EUROPEAN CENTRAL BANK

Research Bulletin

DG Research, No. 1, November 2004

Editorial

by Otmar Issing, Member of the Executive Board, ECB

I was once asked the question whether we should have faith in central banks. At first sight, the answer is "no"; if faith is taken as "belief founded on authority". However, in everyday speech, faith is often used to convey the meaning of "confidence" and "trust".

Trust, confidence and credibility can never be taken for granted. They must be continuously defended by consistency of words and deeds and – in a central banking context – by sound analysis and communication of the rationale of the central bank's actions. This is the foundation for economic agents' rational belief and understanding, of the central banks' ability to deliver price stability. Research can substantially contribute to this.

Research in central banking has the task to provide a sound conceptual and empirical basis for policy-making. It is particularly important in the case of the ECB, given its historical task of conducting a single monetary policy for a set of sovereign countries. The purpose of the ***Research bulletin*** *is to convey information about recent ideas and on-going research activities with a view to strengthening policy-making and communication.*

The main subject of this first issue of the Research bulletin is financial contagion. The article "Financial Contagion: Myth or Reality?" reviews the latest evidence on this controversial subject. The focus is on bank contagion risk in Europe, international financial market contagion, and the respective policy implications. Two more articles accompany the "flagship" article on contagion. The first of these shorter articles, entitled "Monetary Policy in a Low Inflation Environment", highlights the importance of central bank credibility to escape from the danger of a liquidity trap. The second article is about "Policy Changes: Macroeconomics and Identification" and proposes an innovative idea to improve model identification. I believe that you will find lasting value in this new publication.

Table of Contents

Forthcoming Workshops/Conferences

- Joint Workshop of the ECB and the IMF on "Global Financial Integration, Stability and Business Cycles: Exploring the Links", Frankfurt, 16-17 November, 2004.
- 4th Workshop of the Euro Area Business Cycle Network (EABCN), Brussels, 19-20 November, 2004.
- IPN Conference on "Inflation Persistence in the Euro Area", Frankfurt, 10-11 December 2004.
- Workshop on "Monetary Policy Implications of Heterogeneity in a Currency Area", Frankfurt, 13-14 December, 2004.
- Workshop on "Monetary Policy Implementation in the Euro Area: Lessons from the Past and Challenges Ahead", Frankfurt, 20-21 January, 2005.
- International Conference on "Competition, Stability and Integration in European Banking", ECB-CFS Research Network, CEPR and NBB, Brussels, 23-24 May, 2005.

Financial Contagion: Myth or Reality?

by Reint Gropp and Philipp Hartmann, *Financial Research Division, Directorate General Research, ECB*

"Less controversial seems to be the observation that downward spirals in prices can be magnified by the institutions involved in the selling wave of the crash, thereby generating contagion across markets and countries." (Jean-Claude Trichet, November 2003)

"... there is a clear sense that the new technologies, and the financial instruments and techniques they have made possible, have strengthened interdependencies between markets and market participants, both within and across national boundaries. As a result, a disturbance in one market segment or one country is likely to be transmitted far more rapidly throughout the world economy than was evident in previous eras." (Alan Greenspan, October 1997)

Recent research has very much improved our understanding of financial contagion, stressing the propagation of extreme negative outcomes, the distinction from common shocks and the increase in interdependence compared to normal times. The findings suggest that crises in international financial markets may sometimes be contagious, although meltdowns affecting different asset classes and continents are extremely rare. The risk of cross-border bank contagion in the European Union has increased during the late 1990s. Hence, macro-prudential surveillance increasingly needs to adopt a pan-European perspective.

1. Concepts and Policy Relevance of Contagion

Contagion may be best illustrated using an example from epidemiology. Suppose that at the outset of the recent SARS ("sudden acute respiratory syndrome") epidemic an individual was infected by the virus from an outside source, say, an animal. Contagion means that the virus is transmitted to another individual, who previously was not carrying the virus and who falls severely sick (and possibly dies). It is obvious that there would not have been any contagion, if the first individual could have been isolated or treated immediately after being affected with SARS. Contrast this with a different human disaster like hurricane Jeanne that devastated Haiti in September this year. Since this was a common shock affecting a number of individuals simultaneously, a policy response focused only on specific individuals would not have been adequate.

The analogy to financial contagion is straightforward. We can speak of financial market contagion, for example, when a crisis in the stock market of one country causes a crisis in the stock market of another country. Analogously, we can speak of bank contagion, when the failure (or fragility) of one bank leads to the failure (or fragility) of other banks. In contrast, if several markets crash at the same time or if several banks fail simultaneously due to the occurrence of a common adverse shock, this is not contagion, but instability as a result of aggregate risk affecting many markets or banks simultaneously.

There are two main channels through which contagion may emerge in financial systems: Physical exposures and asymmetric information. The exposure channel arises, for example, through interbank lending. A shortage of liquidity or an insolvency in one bank could result in the collapse of other banks (Allen and Gale, 2000; Freixas, Parigi and Rochet, 2000). Similarly, if a crash in one financial market reduces the wealth of traders also active in other markets, they may want to rebalance their portfolio and sell assets in other markets, triggering a crash also there, even if the two markets are unrelated in terms of their fundamentals (Kyle and Xiong, 2001).

Asymmetric information across economic agents active in financial systems may also result in contagion. King and Wadhwani (1990) argue that traders in international financial markets face "signal extraction problems". Traders from one country may have only imperfect information about the situation in other countries. Hence, they have to extract further information from observable stock price movements, reflecting other traders' behaviour. But sometimes they will confuse price movements in relation to idiosyncratic problems in a foreign country with price movements that also reveal information about their home country. In this way, asymmetric information can cause excessive price spillovers across borders, including crashes. Moreover, Kodres and Pritsker (2002) show that the transmission of idiosyncratic shocks across markets through portfolio re-balancing tends to be reinforced through asymmetric information. In the context of bank contagion, the disclosure of problems affecting one bank may lead other banks to stop lending in the interbank market, as they are not sure whether the initial problem is an idiosyncratic or a more general problem. As a consequence, even healthy banks could fail, if they were in need of liquidity at that

time (Flannery, 1996, and Box 1 below). Chen (1999) adds that the presence of adverse macroeconomic shocks can make contagious bank runs more severe[1].

Contagion is policy-relevant for two reasons. First, **some contagion phenomena have the character of externalities, resulting in an inefficient allocation of risk in the economy**. Agents do not take the effect of their actions on other agents into account and, hence, the level of risk is too high. Ex ante policies, such as regulation and supervision, could be used to re-establish efficiency. Moreover, if this is not successful, ex post intervention could be used to stabilise the source of the problem and thereby "neutralise" the trigger of contagion. Second, if contagion is very widespread, then such propagation could in theory lead to a general destabilisation of the financial system. In such a worst-case scenario macro-economic stabilisation policies could help to fight the consequences of widespread contagion ex post. As we will argue in section 3 below, the extent of contagion risk in banking is particularly pertinent for ongoing debates about pan-European financial stability policies.

2. International Financial Market Contagion

The literature has now developed a number of empirical approaches to identify contagion in international financial markets. As different methods lead to different results, most of the debate in the literature and among policy makers is about which approach captures the notion of contagion best. A quite influential recent approach is the one proposed by Forbes and Rigobon (2002). These authors argue that contagion means that correlations between different equity markets increase during well-known crisis episodes. One reason may be the information channel described above, which can enhance price spillovers in times of stress. If correlations do not go up, then any propagation of volatility during these crises is nothing more than the expression of the regular interdependence between markets, rather than a sign of contagion. The authors find no significant increases of equity market correlations during some important crises, such as the US stock market crash of 1987, the Mexican crisis of 1994 or the Asian crisis of 1997. Those results seem to give weight to the camp of sceptics, who regard contagion as a myth.

Another approach sees contagion as "excess co-movements". The idea is that if financial market prices co-move by more than what would be justified by the fundamental variables driving those prices (say, due to asymmetric information), this would be evidence of contagion. Shiller (1989) finds that between 1917 and 1987 US and UK stock market indices co-moved by more than what would be justified by the relationship between dividends paid in the United States and the United Kingdom. Bekaert, Harvey and Ng (forthcoming) estimate a two-factor asset pricing model for stock returns of 22 countries, in which risk factors can vary across specific time periods. Contagion is defined as an increase in the correlation between the model residuals that is not explained by shifts in the common risk factors. In other words, this methodology combines the excess co-movements approach with the increase in correlation approach. The authors find evidence of such contagion effects among Asian countries during the Asian crisis but not during the Mexican crisis.

A further group of papers estimates conditional probabilities of large returns in a certain number of stock markets as a function of large returns in other stock markets as a measure of contagion. Inspired by the epidemiology literature, Bae, Karolyi and Stulz (2003) apply the multinomial logit model to explain concurrent large negative and positive returns in 17 emerging market countries. By controlling for some fundamentals (interest rates and exchange rates), they can also incorporate a little bit of the excess co-movements approach. They find some evidence of contagion between Latin America and Asia, but none between Asia and the US during the Asian crisis. Results for positive and negative returns are similar. Cappiello, Gerard and Manganelli (2004) develop a new econometric method to combine such spillover probabilities with the increase in correlations approach. When pooling the data for all crisis periods (Mexico, Asia and Russia 1998), they find evidence of cross-country contagion among Latin American equity markets.

A related route is taken by extreme value theory approaches, which focus on estimations of spillover probabilities for returns that are close to the most dramatic market movements observed in history.

1 In this article we will not discuss the theoretically more intricate channels related to jumps between multiple equilibria. See De Bandt and Hartmann (2000) for a survey.

Hartmann, Straetmans and de Vries (2004a), for example, estimate conditional co-crash probabilities within and between G-5 stock and government bond markets. **The results suggest that extreme linkages between stock markets are higher than extreme linkages between bond markets. Contagion across different asset classes is weaker. There is even evidence of "flight to quality", stock market crashes being accompanied by strong government bond market booms.**

None of the approaches above combine **all** the relevant dimensions of contagion. How can we nevertheless assess the evidence? Central banks are interested in contagion from a financial stability perspective. This means that the emphasis should be on extreme market situations. So, smaller correlation changes or excess co-movements may be inefficient, but they will not be too important in terms of financial instability. **Overall, international financial market contagion seems to be a relevant but rare phenomenon. It is not a feature of every financial crisis, but occasionally contagion phenomena do occur but these tend to be limited to particular countries or regions.**

While very widespread severe market contagion is an extremely rare event, this does not mean that policy makers should disregard it. Policies to maintain international financial stability are there to keep the likelihood of such extreme events – potentially related to general losses of confidence in the system – as low as possible and to be prepared to fight the consequences when they nevertheless do occur. A first step is that individual countries "keep their own house in order", by establishing a stable macroeconomic environment and a resilient domestic financial system. In a second step – with the absence of a global central bank or supervisory authority – international financial surveillance and the setting of standards by the Financial Stability Forum and the International Monetary Fund are important.

3. Bank Contagion Risk in Europe

It is exceedingly difficult to empirically identify contagion in banking systems. In most industrialised countries safety nets are well developed and, therefore, individual bank failures are quite rare (but potentially costly) events. Moreover, banks and payment systems are heavily regulated, significantly reducing the scope for contagion. Box 1 describes one of the very few relatively well-documented bank contagion cases in recent history. To nevertheless assess contagion risk, the European literature has resorted to two approaches. One, contagion has been simulated, rather than estimated, using data on banks' interbank exposures to each other. And second, the literature has focussed on estimating the propagation of "large" shocks among banks, rather than considering outright bank failures.

For example, various papers use estimated interbank exposure matrices from specific euro area countries, to simulate whether losses from hypothetical bank failures would be high enough to exceed other banks' capital. Upper and Worms (2004) find that the breakdown of a single German bank can lead, in the worst case, to the failure of up to 15 percent of the German banking system, if recovery rates are very low. Degryse and Nguyen (2004) conclude that domestic contagion risk within the Belgian banking system has been decreasing over time. In 2002, however, the scope for cross-border contagion to Belgian banks was higher than domestic contagion risk. Similarly, van Lelyveld and Liedorp (2004) simulate only limited contagion effects in the Netherlands, even for the failure of a large bank. The highest contagion risk comes from other European countries. Elsinger, Lehar and Summer (2002) use risk management techniques in combination with a network model of interbank exposures of Austrian banks and find that 94 percent of simulated bank defaults are due to common shocks and only 6 percent due to contagion.

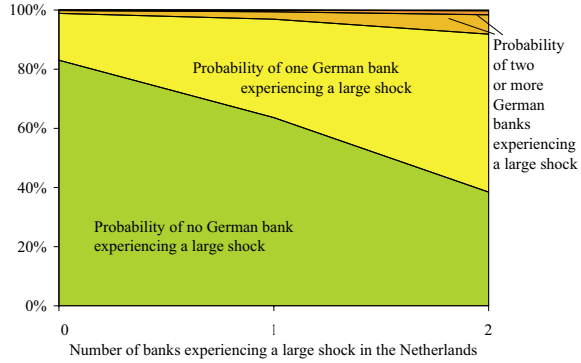
Box 1: A Contagion Case: Penn Square and Continental Illinois

In 1984 Continental Illinois, the seventh largest commercial bank in the United States, failed after more than a decade of rapid growth financed with large cerificates of deposit to other banks, eurodollar deposits and non-deposit short-maturity liabilities. In 1982, the uninsured large depositors at Continental Illinois had begun questioning the health of the bank. This scepticism had been triggered by the failure of Penn Square Bank of Oklahoma, a much smaller bank. Continental had operated in a similar line of business, even purchasing assets from Penn Square. In this context, emerging questions regarding Continental's exposure to Latin America, together with the authorities' approach to let Penn Square fail, led large depositors to run the bank. Ultimately, Continental had to be nationalised, even though it was not insolvent; its net worth at the time of nationalisation was later estimated to be US$2 billion. This case illustrates that contagion may involve both physical exposures and asymmetric information, and that intricate policy difficulties may arise.

These simulations are limited to the exposure channel of contagion and focus largely on domestic data. After the single market programme of 1992 and in the wake of the introduction of the euro, however, policy makers would be particularly interested in the extent and evolution of cross-border contagion risk. Moreover, interbank linkages are not the only channel for the propagation of shocks across banks. Hence, in line with the literature on financial market contagion, bank contagion research has moved to examining varying definitions of the tail properties of stock market returns or indicators derived from them (see Gropp, Vesala and Vulpes, 2004 and forthcoming) as an all-encompassing measure of bank fragility. Gropp and Moerman (2004), Gropp and Vesala (2004) and Hartmann, Straetmans and de Vries (2004b) all examine whether, given that one bank experiences a large adverse shock, other banks are more likely to also experience large adverse shocks. While the basic idea is similar across papers, they differ substantially in their implementation. Gropp and Moerman (2004) use the difference in conditional probabilities of experiencing a large shock to measure net-contagion between a pair of banks, netting out common factors. Gropp and Vesala (2004) use an ordered logit model to estimate the number of banks experiencing a large shock as a function of other banks also experiencing a large shock, controlling for national and euro area common factors. And Hartmann et al. (2004b) use multivariate extreme value theory to estimate the conditional probability that one or several banks experience a very large shock, given that other banks or a measure of aggregate risk exhibit a very large shock.

The results from this literature are quite consistent. For example, Gropp and Vesala (2004) find evidence of cross-border contagion risk among the larger countries (DE, ES, FR, IT, NL) and much less or no contagion risk from and to smaller countries (FI, GR and PT). A qualitatively similar result is reported by Hartmann et al. (2004b). **Contagion risk among the banking systems of large EU countries tends to be economically relevant**. For example, as shown in Chart 1, if both large Dutch banks experience a large shock, this increases the likelihood of at least one bank in Germany experiencing problems by more than 40 percent (measured by the height of the lightly shaded/yellow area at the right margin of the chart), controlling for common shocks. The probability that two or even more German banks are affected is, however, quite low, illustrating that contagion risk is not estimated to spread widely through the banking system.

Chart 1: Estimated contagion risk from The Netherlands to Germany



Note: Chart depicts the conditional probability of y=1,2,3,4 German banks experiencing a large (95th percentile) negative shock, given x=1,2 Dutch banks experience a shock of the same size. The chart was constructed for the unconditional means of common shocks (domestic and euro area wide).

Source: Gropp and Vesala (2004).

There is evidence that cross-border contagion risk has increased over time. Gropp and Vesala (2004) find a sizeable increase in contagion risk with the introduction of the euro, while Hartmann et al. (2004b) find that contagion risk may have increased in Europe as well as in the US during the late 1990s. The latter authors also compare the degree of extreme bank linkages between the euro area and the US. They are much stronger in the US, mainly as cross-border linkages are still weaker in Europe. This is in line with the conventional wisdom that the euro area banking system is less integrated than the US system. It is also consistent with the hypothesis that further integration in the future, beneficial as it may be for many other reasons, could further increase cross-border contagion risk in Europe.

Finally, in Gropp and Moerman (2004), systemically important banks in Europe are identified. These are defined as banks that if they experienced difficulties, would impact significantly upon many other European banks. To identify systemically important banks has great importance for a central bank that is forced, often under immense time pressure, to decide on whether or not to act as a lender of last resort. It turns out that, even though cross-border contagion risk tends to be important, **the number of EU banks that are consistently identified as systemically important is quite small**. Banks of systemic influence are essentially limited to the largest banks in the larger EU countries.

Monetary Policy in a Low Inflation Environment

by Klaus Adam, *Monetary Policy Research Division, Directorate General Research, ECB.*

Monetary policy is far from being ineffective when interest rates are close to zero or already at the lower bound. Close to zero, even more aggressive reactions to shocks seem optimal. At the lower bound, it is the credibility of the central bank, which is crucial to affect inflationary expectations and rescue the economy from the liquidity trap.

Low rates of inflation are economically desirable but the associated low values for the nominal interest rate can generate their own specific problems. In particular, they increase the likelihood that monetary policy is unable to reduce nominal rates by as much as desired because nominal interest rates cannot fall below zero[1].

Lower Bound and Liquidity Trap

Monetary policy controls a very short-term nominal interest rate. Consumption and investment decisions of the private sector, however, should be driven by real interest rates at various maturities (and many other factors). Monetary policy must thus use the short-term nominal interest rate to affect real interest rates at various horizons.

Doing so appears straightforward at first: for any level of expected inflation the desired real interest rate can be implemented by choosing an appropriate path for the future short-term nominal interest rate. Yet, consider a situation where nominal interest rates are low already. Isolating real interest rates from a negative shock to expected inflation rates might then require negative short-term nominal interest rates. Since negative nominal rates are not feasible, a drop in expected inflation can lead to undesirably high real interest rates and depress output. The fall in output in turn puts downward pressure on prices and potentially confirms the initial drop in expected inflation. The zero lower bound may then give rise to a situation with falling prices, low output levels, and zero nominal interest rates, a situation typically referred to as a "liquidity trap".

Possible Solutions

How can monetary policy deal with the constraint that nominal interest rates cannot fall below zero and the potential threat of a liquidity trap?
Imagine a situation similar to the one in the United States in January 2003: nominal interest rates are low but still above zero; economic activity is weak and current and expected inflation rates subdued. Suppose additional adverse shocks hit the economy in such a situation. How should monetary policy react to these additional shocks? Should policymakers keep the powder in the keg, i.e., react less strongly and save some "ammunition" for the future, or should they aggressively lower nominal interest rates, possibly all the way to zero?

Almost all research finds that a more aggressive interest rate reduction is called for in response to adverse shocks once nominal interest rates are in the vicinity of the zero lower bound. This conclusion is reached for rather different reasons in a variety of models. Adam and Billi (2004a), for example, argue that agents understand that the lower bound possibly constrains monetary policy in the future. Additional shocks make reaching the lower bound more likely and induce the private sector to reduce inflation expectations. This increases the perceived real interest rates and amplifies the initial shock. To counteract the amplification, monetary policy should react more aggressively than usual. Similar results have been obtained in Reifschneider and Williams (2000) who study the FRB/US model, and by Kato and Nishiyama (2004) and Orphanides and Wieland (2000) who employ small-scale stylised models.

1 *Negative nominal rates imply that debtors have to pay back less than they borrowed. Since paper money offers a zero nominal return, credit supply by private agents is zero at negative nominal rates.*

Aggressive interest rate reductions in response to negative shocks might bring about zero nominal interest rates earlier than a policy that would react sluggishly to additional shocks. Thus reaching the zero lower bound, is not necessarily a sign of inappropriate policy, but instead might simply reflect that policymakers react with the appropriate vigour to a sequence of adverse shocks.

Now suppose that despite vigorous easing the situation has deteriorated further and short-term nominal interest rates have reached their zero lower bound. This generates a new situation that has been extensively discussed in the literature, e.g., Krugman (1998), Jung et al. (2001), Coenen and Wieland (2003), or Eggertsson and Woodford (2003). The basic conclusion obtained is that monetary policy can still influence economic outcomes even if short-term nominal rates cannot be lowered any further. Policymakers can, for example, make (binding) announcements on how they intend to conduct short-term nominal interest rate policy in the future[2]. To the extent that these announcements are credible, they will affect longer-term nominal rates and thereby the corresponding real interest rates. In particular, the literature suggests that **in a liquidity trap, policy should promise to raise interest rates rather slowly and to tolerate in the future, for a limited time span, an inflation rate that lies above the usual inflation objective.** Low nominal rates in the future and higher expected inflation both reduce real interest rates and help the economy to get out of the liquidity trap. Quantitative studies for the U.S. economy, e.g., Adam and Billi (2004a) or Reifschneider and Williams (2000), suggest that this policy approach is quite effective.

An important precondition for the previous approach to work is that the private sector believes the central bank announcements about the conduct of future monetary policy, i.e., it requires *central bank credibility*. Credibility is important because once the economy has left the liquidity trap, the central bank loses its interest in letting inflation increase above the usual objective, as initially promised. Simulation studies show that if the private sector anticipates that the central bank reneges on its announcements, the welfare cost generated by the zero lower bound increase markedly, e.g., Adam and Billi (2004b).

A number of contributions have investigated how a non-credible central bank might (re)gain the required credibility in a situation with zero nominal interest rates. No simple solutions seem to be available. Krugman (1998) and Eggertsson (2003) consider monetary policymakers that care about reducing the real level of government debt because they take into consideration the tax distortions associated with having to serve the debt. Increasing public debt levels then generate a credible incentive to deliver an inflation rate above the usual objective. Svensson and Jeanne (2004) suggest to engineer a change in the central bank balance sheet that would imply negative net worth should the central bank renege on the announced excess inflation rates or increase nominal interest rates faster than initially indicated. The difficulties likely to be associated with both of these proposals highlight the importance of having gained credibility *before* the economy has reached the zero lower bound, e.g., by having delivered in a timely and accurate fashion on promised policy goals in the past.

Yet, even a credible central bank might have difficulties in generating the right sort of inflationary expectations, a point recently emphasised by McCallum (2004). Since the zero lower bound tends to be reached infrequently, relying on the rationality of private sector expectations is problematic because economic agents have little or no experience with such situations.

2 *The Bank of Japan has recently made a commitment of this sort by stating conditions that have to be fulfilled before it considers abandoning its zero interest rate policy.*

Policy Changes: Macroeconomics and Identfication

Andreas Beyer, Econometric Modelling Division, Directorate General Research, ECB

This article describes an innovative method to identify macro-economic models. By specifying structural breaks in the policy regime one can improve estimation of the transmission mechanism. This casts new light on the optimality of previous monetary regimes.

Empirical models are often used to analyse the quantitative effects of changes in policy variables, such as the central bank's interest rates on the economy.

Before such models can be used for quantitative policy analysis basically two issues are to be solved. We will call them the two "identification problems". The first issue is to understand possible interactions between the variables in the model. We call this "economic identification". Take a very simple static model, like Q = cX. Q might be the amount of ice cream sold on a day and X is the average temperature on a day. In this simple model economic identification can be achieved by assuming that X is an exogenous variable which is determined outside the model. The amount of ice cream sold on a day will not explain or even influence the average temperature on that day. Q is called endogenous. Knowing X one can predict Q multiplying X by c. The second issue is then how to get values for the coefficient c. This we call "empirical identification". Having time series of observations of Q and X we could use econometric methods to get a straightforward empirical estimate of c within the empirical model Q = cX + u, where u is an unpredictable error term. It is the error or "shock" which distinguishes the empirical from the theoretical model.

Now assume a slightly more complicated but still static model of a well functioning market in which the amount of ice cream Q is traded at price P. The supply of ice cream is positively and its demand is negatively related to prices. Hence there are two equations, one for supply: Q=aP+u; and one for demand: Q= -bP+e. Again, u and e are unpredictable shocks. Here we have a difference to the simple model above. In a well functioning market Q and P are jointly determined such that both variables are endogenous. Empirical identification is not possible. With observations of Q and P one could estimate a model Q = cP + g, g being again a shock. But the estimated equation is neither a supply nor a demand curve. Imagine a diagram which shows combinations of Q and P for different points in time. These pairs of observations would form a cloud of points. Suppose now, the demand curve is modeled as Q= -bP+sX + e and X is exogenous. A shift in X would shift the demand curve but not supply. In the Q-P diagram this up and downward shifting of the demand curve would trace out a line which could be identified as the supply curve. Similarly, if supply is modeled as Q=aP+rZ+u the demand curve could be identified by shifts in Z which would shift supply but not demand.

How is that related to a question about the effects of interest rate changes on the economy? More than half a century ago economists developed a framework for studying time-series data that dealt with the difficulty of conducting policy experiments. That methodology, often labelled "Keynesian", proposed a distinction between structural models that might involve large systems of simultaneous equations and reduced form models in which each endogenous variable is explained as a function of predetermined and exogenous variables. These models are dynamic - not static as the simple example above - but backward looking. For example, consumption might be explained by contemporaneous and previous year's income. The role of the theorist is then to find a set of assumptions that would achieve identification of the structural parameters once the reduced form parameters are known through empirical estimation.

This approach was challenged in 1976 when Robert Lucas published a critique of that methodology. He proposed that agents' expectations are not only backward but also forward looking. He argued that the Keynesian identification assumptions were miss-specified and he pointed out that **although Keynesian models might fit well within a given time period, they should not be used for policy analyses since miss-specified structural parameters would**

not remain invariant to a change in the rule followed by a policy maker.

Following the Lucas critique one stream of macroeconomic research moved instead towards a strategy of modelling linear rational expectations models. In such models, often set up as "stochastic general equilibrium models", parameters represent the invariant never changing "deep economic structure" and they would not therefore be expected to change if the central bank were to change its policy rule.

For many years this view influences the agenda of macroeconomic research in universities and central banks in which researchers are trying to uncover the properties of alternative monetary policies. Economic models are simulated under alternative policy rules to analyse the impact of different rules on the properties of the economy. The aim is to find the "best" rule. This procedure will lead to valid conclusions provided that the model is correctly specified and that the correctly identified parameters of the model do not change as a result of a change in the policy rule. In order to ensure that this is the case, models are constructed that are based on solid microfoundations. Microfoundations means that aggregate data can be modelled "as if" they were chosen by a set of identical representative agents operating in competitive markets with rational expectations of the values of future variables. The resulting parameters are taken to be "deep", invariant to changes in policy and thus providing a sound basis for policy analysis.

In an ongoing research project Andreas Beyer and Roger Farmer (UCLA and CEPR) argue that the identifying assumptions used by rational expectations modellers are sometimes difficult to defend and that the lack of identification may have serious consequences for a research agenda that seeks to find an optimal policy rule and therefore are, to say the least, somewhat fragile[1]. But although identification is difficult, it is not impossible. As a solution to the fragility of existing identification methods we have suggested a new approach. We assume that policy rules switch occasionally; perhaps as a consequence of changes in the personalities of the central bank governor. Take as an example the change of monetary policy in the US in 1979, when Paul Volcker came into office. Another example is the formation of the Monetary Union in Europe with the introduction of the Euro in 1999. In Beyer and Farmer (ECB Working paper 275) we argue that occasional changes in policy regime can be used as a natural experiment to help to identify a subset of the parameters of a structural model. In this way, the shift in the policy rule acts like the shift in the demand curve given in the earlier example, and allows us to identify some of the effects on interest rate changes on the economy. We have already demonstrated this strategy in action in a model for the US. Use of our methodology throws a new light on a recent debate over US monetary policy over the last 30 years. Using different techniques - which do not adequately address the identification problem - **a number of authors have argued that the monetary policy followed prior to the Volcker era resulted in a situation in which the equilibrium in the economy was indeterminate due to a too lax monetary policy response to rising inflation expectations**. In this case shocks unrelated to economic fundamentals could generate volatility in the economy and thus the poor performance of the US economy in this period can ultimately be attributed to poor monetary policy. **Our results overturn this finding.**

With this benchmark model at hand, we are currently conducting promising research on a model for the Euro Area.

1 See e.g. ECB Working papers 275, 277 and 323.

Hicks-Tinbergen Medal for Eurosystem Researchers

The 2004 Hicks-Tinbergen Medal, a biannual award for the best recent article in the journals of the European Economic Association was awarded to **Frank Smets** (Head of Monetary Policy Research Division, ECB) and **Raf Wouters** (National Bank of Belgium) "An Estimated Dynamic Stochastic General Equilibrium Model of the Euro Area" JEEA 1 (5) 2003, 1123-1175 at the 19th Congress of the European Economic Association (EEA) in Madrid on 22nd August.

The selection committee, comprising Thomas Mariotti, Torsten Persson and Thomas Piketty, invited the EEA membership to express their opinions before making its decision on the award. The selection committee argued "This door-opening paper advances methodology as well as our understanding of the European economy. It is the first to structurally estimate a fully specified, medium-scaled DSGE model using likelihood methods, showing that it fits the data as well as state of the art time-series models. Relying on Euro area data, it presents interesting substantive findings on the sources of European business cycles and the impact of various shocks. Smets and Wouters' contribution is already having a strong influence on applied macroeconomic analysis in a number of central banks and international organizations."

With regard to the empirical results, the paper finds that a) despite the dominating forward-looking component in wage and inflation determination, there is considerable price and wage stickiness in the euro area. b) The effect of a persistent monetary policy shock is strikingly different from a temporary monetary policy shock. A permanent policy shock has no liquidity effect, i.e. short-term rates do not fall in the aftermath of a permanent expansionary monetary policy shock. This finding highlights the importance of forward-looking pricing behaviour and the degree of persistence of shocks. c) Productivity shocks account for less than 10% of the long-run output variance of the euro area. Instead, labour supply shocks and monetary policy shocks are the most important source of variation in euro area output.

ECB Lamfalussy Fellow Wins Prize for Best Ph.D. Research at 2004 EFA Meeting

Suppose Deutsche Telecom wants to issue EUR 15 billion to finance investment in a new generation of mobile phones. What will be the impact of such issuance on bond yields of the telecom sector? Is the European corporate bond market already liquid enough to swallow such supply shocks with a chuckle? These are the questions that motivate the paper by **Yigal Newman** and his co-author **Michael Rierson**.

Yigal is well-known in DG-Research. He was one of the first Lamfalussy fellows. The Lamfalussy Fellowship was established in 2003 in the context of the ECB-CFS research network on "Capital Markets and Financial Integration in Europe". Awarding the fellowship to Yigal turned out to be a wise choice. The paper not only addresses one important issue in research on European capital markets. It has also won the price as the best Ph.D. research at this year's European Finance Association meeting.

The authors develop a formal economic model to account for bond supply effects on yield spreads. The intuition behind the model is simple. Intermediaries in the bond market act as initial liquidity providers, absorbing a significant portion of new issues. Since they may face delays in their attempt to place new bonds in the market, they will require compensation for the risk they are bearing. This results in lower prices and higher yields associated to similar bonds.

The model is brought to the data, consisting of a carefully selected sample of bond issues in the European telecom industry. The empirical results support the prediction of yield-spread increases on issuance of other bonds. This increase is economically and statistically significant, temporary, and peaks at the week of issuance (not on the day of announcement).

The findings of this paper may have interesting practical implications. Since issuers are subject to the risk that simultaneous issuance by competitors will raise their cost of funding, they may choose to defer planned debt issuance in anticipation of their rivals' issues.

Thomas Sargent on Learning and Model Uncertainty

by Luca Dedola and Fiorella De Fiore, *both Monetary Policy Research Division, Directorate General Research, ECB*.

On 10-12 June, Banco de Portugal hosted the third "Conference on Monetary Economics", a biannual event that provides a forum for the latest research on macro and monetary theory. **Thomas Sargent** (New York University) presented an interesting paper on **"The Conquest of U.S. Inflation: Learning and Robustness to Model Uncertainty"**, jointly written with T. Cogley (University of California, Davis). The paper questions the interpretation of the rise and fall of U.S. inflation after World War II in terms of the Federal Reserve System's changing views about the natural rate hypothesis. Inflation had remained high for a decade after substantial statistical evidence favouring the natural rate hypothesis had accumulated. By the early 1970s, average inflation was on the rise, yet average unemployment had not fallen. As these events turned the economics profession away from Keynesian models, why did policy makers wait a decade to act on this lesson?

The paper's answer prominently features model uncertainty. Concerns about the robustness of a proposed inflation-stabilization policy across alternative models would have induced policy makers to choose high inflation even though the data placed the highest probability on the natural rate model. Because of Bayesian model averaging, evidence was not sufficient to convince the policy maker to abstain from trying to exploit the Phillips curve. Taking model uncertainty into account, a policy of quickly reducing inflation would have been calamitous in two competing models that had smaller but still non-zero probability weights. The discussant, **Harald Uhlig** (Humboldt University), pointed out that speeches of actual policymakers like Greenspan and King confirmed the authors' view of monetary policy as risk management, namely providing insurance against very bad outcomes. However, he questioned the plausibility of the paper's view that policymakers in the 1970s were attaching positive probability to extreme outcomes predicted by models displaying clear signs of structural instability and explosive dynamics. This and other papers presented at the conference can be downloaded at www.bportugal.pt/events/conferences/IIICME/default.htm.

Selected Recent Journal Publications by ECB Staff

Camba-Mendez, G and Lamo A. (2004), "Short-Term Monitoring of Fiscal Policy Discipline", *Journal of Applied Econometrics*, March-April 2004, 19(2), pp. 247-265.

Canova F. and M. Ciccarelli (2004), "Forecasting and Turning Points Prediction in a Bayesian Panel VAR Model", *Journal of Econometrics*, 120(2), pp. 327-359.

Coenen, G. and Wieland, V. (2004), "Exchange-Rate Policy and the Zero Bound on Nominal Interest Rates", *American Economic Review*, Papers and Proceedings, 94(2), pp. 80-84.

De Santis, R.A. and Stähler, F. (2004), "Endogenous Market Structures and the Gains from Foreign Direct Investment", *Journal of International Economics* , 64(2), pp. 545-565.

Ehrmann, M., and Fratzscher, M., (2004), "Taking Stock: Monetary Policy Transmission to Equity Markets", *Journal of Money, Credit and Banking*, 36(4), pp. 719-737.

Eschenbach, F. and Schuknecht, L. (2004), "Deficits and Asset Prices", *Economic Policy*, 19(39), pp. 313-346.

Hartmann, P, Straetmans S, and de Vries, C. (2004). "Asset Market Linkages in Crisis Periods", *The Review of Economics and Statistics*, 86(1), pp. 313-326.

Kaas, L. and von Thadden, L. (2004), "Budgetary Policy and Unemployment Dynamics in an OLG Model with Collective Wage Bargaining", *The Economic Journal*, 114, pp. 867-889.

References

References for "Financial Contagion: Myth or Reality?"

Allen, F. and D. Gale (2000), "Financial Contagion", Journal of Political Economy, 108, 1-34.
Bae, K.-H., A. Karolyi and R. Stulz (2003), "A New Approach to Measuring Financial Contagion", Review of Financial Studies, 16, 717-763.
Bekaert, G., C. Harvey and A. Ng (forthcoming), "Market Integration and Contagion", Journal of Business.
Cappiello, L., B. Gerard and S. Manganelli (2004), "The Contagion Box: Measuring Financial Market Co-movements by Regression Quantiles", mimeo., ECB, September.
Chen, Y. (1999), "Banking Panics: The Role of the First-Come, First-Serve Rule and Information Externalities", Journal of Political Economy, 107, 946-968.
De Bandt, O. and P. Hartmann (2000), "Systemic Risk: A Survey", ECB Working Paper, no. 35, November.
Degryse, H. and G. Nguyen (2004), "Interbank exposures: An Empirical Examination of Systemic Risk in the Belgian Banking System", Paper presented at the ECB/CFS Symposium "Capital Markets and Financial Integration in Europe", May.
Elsinger, H., A. Lehar and M. Summer (2002), "Risk Assessment of Banking Systems", Österreichische Nationalbank Working Paper, no. 79, October.
Forbes, K. and R. Rigobon (2002), "No Contagion, only Interdependence: Measuring Stock Market Comovements", Journal of Finance, 57, 2223-2262.
Freixas, X., B. Parigi and J.-C. Rochet (2000), "Systemic Risk, Interbank Relations and Liquidity Provision by the Central Bank", Journal of Money, Credit and Banking, 32, 611-640.
Gropp, R. and G. Moermann (2004), "Measurement of Contagion in Bank Equity Prices", Journal of International Money and Finance, 23, 405-459.
Gropp, R. and J. Vesala (2004), "Bank Contagion in Europe", Paper presented at the ECB/CFS Symposium "Capital Markets and Financial Integration in Europe", May.
Gropp, R., J. Vesala and G. Vulpes (2004), "Market Indicators, Bank Fragility and Indirect Market Discipline", Economic Policy Review, 10, Federal Reserve Bank of New York, September, 53-65.
Gropp, R., J. Vesala and G. Vulpes (forthcoming), "Equity and Bond Market Signals as Leading Indicators of Bank Fragility", Journal of Money, Credit and Banking.
Hartmann, P., S. Straetmans and C. de Vries (2004a), "Asset Market Linkages in Crises Periods", Review of Economics and Statistics, 86, 313-326.
Hartmann, P., S. Straetmans and C. de Vries (2004b), "Banking System Stability: A Cross-Atlantic Perspective", Paper prepared for the NBER conference on "Risks of Financial Institutions and of the Financial Sector", Woodstock (Vermont), 20-22 October.
King, M., and S. Wadhwani (1990), "Transmission of Volatility between Stock Markets", Review of Financial Studies, 3, 5-33.
Kodres, L. and M. Pritsker (2002), "A Rational Expectations Model of Financial Contagion", Journal of Finance, 57, 768-799.
Kyle, A. and W. Xiong (2001), "Contagion as a Wealth Effect", Journal of Finance Papers and Proceedings, 56, 1401-1440.
Lelyveld, I. van, F. Liedorp (2004), "Interbank Contagion in the Dutch Banking Sector", De Nederlandsche Bank Working Paper, no. 5, July.
Longin, F. and B. Solnik (2002), "Extreme Correlation of International Equity Markets", Journal of Finance, 56, 649-676.
Shiller, R. (1989), "Comovements in Stock Prices and Comovements in Dividends", Journal of Finance, 44, 719-729.
Upper C. and A. Worms (2004), "Estimating Bilateral Exposures in the German Interbank Market: Is there a Danger of Contagion?", European Economic Review, 48, 827-849.

References for "Monetary Policy in a Low Inflation Environment"

A., Klaus and R.o M. Billi (2004a), "Optimal Monetary Policy under Commitment with a Zero Bound on Nominal Interest Rates", ECB Working Paper No. 377.
A., Klaus and R. M. Billi (2004b), "Optimal Monetary Policy under Discretion with a Zero Bound on Nominal Interest Rates", ECB Working Paper No. 380.
Coenen, G. and V. Wieland (2003), "The Zero-Interest-Rate Bound and the Role of the Exchange Rate for Monetary Policy in Japan", Journal of Monetary Economics, Vol. 50(5), pp. 1071-1101.
Eggertsson, G. (2003), "How to Fight Deflation in a Liquidity Trap: Committing to Being Irresponsible", IMF Working Paper 03/64.
Eggertsson, G. and M. Woodford (2003), "Optimal Monetary Policy in a Liquidity Trap", NBER Working Paper No. 9968.
Jung, T., Yuki T., and Tsutomu Watanabe (2001), "Zero Bound on Nominal Interest Rates and Optimal Monetary Policy", Kyoto Institute of Economic Research Working Paper No. 525.
Kato, R. and N. Shinichi (2004), "Optimal Monetary Policy When Interest Rates are Bounded at Zero", forthcoming in Journal of Economic Dynamics and Control.
Krugman, P. R. (1998), "It's Baaack: Japans's Slump and the Return of the Liquidity Trap", Brookings Papers on Economic Activity, Vol.49(2), pp. 137-205.
McCallum, B. T. (2004), "A Monetary Policy Rule for Automatic Prevention of a Liquidity Trap", Carnegie-Mellon University Mimeo.
Orphanides, A. (2004), "Monetary Policy in Deflation: The Liquidity Trap in History and Practice", Federal Reserve Board Mimeo.
Orphanides, A. and V. Wieland (2000), "Efficient Monetary Policy Design Near Price Stability", Journal of the Japanese and International Economies, Vol.14, pp. 327-365.
Reifschneider, D. and J. C. Williams (2000), "Three Lessons for Monetary Policy in a Low-Inflation Era", Journal of Money Credit and Banking, Vol. 32, pp. 936-966.
Svensson, L. E. O. and O. Jeanne (2004), "Credible Commitment to Optimal Escape from a Liquidity Trap: The Role of the Balance Sheet of an Independent Central Bank", Princeton University Mimeo.

The opinions expressed in this publication are those of the authors and do not necessarily reflect those of the European Central Bank.
Editors: Carsten Detken, Gabriel Fagan, Vítor Gaspar, Philipp Hartmann from the Directorate General Research, ECB. Contact person for further information: carsten.detken@ecb.int.
Assistance to editors: Luisa Rey, Molly Schröder
Layout: Isabelle Eeman, Official Publications, ECB.

Address: Kaiserstrasse 29, D-60311 Frankfurt am Main, Germany
Telephone: +49 69 1344 0; Internet: http://www.ecb.int; Fax: +49 69 1344 6000; Telex: 411 144 ecb d

ISBN: 92-9181-518-7