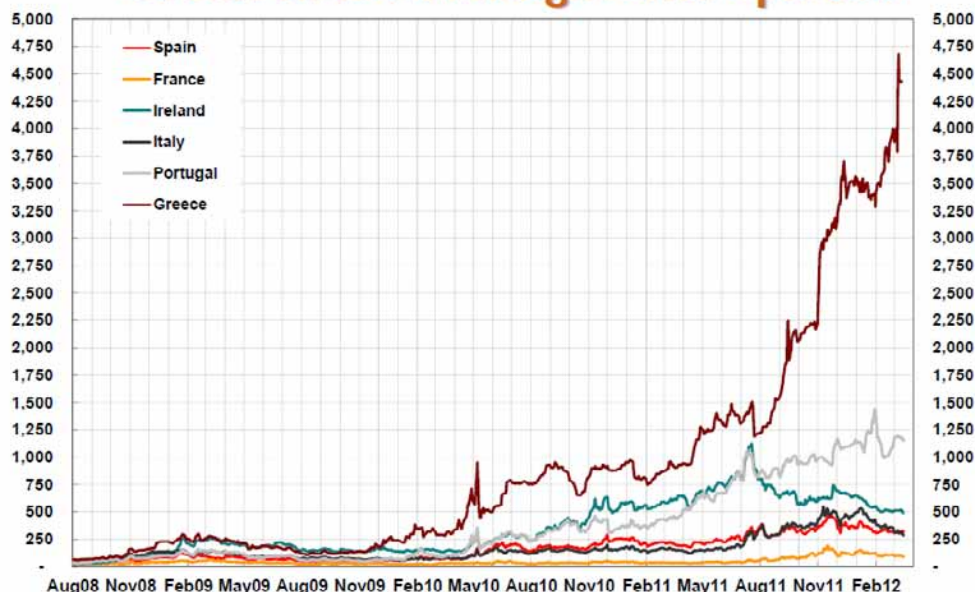
Sources: Eurozone Barometer and ECB calculations. Last observation: November 2010

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# Second Phase of the Crisis: Credit Risk Shocks

## Credit Risk: Sovereign Bond Spreads



Sources: Bloomberg, Thomson Reuters Datastream and ECB calculations. Note: bond yield spreads are vis-à-vis the German 10-year government bond, end-of-day data (last value 16 Mar 2012, 17:00 CET).

Sample: EA countries excluding Cyprus, Luxembourg, Malta, Slovenia and Slovakia, for which data is not comparable and therefore not shown here.

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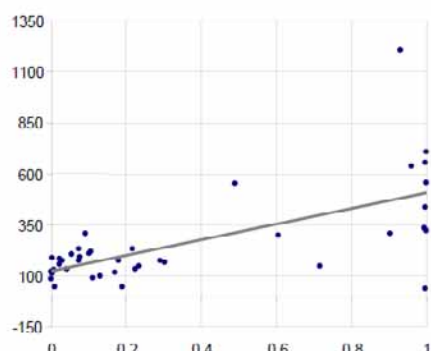
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# Transmission with Credit Risk Shocks

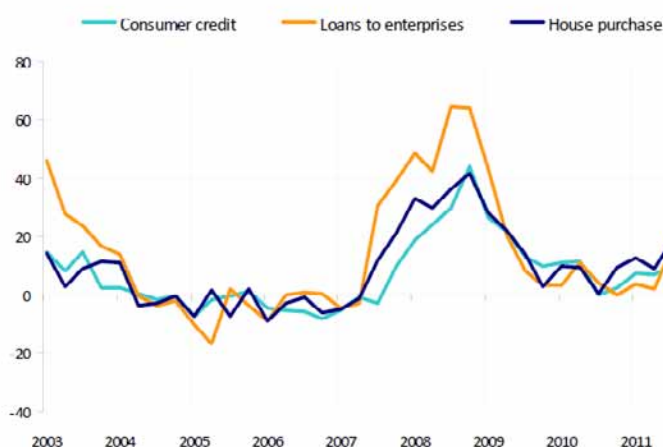
## Sovereign Credit Risk and Bank CDS

Annual change in individual bank CDS in 2011 and exposure to stressed sovereigns (in b.p.; portfolio share)



Source: EBA (8 December), Datastream, ECB calculations. – Notes: Annual changes in banks' CDS (x-axis) vs. proportion of banks' sovereign exposure to countries under stress relative to their overall direct sovereign exposures (y-axis). – 43 EU banks from Dec'11 EBA sample (correlation 66%).

### Banks Lending Standards (Net Percentage)



Source: BLS

# Monetary Policy Measures in the Euro Area

## First Phase of the Crisis:

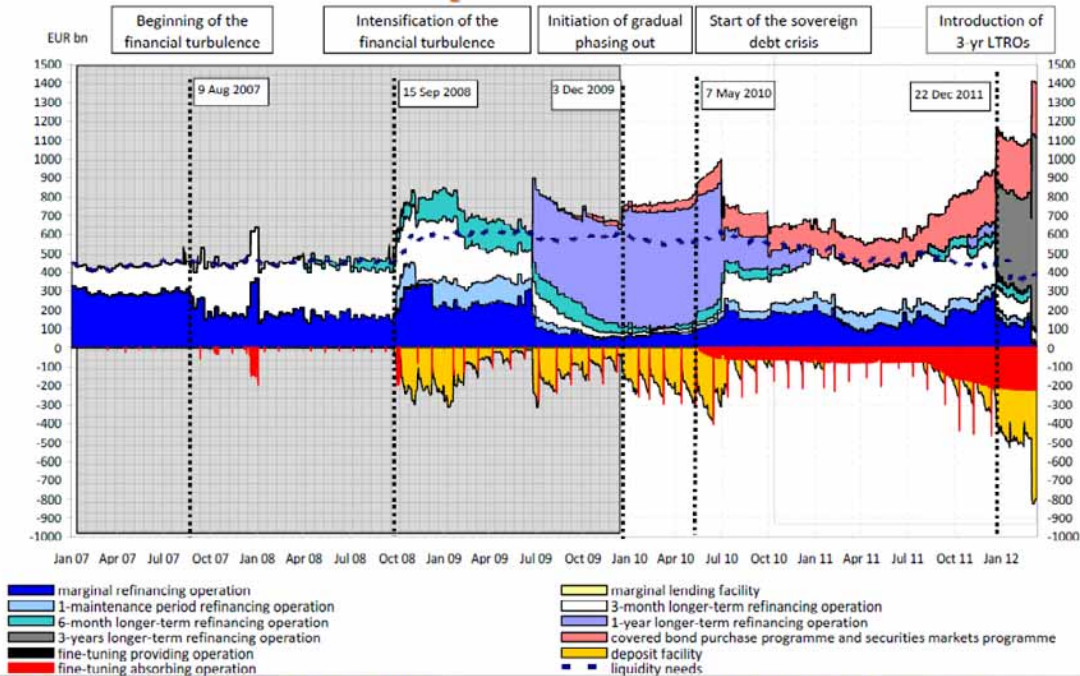
- Full accommodation of liquidity needs at a fixed rate
- Extended range of collateral for open market operations with stringent risk control
- Extended range of maturities for open market operations up to 1 year
- Provision of foreign currency denominated liquidity
- Outright purchases of covered bonds

## Second Phase of the Crisis:

- Securities Markets Programme: Interventions in dysfunctional segments of the securities debt market
- Lower minimum reserve requirements
- Further extension of collateral for open market operations with stringent risk control
- Refinancing operations with a maturity of 3 years

# Monetary Policy in Second Phase of the Crisis

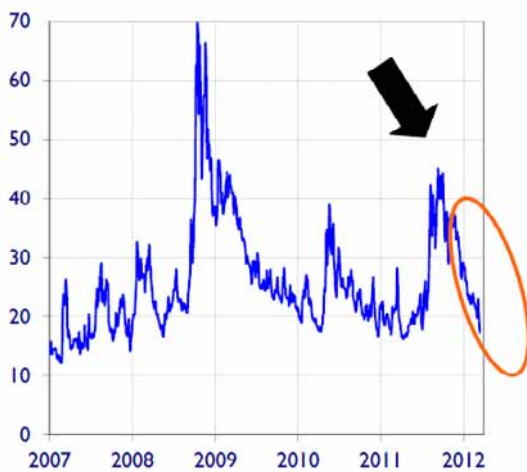
## The Eurosystem Balance Sheet



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# Euribor-OIS Spread and Stock Market Volatility

Implied stock market volatility in the euro area



Sources: ECB, Bloomberg

3 month Euribor-OIS spread (basis points)

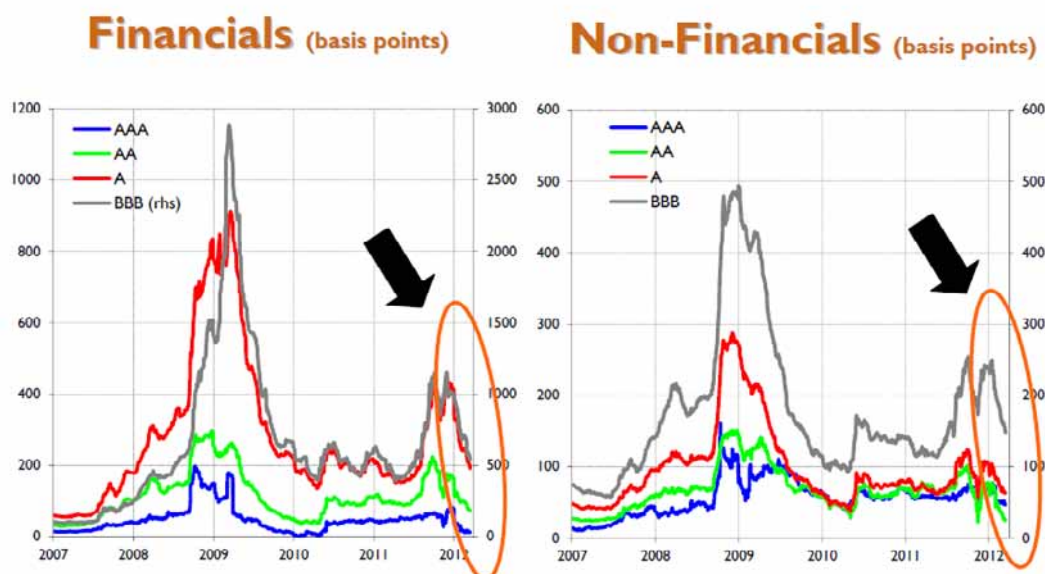


Source: Bloomberg

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## Euro Area Corporate Bond Spreads



Source: Thomson Financial Datastream

Note: Bonds with maturities of over one year are included in the indices. Benchmark is the EMU AAA government bond index calculated by Merrill Lynch. The last observation is dated 16 March 2012.

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## A Model of the Transmission Mechanism

- **Long-term Interest Rates:**
  - Expectation of Future Monetary Policy Interest Rate
  - Plus a Risk Premium

$$(1) \quad i_t^L \simeq \text{average} (i_t^{MP} + E_t i_{t+1}^{MP} + E_t i_{t+2}^{MP} + \dots + E_t i_{t+L}^{MP}) + pr_t$$

- **Monetary Policy Interest Rate:**
  - Inflation Objective

$$(2) \quad i_t^{MP} \simeq r^* + \pi^* + \alpha (E_t \pi_{t+1} - \pi^*) + \lambda m_t$$

- **Risk Premium:**
  - Volatility of Inflation and Volatility of Real GDP
  - Credit Risk Premium

$$(3) \quad pr_t \simeq \beta \text{var} (\pi_t) + \gamma \text{var} (y_t) + d_t$$

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