



Research Programme 2009/2010

This version:

23 January 2009

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Introductory remarks

This research programme seeks to give an overview of research in the Bundesbank over the next two years. Research is a risky business – as it should be – and so it is not always easy to predict precisely what the coming years hold in store. Therefore the programme entails a mix of rather concrete projects – which are often ongoing research – and more general ideas and challenges we envision over the reporting period. As the annual research programme has a two-year horizon, there is always a one-year overlap with the previous programme. We therefore also briefly discuss progress which has been made in the recent past.

This research programme has been written in the middle of the severest financial crisis in decades, and we are generally uncertain about its consequences for the future of the financial system and its effects on the real sector. Rescue operations are currently dominating the activities of governments and central banks. They are also absorbing staff resources, therefore limiting our capacity for research activity. However, we are confronted with many new and difficult questions about the causes of the crisis, its possible implications for the economy and the future financial structure, available remedies to reduce the risk of similar experience in the future, the robustness of the system after the great moderation and the appropriate strategy for post-crisis action on the part of central banks.

These are not totally new challenges. Concerns about financial stability have been a fixture of the agenda over the last few years, and central bankers have always been aware of the limitations of their knowledge. A growing body of research in universities, central banks and other research institutions has therefore been dedicated to these questions. Nevertheless, our past progress has admittedly been limited. One example is the lack of convincing models connecting the real economy and the financial sector to study their interrelationship not only in normal times but also in times of distress.

The current situation is a challenge for many fields of research in the Bundesbank. We face new questions not only regarding financial stability, regulation and the structure of the financial system but also regarding possible consequences for the monetary transmission process (and possibly for the monetary policy strategy), further progress in international integration in the real and financial sectors and fiscal policy. All this means that we are confronted with a huge research agenda. Of course we are by no means able to do justice to such a programme. The best we can do is to try to select specific aspects. In addition, we are not of the opinion that the research programme should exclusively be dedicated to questions related to the financial crisis and its consequences. Instead, we have tried to make clear in the programme of the individual research groups involved where we see a potential connection to the crisis or whether specific projects have been triggered by recent events.

The “Financial Stability”, “Risk Modelling” and “The Financial System: Structural Issues and its Changes” research groups particularly need to be mentioned in this respect. Some other groups have been influenced by the recent experiences, albeit to a lesser extent. The argument that we have to make progress in our attempts to better integrate the banking sector in our macroeconomic models has gained momen-

tum (see the “Money and Monetary Policy” and “The Role of Frictions in Goods, Labor, and Financial Markets for Business Cycles and Monetary Policy” research groups). Also, research on heterogeneity among households and firms seems to be even more relevant in light of the new experiences, as financial vulnerability is not equal for all firms and households (see “Corporate Finance, Household Finance and Monetary Transmission”). Furthermore, the question to what extent the economy will be able to buffer financial shocks is touched in several research groups (e.g. by studying the issue of financial constraints of firms or the wealth of private households).

As in the past two years, the programme has been organised according to the research groups. Most research groups continue to exist. However, last year we established a new group on “Monetary Policy Implementation and Payment Systems”. This group made progress in the first year, and we think that research on the optimal design of a central bank’s operational framework is now needed more than ever. However, due to understaffing, we are not able to pursue this direction of research at the moment. We are confident that some of the projects which have been initiated in 2008 will be continued by visitors and external partners.

For a few years now, the Research Centre has been attempting to establish DSGE models as a more general framework for research in the Bundesbank. We think that 2008 brought important progress in this respect. The research programme of several research groups (“The Role of Frictions in Goods, Labor, and Financial Markets for Business Cycles and Monetary Policy”, “Money and Monetary Policy”, “Fiscal Policy interactions with Monetary Policy, Capital Markets and the Real Sector”, “Monetary Policy and Asset Prices”) includes current and forthcoming projects which will use this analytical framework. New advisors and visitors will be helpful in fostering this process.

The research group “Short-term Forecasting” has been renamed “Forecasting and Monetary Policy”. As the research topics have been broadened, we think that this title better describes the current research programme.

A large volume of the Research Centre’s resources have been and will be absorbed by activities linked to ESCB research networks and the Research Task Force of the Basel Committee on Banking Supervision. Active networks include the “Wage Dynamic Network” and the “Household Finance and Consumption Network”. The Research Task Force has a new mandate to study the transmission between the financial and the real sector. Also some of the ESCB working groups are research-oriented. All these groups are very fruitful as they improve cooperation and communication among researchers in central banks and give a strong stimulus to the research areas involved. On the other hand, in some cases they are behind the curve on the research agenda and require some extra statistical and administrative input. The HFCN conducts a large household survey (in Germany and other countries) which requires assistance from external partners and the Bundesbank’s Statistical Department.

As in the past two years, it was not always easy to assign specific projects uniquely to one research group. For example, research on fiscal policy and bond yields can be

subsumed under the programme of the “Fiscal” group or the “Asset Price” group. However, we try to alert the reader (and the researchers) to related projects in other groups. We thus hope that the report will also stimulate the discussion not only within the respective groups but also between and among all groups in the Bundesbank.

Research group

“Money and monetary policy”

JEL Codes: C2, C3, E2, E3, E4, E5

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1. General interest and Policy Relevance

Given the experience of the “great inflation” of the 1970s, policy makers have endowed central banks with the clear mandate to maintain price stability and with the necessary independency to pursue this. There is widespread agreement that “inflation is a monetary phenomenon”. Accordingly, the monetary policy strategy of the Eurosystem underlines the key role of money and credit aggregates for future inflation. Therefore, a sufficiently precise understanding of the determinants of monetary developments, of the role of money in the monetary transmission process and of the implications of monetary developments for inflation and the real economy is of utmost importance for monetary policy.

Low inflation, however, may not prevent episodes of financial distress as just revealed by the recent financial turmoil. This challenges not only the conventional wisdom that a monetary regime that achieves price stability would also promote financial stability but underlines the general need to improve the understanding of the interplay of key financial variables with the real economy. A major policy challenge will be to put in place mutually supportive safeguards in the financial and monetary spheres to ensure the necessary degree of monetary and financial stability not only in normal times but also in times of distress.

2. Recent Research

Recent work of the research group has focussed on the link between monetary aggregates and asset prices (Bläs, 2008; Belke, Orth and Setzer 2008), the monetary transmission mechanism (Weber, Gerke and Worms, 2008) and monetary policy strategy (Beyer, Gaspar, Gerberding and Issing, 2008).

⁺⁾ An asterisk indicates that the staff member intends to contribute a paper.

Bläs (2008) analyses the link between monetary aggregates (M3 and their subcomponents) and changes in the short term interest rate for the euro area. The factor augmented VAR (FAVAR) model as a modification of the standard VAR model is used in order to get a more comprehensive assessment of the monetary policy transmission process. The main result is that M3 initially rises in response to a one-off positive shock to the short-term interest rate before showing the expected falling pattern and converging in the long run towards zero. The results of the study have also been presented in the Bundesbank Monthly Bulletin September 2008.

The project of **Belke, Orth and Setzer (2008)** analyses the money, asset and consumer price relationship on a global scale. The basic idea is that different price elasticities of supply lead to differences in the dynamic pattern of price adjustment to a global liquidity shock. While goods prices adjust only slowly to changing global monetary conditions due to an elastic supply of consumer goods not least from emerging markets, asset prices such as housing and commodity prices react much faster since the supply of real estate and commodities cannot be easily expanded. Using aggregated data for major OECD countries, the empirical results support the view that different price elasticities on asset and goods markets are to a large extent able to explain the observed relative price changes between asset classes and consumer goods.

The project by **Seitz and Setzer (2008)** finds evidence on the effective use made of banknotes by studying the time series properties of German cash balances. Different empirical methods such as principal component analysis and more structural models are applied to explain and forecast the demand for different denominations (banknotes and coins) in Germany. The results suggest that private consumption and the euro exchange rate (as a proxy for foreign demand) are important determinants of banknote demand in Germany. In addition, financial innovations, house prices, interest rates and the black economy seem to play a significant role, at least for some denominations. This project is part of a wider research project on the development of currency in circulation in Germany (under the responsibility of the cash department. See also the ongoing project of von Kalckreuth in the research group "Corporate Finance, Household Finance and Monetary Transmission").

Beyer, Gaspar, Gerberding and Issing (2008) examine the contribution of the Bundesbank's monetary policy strategy to its success in opting out of the Great Inflation. They propose a theoretical framework (following Söderström, 2005) where monetary targeting is interpreted, first and foremost, as a commitment device. In this setting, a monetary target helps anchoring inflation and inflation expectations. They derive an interest rate rule and show empirically that it approximates the way the Bundesbank conducted monetary policy over the period 1975-1998. Comparing the Bundesbank's monetary policy rule with those of the FED and of the Bank of England, they find that the Bundesbank's policy reaction function was characterized by strong persistence of policy rates as well as a strong response to deviations of inflation from target and to the activity growth gap. In contrast, the response to the level of the output gap was not significant.

Weber, Gerke and Worms (2008) investigate whether there has been a significant change in the overall transmission of monetary policy to inflation and output by esti-

inating a standard VAR for the euro area and by searching for possible break dates. They find a significant break point around 1996 and some evidence for a second one around 1999. They compare the effects of monetary policy shocks for these episodes and find that the well-known “stylized facts” of monetary policy transmission remain valid. Moreover, it seems that monetary transmission after 1998 is not very different from before 1996, but probably very different in the interim period. This implies that evidence for the euro area could be biased by an “atypical” interim period 1996-1999.

3. Planned and Ongoing Research Projects

The research plan for 2009/2010 is to continue the former strands of research, related to the forecasting ability of money, the analysis of monetary and loan developments in the monetary transmission mechanism and the modelling of monetary policy reaction functions. Some of the projects deal with some of the issues that are at the forefront since the recent financial turmoil.

A. Bank lending and corporate debt

Since bank loans are the main counterpart of money, a better understanding of the determinants of loan demand and supply can provide useful information on the evolution of monetary aggregates. From a central banker’s point of view, in particular, the analysis of credit channels in the transmission process has produced interesting insights (Kiyotaki and Moore, 1997; Bernanke, Gertler and Gilchrist, 1999). However, despite huge theoretical efforts and achievements the empirical evidence regarding those effects remains mixed. A main problem in this respect is to disentangle supply and demand effects, an issue which will be addressed by the following projects:

A.1. “The effects of monetary policy shocks on housing, asset prices and private sector balance sheets in the US” by Eickmeier and Hofmann (2008). The goal of this project is to derive stylized facts for the role of monetary policy shocks in asset prices, the housing market and private sector’s (households, financial and nonfinancial institutions) balance sheets in the US between 1975 and 2007 and between 1985 and 2007 using a factor-augmented VAR (FAVAR). The authors investigate the role of monetary policy (shocks and the systematic part) for previous and the recent financial turmoil. The paper finds that monetary policy affects the housing market, asset prices and private sector balance sheets in the US. The effects are weaker for the shorter sample.

A.2. "Shock transmission to asset prices and private sector balance sheets in the euro area" by Eickmeier and Hofmann. Building on Eickmeier and Hofmann (2008), this paper assesses the propagation of aggregate euro-area (supply, demand and monetary policy) shocks to aggregate and individual countries' asset prices and private sector's balance sheets based on a FAVAR. It uses newly constructed aggregate flow of funds statistics provided by the ECB as well as individual countries' flow of funds data. One important goal is to understand to what extent common shocks lead to heterogeneous responses of assets and liabilities of households and enterprises in the euro area.

A.3. “Identifying credit supply shocks” by Eickmeier and Hofmann. Building on work by Eickmeier, Hofmann and Worms (2008), the goal of the project is to derive sign restrictions on short-run impulse response functions from a DSGE model that incorporates a banking sector (cf. Bernanke and Blinder, 1989). The restrictions will serve to identify credit supply as well as some macro shocks in vector autoregressive models for the US and the euro area (cf. Peersman and Straub, 2007). Historical decompositions will allow to assess whether there have been credit supply effects in specific periods. This project is particularly pertinent in light of the current financial crisis in the US, as concerns about a credit crunch are expressed.

B. Credit and money in structural models

Dynamic stochastic general equilibrium (DSGE) models are one of the most advanced models currently used or under construction in central banks. They feature a number of frictions that capture the empirical persistence in macroeconomic data. Some of these frictions like sticky prices and sticky wages have become pretty standard (see, e.g., Christiano, Eichenbaum and Evans, 2005). However, financial intermediation or financial frictions are typically absent. Accordingly, a relevant research task is to extend the current research frontier by attempting to incorporate a financial sector into the New Keynesian DSGE setting (see also the research group on frictions in labor, goods and financial markets). Further, in order to model the transmission of financial sector shocks into the real sphere of the economy alternatively, it may be worthwhile to deviate from the DSGE approach and to develop an alternative setting which is able to explain the link between business cycles and financial cycles (debt-equity cycles).

B.1. “Financial intermediation in a new Keynesian DSGE model” by Gerke, Hammermann and Lewis (National Bank of Belgium). As part of a wider research project, they implement financial intermediation in a standard New Keynesian DSGE framework. As a first step they introduce a banking sector as in Goodfriend/McCallum (2007) (GM) who illustrate the dynamic consequences of money and banking for monetary policy. Specifically, GM investigate to which extent a central bank could misjudge its interest rate policy response to a productivity shock by neglecting the existence of a banking sector. In addition to replicating the results in GM they have started to analyse monetary policy under commitment and discretion. As a sensitivity analysis along the lines of Hansen and Sargent’s (2008) robust control approach they have begun to evaluate the implications of model uncertainty. It is planned to use this DSGE framework with a banking sector to address further issues regarding the role of financial intermediation for monetary transmission, financial stability and monetary policy.

B.2. “Explaining financial and business cycles – a balance sheet view” by Radke. The plan is to develop a theoretical model which is able to explain the link between business cycles, financial cycles, and financial crises. Moreover, the model should allow for studying the impact of different monetary policy rules (inflation targeting vs. debt-level-targeting) on monetary and financial stability. The structure of the model combines the Neo-Keynesian approach by

Tobin (1969) and Franke and Semmler (1999) regarding the modelling of the various sectors' balance sheets, the industrial organization approach to banking in the tradition of Monti (1972) and Klein (1971) respecting the modelling of banks' price setting behaviour, and rudimentary the New-Keynesian approach by Clarida, Gali, and Gertler (1999) with respect to the modelling of the monetary policy design and the Phillips curve. Owing to the explicit consideration of sectoral balance sheets and the various transmission channels between the financial and the real sphere of an economy, the model provides a theoretical foundation for the use of flow of funds data in the analysis of monetary policy.

C. Money demand and financial asset markets

Recent work has shown that it is difficult to explain the more recent behaviour of monetary developments in the euro area by traditional explanatory variables. One way to improve on this could be to exploit the potential information contained in flow of funds data. These data might yield insights considering portfolio adjustments of private persons and also permit to construct proxies for wealth and/or permanent income (possibly a better scale variable than current income). Motivated by the increasing availability of data, another research avenue is to employ advanced econometric tools in order to test whether recent evidence on the role of money can be gauged as robust.

C.1. "The usefulness of financial accounts data for monetary analysis from a portfolio choice perspective" by **Bartzsch and Schmidt**. The plan is to model the asset demand of private households and of non-financial corporations using the quarterly data provided by the Bundesbank's financial accounts statistics. The project will permit to analyse how this asset demand is affected by transitory (e.g. interest rate) and permanent (e.g. demographic developments) shocks. Since different financial assets exhibit different degrees of liquidity, they have diverse potential consequences for private households' consumption spending and possibly varying effects on inflation.

C.2. "Monetary Dynamics" by **Bläs and Scharnagl**. The analysis of monetary dynamics in vector autoregressive models reveals positive effects of interest rate increases on monetary aggregates for the euro area (Deutsche Bundesbank, 2008). However, these effects are only temporary. In the long-run, the reactions are negative as expected. Due to the curse of dimensionality problem VAR models are constrained in the number of variables included. Therefore, this analysis was extended by a FAVAR model. This approach allows for including a broad spectrum of macroeconomic variables by summarizing the "relevant" information by means of a relatively small number of "factors". As some kind of an additional robustness check, the analysis will be extended by estimating BVARs as an alternative way of reducing the "curse of dimensionality" problem and still allowing for a relatively high number of variables.

C.3. "Money demand and inflation uncertainty" by **R. Kim** (in cooperation with **H. Herwartz**, University Kiel). The project attempts to improve our under-

standing of the role of a particular uncertainty, namely inflation uncertainty for money demand.

D. Monetary policy strategy

The following projects extend previous work on the information content of monetary indicators and on monetary policy reaction functions, respectively.

Money as a predictor of inflation

Research at the Bundesbank has shown that using monetary and real variables jointly in forecasting inflation is superior to restricting the forecasts to representatives of either real or monetary variables (Scharnagl and Schumacher, 2007). The robustness of this conclusion can be checked by applying this analysis to other regions, in particular to those, where monetary aggregates played no or only a subdued role in central bank's strategy (like the US).

D.1. "The role of monetary indicators for US inflation" by Scharnagl and Schumacher. Research at the Bundesbank has shown that the joint use of monetary and real variables in forecasting inflation is superior to restricting the forecasts to representatives of either real or monetary variables (Scharnagl and Schumacher, 2007). The robustness of the conclusion can be checked by using US data instead of Euro area data. In a similar exercise as for the euro area, Bayesian Model Averaging (BMA) will be used in the analysis (Stock and Watson, 2002). The relevant data set is much larger for the US, containing more than 200 variables. The focus will be on the relevance of various sub-groups of indicators, i.e. money, interest rates, wages, output, etc.

Monetary policy reaction functions

In the canonical New Keynesian model (NKM), money growth is irrelevant for the determination of real output, inflation and the interest rate. Still, a number of authors have developed arguments for assigning a role to money even under this narrow view of the monetary transmission mechanism. For instance, Scharnagl et al. (2007) find that interest rate rules which include an additional response to money growth outperform both Taylor-type rules and speed limit policies once real-time output gap uncertainty is accounted for. Similarly, Beck and Wieland (2007) have shown that ECB-style monetary cross-checking can generate substantial stabilisation benefits in the event of persistent policy misperceptions regarding potential output. However, in the simple NKM they use, filtered money growth does not clearly dominate filtered inflation as the object of cross-checking.

D.2. "The role of money in the presence of transmission lags and imperfect information about the output gap" by Gerberding, Scharnagl and Worms. The project will extend previous work in several directions. In a first step, an optimal control exercise will be repeated in a model which allows for delayed effects of monetary policy on inflation (for instance, by introducing a one-period implementation lag; see Kilponen and Leitemo, 2007). In a second

step, it will be assumed that the central bank uses filtering methods to derive optimal estimates of imperfectly observed variables like the output gap (instead of responding directly to noisy measures of these variables). In order to tackle the twin problem of model and state uncertainty simultaneously, it will be necessary to go beyond the standard Kalman filtering exercise advocated by Svensson and Woodford (2002, 2003) and use robust filtering methods (Kilponen, 2004).

D.3. “Asset price bubbles and monetary policy” by **Mislin**. The focus of this research project is to derive in the first step an optimal monetary policy rule on the basis of a macroeconomic dynamic stochastic model and flexible inflation targeting as the concept of the central bank. With these tools, we analyze the model on a more theoretical level. The implementation of asset price bubbles into the money political strategy of a bank of issue shows that the reaction depends by means of the instrument variable and on the stochastic process of the price bubble. We assume continuous time; the asset price bubble depends on the future money growth. We analytically show under special conditions saddle path stability for the course of the following variables: inflation, nominal money supply and the asset price bubble. Based on Mislin (2007) we go on in the second step to calibrate an adequate macroeconomic model which analyses the responses of asset price bubbles, inflation and economic activity to the monetary policy rule.

D.4. A project by **Gerlach und Knüppel** will investigate some questions related to the controversy between inflation targeting and price level targeting. This topic may gain new prominence due to the recent events in the world economy.

E. Others

E.1. “Has the monetary transmission mechanism changed? FAVAR-based evidence for the US and Germany” by **Eickmeier, Lemke and Marcellino**. The paper investigates whether the monetary policy transmission mechanism has changed in the US and Germany between 1980 and 2007. It applies a FAVAR with time-varying parameters and considers several reasons for the changes such as a more aggressive monetary policy and changes in the private sector's behaviour possibly due to globalization and technological progress.

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Research group

“Monetary Policy and Asset Prices”

JEL Codes: E43, E44, F31, G2

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General interest and policy relevance

Asset prices, including exchange rates, play an important role within the transmission process of monetary policy as they contain information about the current state of the economy, reveal private sector expectations about future developments and the degree to which past monetary policy measures have already unfolded their effects. Moreover, the levels of asset prices, their volatility and their co-movement may have consequences for global financial stability.

This research group will concentrate on four issues: (1) quantification of the interlinkage between key macroeconomic variables, asset prices and monetary policy instruments. (2) institutional factors which are relevant for asset price developments, including bubbles in asset markets, (3) development of methods to extract information from asset price data that could be useful for monetary policy and (4) improve the understanding of foreign exchange markets.

Recent Research

Schulz and Wolff (2008a) present a comprehensive data set of all bonds issued by the sixteen German states (Länder) since 1992 and employ this new dataset to describe the spread between Länder bonds and Federal paper (Bunds). Furthermore, they document that the German Constitutional Court's denial of additional aid for the Land of Berlin has not altered the risk assessment of financial markets towards the German Länder. The quantitative analysis reveals that Länder follow different issuing strategies: while some concentrate to a greater extent on large issues or issue joint bonds with other Länder (Jumbos), others rely more on comparatively small but frequent issues. Moreover, some Länder issue a significant volume-share of their bonds in foreign currencies. Based on this unique dataset, they demonstrate that spreads to the Bund are mainly driven by risk aversion and liquidity, while fiscal determinants have an economically negligible impact. (Cooperation with research group “Fiscal policy interactions with monetary policy, capital markets and the real sector”).

Schulz and Wolff (2008b) disentangle different driving factors of sovereign bond market integration by studying yield co-movements of EMU countries, the UK, the US and 16 German Länder in the last 15 years. At a low frequency of weeks, bond market integration has increased gradually in the course of the last 15 years in EMU countries, as well as the UK, the US and the German Länder. The euro and increasing international capital flows, appear to drive low frequency integration. In contrast, yield adjustments to changes of the German benchmark bond at high frequencies, i.e., 2 days, remain relatively low until October 2000, when a sharp increase in integration can be observed in all samples. The increase in high frequency integration can be attributed to electronic trading platforms becoming functional. The change-over from national currencies to the euro can not explain the dramatic increase in high frequency integration. (Cooperation with research group “Fiscal policy interactions with monetary policy, capital markets and the real sector”).

Jochem, A. and Reitz, S. (2008) investigate the presence of a non-linear impact of real exchange rates on German GDP growth. Estimating a Smooth Transition Regression model the authors find that - in general - rising real exchange rates cut into German price competitiveness and tends to decrease GDP growth. However, as purchasing power parity misalignments grow the negative exchange rate impact weakens substantially.

Reitz, S. and Slopek, U. (2008) propose an empirical oil market model with heterogeneous speculators. While some of the recent surge of oil prices can be attributed to robust global demand at a time of tight production capacities, commentators occasionally also blame the impact of speculators for part of the price pressure. Assuming that trend-extrapolating chartists may destabilize the market, fundamentalists should exercise a stabilizing effect on the price dynamics. Using monthly data for WTI oil prices, the STR-GARCH estimates indicate that oil price cycles may indeed emerge due to the nonlinear interplay between different trader types.

Ongoing Research and Envisaged Research Projects

Term structure of interest rates

Since “the macro-finance term structure literature is in its infancy” (Diebold, Piazzesi and Rudebusch, 2005) there is a fairly large number of open questions to be answered within this framework, e.g. concerning the effect of macroeconomic and policy shocks on long-term bond yields, and vice versa the feedback of long-term yields on monetary policy, as well as the repercussion of bond yields on macroeconomic state variables, or the performance of macro-finance models in forecasting interest rates and macroeconomic variables. The following projects are envisaged:

- An important field in macroeconomics and finance is the dynamic relationship between macroeconomic activity and yields as well as term premia on long-term bonds. One aspect of the macro environment that might affect yields is the stance of fiscal policy. Recent work by Dai and Philippon (2006) uses an affine term structure model with observed and latent factors, including a factor proxying fiscal policy, and identifies a prominent role for fiscal policy on U.S. interest rates along the entire yield curve, both through expectations of future short rates and through ef-

fects on term premia. In view of the large changes in German fiscal policy, especially around the time of reunification, it might be interesting to a) extract an idiosyncratic German component in the yields and b) estimate afterwards a similar model for this idiosyncratic German term structure element (prior to, or including the period since EMU) to gain a better understanding of the determinants of the yield curve, especially during the early 1990s. This project will be initiated by **Thomas Laubach**, a new advisor.

- Recently some researchers have started to analyze the nominal, real and inflation expectation terms through the looking glasses of the New Keynesian approach. It is planned that **Qi Sun**, a visiting researcher at the Deutsche Bundesbank in 2009, will initiate a research project along these lines in early 2009 and aims at analyzing the response of yield curve components to various macroeconomic shocks.

Besides the term structure of nominal bond yields, real yields of various maturities play a key role as determinants of consumption and investment. However, moving from nominal to real yields entails the identification and quantification of inflation expectations as well as of inflation risk premia.

- The project '**price discovery on traded long-term inflation expectations**' by **Schulz and Stapf** aims at explaining which financial instrument reflects quicker and more meaningful inflation expectations of market participants. Instruments on swap and bond markets are actively traded and provide us with break-even inflation rates (BEIR) e.g. inflation expectations plus risk and liquidity premia for maturities up to 30 years. We are investigating the price discovery for these BEIR between the swap and the bond market implying that there exist an arbitrage relation. Preliminary results show that the BEIR derived from swaps lies unanimously over the BondBEIR. This is in line with previous literature assessing the spread of the swap over the bond market with tailoring premia, counterparty risk and liquidity considerations. Further extensions might comprise announcement effect of inflation news on inflation expectations which can be analyzed within the high frequency data framework.

Real estate prices, consumption and monetary policy

Real estate play often a major role in an individual's as well as in an aggregate wealth portfolio and the behavior of house prices account for a large fraction of business cycle activity through their effect on household expenditure. Of particular importance from a policy perspective is an understanding of the monetary and real factors that drive house prices.

- The project "**Demographic Changes and Real House Prices**" by **Weth and Schich** (OECD) analyze an important demand factor for housing over longer horizons: "shifts in demographics". They argue along the lines of the literature that when a large population cohort is working and accumulating assets for financing retirement incomes, their demand for wealth is high, and this demand raises the price of financial and real estate assets. The envisaged study will explore in depth the relationship between summary measures of demographic structure and the (real) returns to investors holding real estate, controlling for developments in real

income and user costs of home ownership. The work suggested here examines the relationship between demography and real estate returns across a panel of countries.

Topics in Financial Asset Prices and Institutions

Risk aversion is a fundamental determinant of asset prices. Aversion to risk gives rise to a risk premium, which consists of an expected extra return that investors require to be compensated for the risk of holding specific financial instruments. In credit markets, the observed credit spread in corporate bonds exceeds the expected loss derived under risk neutrality. In options markets, the preference-weighted probability of future declines in stock prices exceeds the statistical probability of such declines by a sizable distance.

- The project by **Craig, Keller, Scheicher** on “**A comparison of risk aversion in equity options and credit default swap premia**” extract information about risk embedded in derivative prices. The purpose is to compare the risk aversion in the credit market and in the stock market. In both markets we obtain our estimate of risk aversion by comparing information extracted from asset prices under the assumption of risk-neutrality and estimates based on a preference-free, i.e. “objective” measure. In parallel, equity risk aversion is estimated by comparing density estimates obtained from equity index options with those based on historical stock returns.
- Related to this paper is a project carried out by Uhlenbrock, who aims at evaluating feasible indicators of the “risk appetite” of investors in financial markets.¹

The understanding of the forces driving speculative bubbles is still rather poor. Research into the causal connections seems therefore needed, in particular if policy makers should be able to act on such linkages. The behavior of professional analysts may give hints, whether bubbles can emerge.

- The project by **Baltzer** on “**Characteristic, colleague or company: What determines individual analysts’ earnings forecasts in Europe?**” looks at determinants of financial analysts’ earnings forecasts within Europe. It differentiates between individual characteristics and impacts that apply to all analysts and are sometimes prematurely subsumed as herding effects. The project tries to disentangle the latter and show that they are influenced by macro-economic outlook, past stock returns, and consensus earnings forecasts. First results show that determinants’ explaining power for analysts’ forecasts do change over the fiscal year; i.e. the more private information the analyst gets the less he relies on publicly available information. Moreover, preliminary results confirm prior research that working as analyst in Europe differs from working in the US.

Institutional investors may also influence the level of stock market prices. According to Allen and Gale (2000) institutional investors like pension funds have an incentive to take excessive risks if the downside risk of poor investment decisions is limited

¹ „Risk Modelling and Financial Markets“

leading to stock market bubbles. Empirical evidence on the relevance of this argument is missing.

- The project “**Determinants and implications of investment funds’ cash holdings – a panel-econometric analysis of Bundesbank investment funds data**” by **Dötz and Weth** uses a panel dataset of German investment funds’ balance sheet positions in order to analyze the role of cash holdings – which can be regarded as an important instrument of risk management. The project focuses on the question whether liquidity positions vary over time and thereby reflect changes in the risk appetite of fund managers in periods of rising and falling asset prices. Moreover, this analysis allows an assessment of whether or not their activities tended to reinforce market trends and potentially had destabilizing effects. (See also related projects in the group “Financial Stabilities”.)

Exchange Rates and Market Microstructure

In spite of many years of extensive research short-run exchange rate fluctuations still remain difficult to explain. The microstructure approach attempts to make progress in this respect by stressing the role of asymmetric information on foreign exchange markets. Of course, currencies are traded in opaque market consisting of a number of competing segments, which may allow for price discrimination. Moreover, a segmented market structure implies that information aggregation tends to be slow (Reitz, Schmidt, Taylor, 2007), which probably gives rise to exchange rate predictability.

- The aim of the research project by **Reitz, Schmidt, and Taylor** is to incorporate market power considerations in an otherwise standard microstructure model of FX trading. Assuming a two-tier market structure consisting of a customer segment and an interdealer segment to which only market makers have access may give rise to the possibility of price discrimination. The authors’ goal is to provide a theoretical model of foreign exchange pricing that accounts for market power considerations and to analyze a database of the trades of a German market maker and his cross section of end-user customers. The results are supposed to shed light on puzzling empirical findings such as dealers tend to earn lower average spreads on trades with financial customers than commercial customers, even though the former are perceived to convey exchange-rate-relevant information.
- A project on exchange rate forecasting by **Reitz and Schmidt** revisits the Evans and Lyons (2005) results who found that order flow is able to outperform both naïve random walk forecasts as well as a standard uncovered interest parity macro model at forecast horizons up to 20 trading days, respectively. As the authors’ database comprises six years of segmented daily end-user order flow from a major player in FX markets it is far from clear to which extent the average dealer might benefit from his order flow. Investigating the forecasting performance of the tick-by-tick data set of a German trader may help to assess the information content of an average dealer’s order flow.

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Research group

“Corporate Finance, Household Finance and Monetary Transmission”

JEL Codes: G3, D1, D2

Members: Ulf von Kalckreuth* (coordinator), Tobias Schmidt*, N.N.*, Nikolaus Bartzsch, Elmar Stöß

Advisors/visitors/cooperating researchers:

Jörg Breitung (Bonn), Gert Wagner (SOEP, Berlin), Axel Börsch-Supan (MEA, Mannheim), Joachim Grammig (Tübingen), Uwe Walz (Frankfurt), Leonid Silbermann (Frankfurt), Helmut Stix (Vienna), Rüdiger Bachmann (Michigan), Christian Bayer (Universität Bonn)

General interest and Policy Relevance

Financial conditions of firms and households, the financial decisions they take and the interaction of these decisions with real investment, saving and consumption are key elements in the transmission of monetary policy. Their study is one of the analytical cornerstones of monetary policy. Furthermore, a clear theoretical and empirical understanding of firm and household finance is indispensable for any discussion on the evolution of the financial system and its consequences. In order to analyse the decisions of economic entities, it is insufficient to look at aggregates only. Aggregates mask the heterogeneity of agents, and are prone to simultaneity problems that disappear once the reaction of individual decision makers to changes in their economic environment can be observed. Therefore, in central bank research all over the world, it is the aim of micro-econometric research to deliver the empirical underpinning to macro-modelling – whether representative agents are assumed or heterogeneity is explicitly modelled. Ultimately, the reaction of economic agents with respect to certain data changes will be asymmetric and depend on their economic position. In order to assess the effect of interest rates changes on household or firm insolvencies it is clearly useless to know the *average* indebtedness, as household debt is concentrated and only the highly indebted households are likely to fail. Any stress-test type of analysis needs *distributions* as analytic raw material, as the effect of asset price or interest rate changes crucially depends on who holds the asset or the debt. This is true in times of crisis even more than when the system is in the neighbourhood of equilibrium and linearization may work sufficiently well.

Recent Work

The year 2008 was dominated by work related to the participation in **two household survey projects**. First, in a joint project with Bundesbank departments H (Cash) and Z (payment systems). The group was actively involved in all stages of a survey on **cash demand** and the choice of payment instruments, combining a traditional CAPI instrument with a household diary on payments. Extremely valuable experience on

survey design, survey methodology and data preparation was an important by-product of this work. Actively shaping the data generating process creates unique research opportunities. Instead of going the usual way of starting with an existing dataset and then thinking of interesting questions that can be worked at using these data, the group was able to start with the questions and shape the data accordingly. The resulting dataset is of high quality and its econometric use is under way.

On an even larger scale, the same set of opportunities is associated with the second survey project, working out the German contribution to the **Eurosystem household finance and consumption network (HFCN)**. The HFCN aims at creating an encompassing survey on household finance and wealth that will be conducted in all Euro area countries in a decentralised way, with a common harmonised core questionnaire and complementary national modules. The Bundesbank plan features a full panel with a frequency of two years. Refining the questionnaire and pretesting the instrument in a large pilot study in spring and summer was extremely time consuming, but the group was able to show that, against all odds, a survey of this type is feasible in Germany. In September 2008, the Governing Council of the ECB agreed that the common survey will be implemented over the next years, and all member countries plan to participate. As of today, carrying out the field phase of the first wave in spring 2010 seems realistic. The current state of the project, the pretest results, and their usefulness for preparing the future survey are described by von Kalckreuth (2008), Schmidt and von Kalckreuth (2008) and Schmidt (2008). The group is cooperating with researchers at SOEP, a large socioeconomic panel survey situated at the DIW in Berlin, as well as MEA, an institute at the University of Mannheim headed by Axel Börsch-Supan. For Bundesbank research, with little prior experience in survey design and conduct of its own, preparing a large scale survey is a considerable challenge, but one from which a lot is to be gained for the future. The research group's current activities in this area is a time consuming, but highly productive investment in infrastructure and competence for future research.

Concerning **firm behaviour and corporate finance**, three projects were finalised. As part of a series of papers that identifying the effects of financing constraints on investment using direct information from surveys, von Kalckreuth (2008a) develops a set of methods for estimating models of state dependent adjustment in a panel context when the target is partially unobserved, and von Kalckreuth (2008b) applies the new methods on investment survey data, working out the aggregate consequences of state dependent adjustment speed. These two papers are the capstone of von Kalckreuth (2008c), a habilitation thesis at the University of Mannheim. Schmidt, Schwiebacher and Sofka (2008) shed light on the role of asymmetric information and information gathering for the innovation process in firms. These results will be helpful in analysing the relationship between firms and banks, as information asymmetries are crucial in this respect.

The knowledge gap

As to firm finance, the interaction of financing and real activity – innovation, investment, and hiring – in bank-based Germany is still imperfectly understood. Furthermore, Germany's financial system is undergoing a transformation that is driven by

economic integration and globalisation. A proper understanding of the relationship between financing alternatives and real activity is more important than ever.

Household finance, the second focus, is of increasing interest, not only because of the imminent availability of encompassing and internationally comparable research data as a result of the HFCN activities, but also as a consequence of the financial crisis. With the ongoing turmoil, the role of fluctuating asset prices for saving and consumption of private households will become more relevant for policy oriented economic research. The financial vulnerability of households to possible real estate booms and busts in some European countries has proven to be an important aspect of this question. Furthermore, the demographic revolution is feeding through all aspects of economic life and makes it crucial to understand the life cycle patterns of wealth accumulation and portfolio structures.

At the borderline between traditional corporate finance and household finance is retail finance, a new and promising research area. How are financial instruments tailored to customers, what are the market structures in which they are sold and what are the aggregate consequences? The financing of housing equity and the German market of structured financial product ("certificates") are both topical and under-researched areas.

Current and future research projects

A. Firm finance and monetary transmission

Two new micro datasets have been created by matching large firm level survey data to accounting information from external and internal sources. One survey concentrates on investment, the other on innovation. This is an important and rather unique research instrument, giving direct access to the joint endogeneity of investment, innovation and financing behaviour. It will take time and effort to make appropriate use of these data. In part, this will be joint work with Leonid Silbermann and Uwe Walz. We are also actively looking for external researchers that may cooperate in the exploitation of these data. Another project by von Kalckreuth and Silbermann studies the demise of the German Neuer Markt by analysing the incentives of firms and their economic behaviour.

A project by two external visitors, **Rüdiger Bachmann and Christian Bayer** is close to its finalisation. They use the uniquely broad and representative information of the USTAN annual account database with the aim of studying **business cycle characteristics of higher moments** of the cross section for important economic variables, such as investment, sales and TFP shocks. This sheds light on the extent to which countercyclical firm-level risk can produce or amplify business cycles, and on the importance of micro-level lumpiness in explaining investment dynamics. More generally, the results contribute to the understanding of how aggregate shocks are propagated through micro-frictions and general equilibrium price movements.

B. Household finance and monetary transmission

Participation in the euro area research network on household finance and consumption (HFCN) has introduced a major new focus in Bundesbank research. However, currently the group's capacity to take on new projects is rather low, as highly demanding statistical work has to be done in connection with building up the new survey. The small number of active Bundesbank researchers does not match the importance of its focus topics, and the group has to rely on external cooperation and visitors.

On the basis of household diaries coupled with traditional questionnaires, von Kalckreuth, Schmidt and Stix (OeNB) are working on a **micro-econometric analysis of cash demand** as well as on a two stage-model for the selection of payment instruments: what governs the decision to acquire certain non-cash means of payments (credit card, electronic cash) in the first place, and what are the transactions in which they will be used. Preliminary work and first estimates have proven the high quality of the dataset and its ability to identify the key mechanisms.

In a longer-term endeavor, the group wants to address the **bidirectional links between aggregate outcomes on the one hand and the various types of heterogeneity found** at the household and the firm level. For that purpose, it is necessary to work with models that describe economic behaviour of individual agents in an equilibrium framework. Such models help to "translate" the results of micro level research into their macroeconomic implications and foster communication between micro data experts and researchers mainly interested in aggregate data.

Currently we start a discussion about interesting research questions in the framework of the HFCN. The outcome is still open. From our perspective two promising projects on **homeownership in Europe** and on **income distribution in a globalised economy** are worth to be investigated.

Buying a home is usually the largest investment a household makes over his lifetime. It is also linked to substantial mortgage debt. By definition, indebted homeowners are more vulnerable to interest rate changes and house prices shocks. It is a well known fact that home-ownership rates in Germany are extremely low both in the Euro area context as well as compared to other developed countries. In a comparative study, von Kalckreuth and Schmidt aim at understanding the determinants of home-ownership in various Euro-area countries.

A related question deals with the shift of the personal distribution of household income in advanced economies. Von Kalckreuth and Ziebarth (2007) have investigated the effects of international integration on *functional* income distributions in a Ramsey-type representative agent growth model. The analysis of *personal* income distributions is characterised by the fact that most households receive both capital and labour income. Working out the dynamic effects of factor price shocks on the personal income distribution thus calls for data on wealth distributions and a heterogeneous agent model for simulation purposes.

Which of these projects will be realised depends on the outcome of the HFCN debate.

C. Related work in other research groups

Under the umbrella of "Money and Monetary Policy", Markus Schmidt and Nikolaus Bartzsch investigate the dynamics of the household sector's portfolio structure, with the aim of developing an aggregate portfolio model. Within the same research group, Marc-Peter Radke works on a macro model that explicitly comprises balance sheets of all institutional sectors and, on that basis, models portfolio decisions. Finally, within the group "Monetary Policy & Asset Prices" Mark Weth and Sebastian Schich are exploring the role of age structure variables in the long-run relationship between real residential house prices, real per capita income, and interest rates in a panel of 18 OECD countries. In the group "The financial system: Structural issues and its changes" a projects on the effects of the current financial crises on the real sector is planned.

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Research group

“Fiscal policy interactions with monetary policy, capital markets and the real sector”

JEL Codes: E32, E42, E44, E62, F33, F37, G10, G12, G15, G18, G61, H61, H62, H63, H74

Members: Nikolai Stähler* (coordinator), Mathias Hoffmann, Gerrit Köster*, Michael Krause, Alexander Schulz, Dan Stegarescu*

Advisors/visitors: Eric Mayer (University of Würzburg), Stéphane Moyen (ECB), Guntram Wolff (EU Commission)

General interest and policy relevance

Fiscal policy interacts in various ways with monetary policy, capital markets and the real sector. Fiscal and monetary policies are linked inter alia through the intertemporal budget constraint, and the requirement that, in the long run, the discounted sum of government expenditure does not exceed the discounted sum of its revenues. If regular revenues are found to be insufficient, governments might put pressure on the central bank to create seignorage and inflation. Since in a monetary union the incentive for national governments to make use of expansionary fiscal policies increases, the Maastricht-Treaty acknowledges the importance of sustainable public finances and potential political economic biases, and provides a number of institutional provisions aimed at preventing unsustainable fiscal policies. The analysis of fiscal policies and institutions is thus of great importance to central banks in Europe. Public finance developments also have a significant impact on capital markets (e.g. demand for and supply of capital, aspects of risk premia and the stabilization of financial markets) and on real developments. Similarly, structural fiscal reforms have important macroeconomic repercussions and implications for the conduct of monetary policy (e.g. by influencing potential output). Overall, the topic is a great challenge for theoretical models as well as empirical work. The aim of this research cluster is to shed light on **selected** aspects of these questions.

New research findings

Since the publication of the last research program, several projects have been finished which (a) investigate aspects of the relationship between fiscal policy and developments on the capital market and (b) analyze some proposals which have been made to reform fiscal policy in order to obtain sustainable fiscal policy in the presence of a deficit bias. More specifically:

Schulz and Wolff (2008a) present a comprehensive data set of all bonds issued by the sixteen German states (Länder) since 1992 and employ this new dataset to describe the spread between Länder bonds and Federal paper (Bunds). Furthermore, they document that the German Constitutional Court's denial of additional aid for the Land of Berlin has not altered the risk assessment of financial markets towards the

German Länder. In the data section, the quantitative analysis reveals that Länder follow different issuing strategies: while some concentrate to a greater extent on large issues or issue joint bonds with other Länder (Jumbos), others rely more on comparatively small but frequent issues. Moreover, some Länder issue a significant volume-share of their bonds in foreign currencies. Based on this unique dataset, they demonstrate that spreads to the Bund are mainly driven by risk aversion and liquidity, while fiscal determinants have an economically negligible impact. (Cooperation with research group “Monetary Policy and Asset Prices”).

Schulz and Wolff (2008b) disentangle different driving factors of sovereign bond market integration by studying yield co-movements of EMU countries, the UK, the US and 16 German Länder in the last 15 years. At a low frequency of weeks, bond market integration has increased gradually in the course of the last 15 years in EMU countries, as well as the UK, the US and the German Länder. The euro and increasing international capital flows, appear to drive low frequency integration. In contrast, yield adjustments to changes of the German benchmark bond at high frequencies, i.e., 2 days, remain relatively low until October 2000, when a sharp increase in integration can be observed in all samples. The increase in high frequency integration can be attributed to electronic trading platforms becoming functional. The change-over from national currencies to the euro can not explain the dramatic increase in high frequency integration. (Cooperation with research group “Monetary Policy and Asset Prices”).

In a dynamic model of fiscal policy, Stähler (2008) investigates the effects of automatic tax increases due to deficits, as has been proposed by the German Council of Economic Experts (among others). In the model, social polarization provokes a deficit bias. He shows that deficit taxation reduces the deficit bias as it internalizes the externality which different lobby groups impose on others. Notably, the mechanism described in the paper is, in contrast to most of the existing work, not due to the political risk of being voted out of office due to the private sector’s dislike of taxation. Lower government spending and the resulting reduced deficit bias augment capital accumulation.

Planned projects and ongoing research

One section refers to the **interaction of fiscal policies with the real economy** on a mainly theoretical basis and highlights the strengths and shortcomings of existing literature. Motivated by a rising awareness of fiscal policy for stabilization purposes (see Gali et al., 2007, IMF 2008, Mayer and Grimm 2008, and Stehn and Vines 2008), special emphasis is given to the question of which impact several kinds of fiscal rules have on the economy under different circumstances. Mayer and Stähler are developing a DSGE model for a closed economy with New Keynesian elements and implement three different fiscal rules: the balanced budget rule, the debt brake in line with what is being executed in Switzerland and proposed to be implemented for Germany by the German Council of Economic Experts and a debt brake with (more active) built-in stabilization in line with how automatic stabilizers are conventionally modeled in the literature. We are able to show that the debt brake seems to perform quite well both in terms of steering effects and in terms of welfare. In addition, Moyon and Stähler plan to extend this work and to develop a medium-scale version of a New

Keynesian two-country currency union DSGE model (as Leith and Wren-Lewis 2006) with a labor market structure in the style of Mortensen and Pissarides (1994) to assess the role of tax structure heterogeneities. More precisely, we plan to analyze what effect unilateral fiscal policy reforms, i.e. a permanent change in the tax structure of a union member country, have in the long run and whether it transmits to the economy in the short run. The ultimate goal is to get enough insights of fiscal policy in DSGE models to integrate a well-behaving fiscal block in the new Bundesbank DSGE model. (See also the Research Group on frictions in goods, labor and financial markets for business cycles and monetary policy.) In the more distant future, we plan to use this type of model to analyze questions related to fiscal policy in a currency union. One aim is to use such a DSGE model to analyze fiscal reforms. If possible, we also want to extend the model to analyze question relating fiscal policy to capital markets and yield curves in cooperation with the research group “Monetary Policy and Asset Markets” (for more details, see the description of their research program).

In relation to this, various approaches are followed to assess the **empirical effects of tax reforms on the real economy**. It is widely known that fiscal policy influences real economic activity through government spending, but also through changes in the fiscal levy ratio. While changes in expenditures can be estimated fairly well with statistical methods, fiscal shocks resulting from changes in the tax and contribution ratio are by far more difficult to assess. A newly developed data set, which includes all legislative changes in tax and contribution rates in Germany from 1964 until 2008, enables us (Köster) to use alternative empirical methods to analyse the effects of changes in the levy ratio. These effects are to be investigated in the light of the new dataset using different methodologies. First, it should be tested how the change in the levy ratio has affected economic growth following a study by Romer and Romer (2007a,b). Second, in a VAR analysis, a robustness test of the results is to be conducted (based on existing literature such as Heppke-Falk, Tenhofen and Wolff 2007). We also want to analyse if there is a difference in the effects between anticipated and unanticipated fiscal reforms (see also Tenhofen and Wolff 2007, and Mertens and Ravn 2008). In a third step, we want to construct a DSGE model with anticipation, in which the relevant parameters are estimated by adjustments from comparing the impulse response functions of a VAR analysis with those from the model. This can mainly go alongside the study of Mertens and Ravn (2008).

Another research section will investigate the **German fiscal federation** more closely. The purpose of the project (Stegarescu) in this section is to investigate the **development of the government finances** of the different German Länder over a long period of time. Based on this, an empirical panel analysis will be carried out in order to determine the factors driving public finance developments. The results will also be used to compare the empirical validity of different hypotheses of the political economic literature concerning the determinants of public deficits. This project should, in particular, contribute to explaining why, despite similar institutions, extensive federal legislation in most areas and nearly completely equalized per capita revenues, the fiscal stance of the different Länder is increasingly diverging. The project is intended to complement recent literature such as Berger and Holler (2007), Galli and Rossi (2002), Joachimsen and Nuscheler (2007), Margraf (2008) and Potrafke (2007). The time-consuming data collection process has just been completed and first estimates are about to be run.

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Research group

“The role of frictions in goods, labor, and financial markets for business cycles and monetary policy”

JEL Codes: D5, E2, E3, E4

Members: Michael Krause* (coordinator), Rafael Gerke, Felix Hammermann, Johannes Hoffmann*, Mathias Hoffmann*, Daniel Radowski*, Michael Scharnagl*, Harald Stahl, Nikolai Stähler*, Kerstin Stahn*

Advisors/visitors: Holger Bonin (ZEW Mannheim), Thomas Laubach (Johann Wolfgang Goethe-University Frankfurt), Thomas Lubik (Federal Reserve Bank of Richmond), Harald Uhlig (University of Chicago), Fang Yao (Humboldt University)

General interest

This research group's focus is on the general equilibrium effects of microeconomic frictions, both to understand their long-run effects (say, on structural unemployment and growth), and their short-run effect on business cycle adjustment. Frictions affect the adjustment of the economy to both aggregate shocks and monetary policy. For example, in product markets, sticky prices can lead to excessively volatile output in response to shocks, which in turn calls for monetary policy to mitigate these effects. In labor markets, frictions in the process with which unemployed workers find jobs can lead to unnecessarily high unemployment. The same holds for wage rigidities. In credit markets, difficulties to monitor the activity of borrowers may make lending depend on their net worth, which is cyclical, and thus amplify macroeconomic fluctuations.

These and other frictions are of particular interest for the study of the German and Euro area economies. For institutional reasons, European economies feature legislation and regulation that partly increase the effects of frictions or introduce new ones. For example, most countries in Europe have labor market regulation aimed at providing job security and income support during unemployment. The extent of these regulations goes beyond what the Anglo-Saxon economy have chosen to implement. Similarly, credit and product markets still face structures different from those in the U.S., and often regarded as uncompetitive.

Macroeconomic models that take into account a variety of frictions are crucial for policy analysis. Most suitable in this respect are dynamic stochastic general equilibrium (DSGE), that have found increasing use at central banks and other policy institutions. These models have microeconomic foundations and are internally consistent representations of the macro-economy, and therefore allow to incorporate empirical and theoretical findings on frictions at the micro-level. Therefore, the development of DSGE models for policy analysis at the Bundesbank is taking place in the “frictions” research group.

Recent Research at the Bundesbank

Many resources of this research group were used to develop and estimate a DSGE model which can be a kind of workhorse to analyse policy-oriented questions related to the German and the European economy. Furthermore research was directed to several questions related to frictions in the labor markets not least because members participated in the ESCB research network on wage dynamics.

Moser and Stähler (2008) present a two-sector search model, in which one sector is more productive than the other one and, thus, pays higher wages. In such a framework, a minimum wage in the unproductive sector to reduce the wage gap causes a negative spillover effect on the productive sector, through the distortion of search effort. **Baumann, Mechtel, and Stähler (2008)** investigate which effects the strictness of employment protection legislation has on the emergence of temporary agency work. They conclude that the rapid growth in the temporary work sector is more likely to be explained by other reasons such as short-term labor requirements rather than as a substitute for regular employment to save on firing costs, as is often claimed. **Bonin and Radowski (2008)** used new survey evidence to analyse the extent of wage rigidities in manufacturing and the service sectors and the reasons thereof.

New work by **Krause, Lopez-Salido, and Lubik (2008a, 2008b)**, building on Krause and Lubik (2007) has explored empirically which shocks play a role for inflation dynamics once we allow for labor market search frictions. They identify real demand shocks (due to markup variations) as the main driving force. This points at cyclical variation in product market competition as an important factor in inflation dynamics and labor market volatility.

Naturally, the volatility of aggregate output is the outcome of an interaction between the shocks that hit an economy, the policy response to these shocks, and the structure of the economy. Since the 80s, most developed economies have experienced a substantial decline in output volatility, known as the “Great Moderation”. Different authors attribute this decline with varying weights to “good luck” (i.e., less volatile shocks), to “good policy” (mainly better monetary policy), or to structural changes, such as the reduction in labor market frictions, due to labor market reforms. **Claudia Buch, Jörg Döpke, and Kerstin Stahn (2008)** have studied this phenomenon at the micro-level, using a panel dataset on German firms that covers 35 years. They isolate the idiosyncratic component of firms’ real sales growth from macroeconomic impacts. The authors find that unconditional firm-level volatility and aggregate (GDP) output volatility in Germany have a similar downward trend over time. By contrast, the conditional, idiosyncratic firm-level volatility exhibits a rather flat time profile; if anything, it shows a weak upward trend. Thus while there has been a “great moderation” of volatility at the macro-level, volatility at the micro-level has persisted. This may indicate that “good policy” was important for the great moderation.

Open Questions and Research Projects

The research group aims to proceed in several directions.

DSGE Modelling

On an applied level, many members are involved in the **development and extension of a suite of DSGE models** usable for policy analysis. Work in this area is partly within a DSGE network that spans across various research groups. To this end, Mathias Hoffmann, Michael Krause, and Vivien Lewis (now University of Ghent and Belgian National Bank) have set up a baseline closed economy sticky price model, which is to serve as the core of all future developments, and thus ensures comparability of results. The extensions go in various directions. One (by Hoffmann and Krause) is a three-region model with German economy, the European Monetary Union, and the rest of the world. This model is usable for specific questions where interaction between the rest of the Euro Area and Germany matters, or where the effect of global shocks, such as oil price shocks are important. In this framework, M. Hoffmann and Krause work on an assessment of monetary policy responses to global oil demand and supply shocks. A second extension (in collaboration with the research group on fiscal policy) is to incorporate details of the government sector, including distortionary taxation, and fiscal policy rules. In the area of credit markets, joint work with the “money” research group is aimed at including financial market imperfections and monetary aggregates into the baseline DSGE model.

DSGE models for policy analysis are mostly calibrated, especially when incorporating a larger number of sectors or international linkages. Key insights are not likely to depend on small differences in parameter values that a full-information likelihood estimation of such a model may show relative to calibration. However, for the general quantitative credibility of policy simulations as well as for forecasting purposes, estimation is indispensable. Therefore, Hoffmann, Krause, and Michael Scharnagl work on the estimation of the DSGE baseline model and explore its usability as a forecasting tool.

On a more general level, work with **Thomas Laubach** of the University of Frankfurt aims at exploring **deviations from the full-information rational expectation assumption** using in DSGE models. For example, learning by agents has been found to increase persistence in the short-term fluctuations in macroeconomic aggregates without assuming ad hoc frictions that do not have a proper micro-foundation. This will have also consequences for the monetary policy strategy (see also the money and monetary policy group).

Product Market Frictions and Inflation Persistence

Work in the area product market frictions focuses on **inertia in price setting and aggregate inflation**. While macroeconomic models include price rigidities, the microeconomic evidence on price setting is at odds with the stylized macro-assumptions made in many models. **Johannes Hoffmann, Daniel Levy and Arvichai Snir** (the latter two from Tel Aviv University) analyse the effects of the recent value added tax change in Germany to obtain deeper insights into price setting. Since this tax change was announced in advance, it promises to provide important new insights into price setting.

Fang Yao (Humboldt University) is working on a project explaining the role of lagged expectations in a New Keynesian Phillips-Curve by a model which explains inflation persistence intrinsically.

Labor Markets

As a follow-up to the research by **Bonin and Radowski** in 2008, a second project uses matched employer and employee data to analyse **firms' wage setting** and employment policies over the business cycle.

The research on aggregate labor market frictions also proceeds partially in the context of the Wage Dynamics Network. **Istvan Konya** (of the Hungarian National Bank) and **Krause** have surveyed and extended research on the role of wage stickiness in models with search frictions. The issue here is that real wage rigidity helps amplify unemployment volatility to a realistic one only if it pertains to the wages of newly hired workers. If, say, favourable labor market conditions feed immediately into wages when they are negotiated the first time, firms would not want to hire much in the first place. How rigid wages for new hires actually are is still debated in the academic literature. Konya and Krause contribute to this question by estimating a **DSGE model with frictions and wage stickiness** to let the data decide on the aggregate degree of rigidity of new hires' wages, pointing at less but still significant rigidity than for wages in ongoing employment relationships.

The volatility of output and productivity depends on how aggregate hours evolve in response to shocks. **Krause and Lubik** explore the issue of aggregate hours volatility when there are labor market frictions. Since frictions slow down the adjustment of employment, part of the cyclical labor input adjustment is due to changes in hours per worker. The problem is that the search and matching model predicts a far too high volatility in hours per workers. Bayesian estimation of such as model is aimed at uncovering which frictions and shocks are most likely to have contributed to observed aggregate labor market fluctuations. Preliminary results point at both markup and technology shocks. The research also shows a general difficulty in identifying certain structural parameters that govern volatility.

Julen Esteban-Pretel (of the University of Tokyo) and **Krause** work on a related project that aims at understanding **differences in the hours and labor adjustment** in Japan and other developed countries, such as the US and the Euro Area. Japanese labor market adjustment is dominated by adjustment in hours per worker.

Finally, ongoing work by **Krause and Harald Uhlig** shows how the **German labor market reforms of 2005** have changed labor market outcomes. In models that allows for skill depreciation after job loss, it can be shown that lowering unemployment benefit and their duration reduces unemployment through two channels: one is the direct effect on search incentives by workers whose unemployment income has fallen. The second is an indirect effect on job creation: firms have increased incentives to post new job openings because they are more likely to be filled, and secondly, the wages paid to workers are relatively lower. However, the fact that the labor market tightens mitigates the wage loss for workers, and makes job finding easier.

Financial markets/fiscal policy

In the area of financial markets, research at the Bundesbank has so far been concentrated at the micro-level both empirically and theoretically, macroeconomic aspects were analysed with regard to issues of systemic risk in the banking sector. Up to now, the macroeconomic literature in this area is still in its infancy. The aim of the research group is to build on existing approaches and to work towards **integrating financial market frictions in DSGE models**. The long-term aim is to develop models that give banks a realistic role in the transmission of shocks and policy. Furthermore, it is hoped that this approach will allow an integrated understanding of the role of money and credit.

Rafael Gerke and Felix Hammermann (both from the 'money' research group) work on incorporating a financial accelerator in the standard New Keynesian DSGE model, and enrich the framework with a banking sector, along the lines of Goodfriend and McCallum (2007), and Canzoneri, Cumby, Diba, and Lopez-Salido (2007) (see more in the programme of "Money and monetary policy"). Furthermore, **Krause and Skander van den Heuvel** (of the Federal Reserve Board of Governors, Washington D.C.) have begun a project on incorporating bank balance sheets and banks' deposit creation and lending activities into a general equilibrium framework. Finally the "financial structure group" considers projects on the relationship between the financial system and the real economy, e.g. the relevance of the financial system for economic growth.

Topics related to fiscal policy and analysed in a DSGE framework are described in the programme of the fiscal policy research group (see projects by **Mayer and Stähler, Moyen and Stähler**).

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Research group

“Forecasting and Monetary Policy”

JEL Codes: C5, E32, E37, E47, E58, F41, F47, C61

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General interest and Policy Relevance

Forecasting is nowadays a central element in the decision-making process of central banks. Because of lags in the effects of monetary policy on macroeconomic activity, monetary policy cannot affect current inflation and output. Owing to these lags, it is widely recognised that monetary policy should be forward-looking and, as a consequence, monetary policy decisions are to some extent dependent on forecasts.

As part of their communication strategy, many central banks have decided to publish their forecasts in order to increase transparency and to guide expectations of future monetary policy actions. For this reason, the quality of the forecasts is crucial not only under reputation aspects but also for reasons of policy effectiveness.

For forecasting, many central banks typically follow full-information strategies in terms of a broad set of monitored time series and econometric models. The advantages of such a wide approach are that potentially important information is not left aside and that model uncertainty is taken into account. The group of models used at central banks, often called a suite of models, typically contain quite different models in terms of variable coverage, econometric rigour and economic theory incorporated, see Andersson and Lof (2007) as an example for the Sveriges Riksbank.

In the monetary policy strategy of the Eurosystem, projections of key macroeconomic variables play an integral part. The Broad Macroeconomic Projection Exercises (BMPE) are carried out in collaboration of the ECB together with national central banks of the euro area and results are published twice a year. In line with other central banks, these forecasts are published as forecast intervals rather than point forecasts to account for the forecast uncertainty due to model, estimation and data uncertainty.

Due to this important role of forecasts, the Bundesbank and the other members of the Eurosystem have a natural interest to apply modern forecasting models and methods and regularly refine the current practice of forecasting. As an integral part of the research activities, the ECB, the Bundesbank as well as other national central

banks of the Eurosystem regularly organise workshops and conferences to discuss new developments in the field of forecasting. The Bundesbank has also to contribute to the ESCB working group on “Forecasting” and on “Econometric Modelling”.

The research group “Forecasting and Monetary Policy” at the Bundesbank aims at evaluating and developing econometric models and methods for forecast purposes relevant for monetary policy in order to contribute to the best practice of forecasting in the Eurosystem and particularly at the Bundesbank. Whereas the research efforts in this area were concentrated on short-term forecasting of GDP in the recent years, in the future the focus of the forecasting group will be broader.

This may involve projects on the **development of the suite of forecast models employed in practice**, and ways to **combine forecasts** from the individual models. The group plans also to address alternative ways to extract the information content of forecasts when they are communicated to practitioners or the public. This includes the investigation of **forecast uncertainty** and its presentation as fan charts as well as the relative importance of individual business cycle indicators for forecasting and forecast revisions.

Recent Work at the Bundesbank

Existing Bundesbank research on forecasting comprises several areas:

The forecasting accuracy of large factor models has been investigated in different research projects in previous years, see Schumacher (2007), Eickmeier and Ziegler (2008). In the year 2008, the research group continued to work on factor forecasting topics, taking account of realistic problems with the data such as real-time data problems, mixed-frequency data and ragged-edge data problems due to different statistical publication lags, see Schumacher and Breitung (2008), Marcellino and Schumacher (2008). In addition, Breitung and Eickmeier (2008) have investigated methods for the detection of structural instabilities in factor estimation. Kuzin, Marcellino and Schumacher (2008) have addressed the gains of nowcast pooling, when many individual models and variables are available. In this project, factor models as well as other small-scaled projection methods, in particular mixed-data sampling (MIDAS) regression, have been employed.

In 2007 the Bundesbank published its macroeconomic forecast for the first time, including the degree of uncertainty and also considering specific risk scenarios. Against this background researchers were asked to evaluate and apply different methods, see Knüppel and Tödter (2007). Knüppel and Schultefrankfeld (2008) have investigated the risk assessment embodied in the fan charts of the Bank of England.

Furthermore, attempts were made in order to apply Bayesian techniques to consider model uncertainty. In Scharnagl and Schumacher (2007), forecasting inflation in the euro area is discussed using possibly many different indicators. The paper introduces a new way to measure the relevance of groups of indicators for forecasting.

Finally, research projects on alternative forecast techniques were carried out. Kurz-Kim (2008) proposes a generalized autoregressive framework, where information from all possible frequencies of an integrated variable are employed for forecasting. At the same time, optimal combination weights are provided to combine forecasts from the various frequencies. Therefore, the forecasting performance of the generalized autoregressive model is expected to be superior to that of the usual autoregressive model. Additionally, Kurz-Kim (2007) compares the forecasting performance of the single equation error correction model with that of the difference autoregressive model with exogenous variables. The main result of the paper is that the single equation error correction model produces superior forecasts for short horizons, but not for long horizons.

Ongoing and future projects

As forecasting models and methods forecasting is a highly active field of research, there is a continuous flow of new models and methods from the academia that require to be evaluated for potential use in regular forecasting practice in the Eurosystem and the Bundesbank in particular. Thus, improving the suite of forecast models used at the Bundesbank will remain one of the main goals of the group. In doing so, methods and models should be implemented in a user-friendly way in order to complement the existing methods used for regular forecasting exercises in the Bundesbank.

In line with this, the group will further try to **improve the suite of short-term forecast models** for German GDP. In this regard, the evaluation and development of small-scale forecast models relative to large factor models will be ongoing. In addition to existing methods, we will consider mixed-frequency VAR models, models and combinations of them (Kuzin, Marcellino, Schumacher).

Large factor models summarize the information content of over hundred of business cycle indicators. For practical purposes, it might be useful to investigate which indicators or group of indicators contribute to the forecast, e.g. whether hard indicators like industrial production matter more than soft survey data. A future project will thus discuss the role of individual business cycle indicators for forecasting by using contribution measures for factor models (Ruth, Schumacher). These statistics allow for a decomposition of the forecast revisions into the contributions of individual variables when new releases of data become available. In the same way, the reduction in forecast uncertainty due to new time series observations can be quantified.

Many factor models employed for forecasting mainly rely on national data. There is, however, a broad literature on international economics that is incorporates structural factor models, see for example Eickmeier (2007). Following this literature, two projects will investigate **the role of international data for forecasting**. One project investigates to what extent international information can help forecasting real economic activity in a small open economy like New Zealand (Eickmeier, Ng). The paper considers simple trade-weighted averages of foreign aggregates, as well as econometric methods such as principal components and partial least squares which implicitly account not only for direct trade linkages, but also for other linkages such as indirect trade linkages and financial markets. A similar project is concerned with the German

economy, where alternative methods of variable preselection in a factor model framework are applied (Schumacher). In case of significant improvements in forecast performance over the national models for Germany, it is envisaged to include it to the suite-of-models already in use at the Bundesbank.

It is envisaged to work more on **confidence intervals**. As many **forecast intervals** provided by central banks are not based on statistical methods, rather on judgement, it might be interesting to evaluate ways to bring the practice of computing forecast intervals more in line with econometric or statistical models used at central banks. In this regard, a project will investigate the construction of confidence intervals from past forecast errors using GLS regressions (Knüppel). Another project estimates dynamic factor models with Bayesian techniques (Kaufmann, Schumacher). The Bayesian approach provides a natural way to account for estimation and model uncertainty, and thus is able to provide confidence intervals for forecasts.

Furthermore, the applicability of **Bayesian methods for variable selection and model averaging** will be investigated in more depth with respect to forecasting of inflation in the Euro area (Scharnagl, Schumacher). As Bayesian simulation methods are computational burdensome, and in particular, if relevant variables have to be selected from a large set of indicators, the project will include an evaluation of efficient sampling methods. The work can also be extended to find methods for computing and confidence intervals for forecasts. There are also plans to extend the work to US data. The focus will be on the relevance of various subgroups of indicators, i.e. money, interest rates, wages, output, etc.

A project will provide a theoretical comparison of forecast methods with mixed-frequency and ragged-edge data (Marcellino, Schumacher). In particular, the project will investigate the restrictions imposed by the recently developed MIDAS approach.

A final project will extend the **generalized autoregressive framework** from Kurz-Kim (2008). So far, this framework does not take into account exogenous variables and multivariate relationships as well as mixed-frequency data. The project will evaluate to what extent the generalized autoregressive framework can take into account these issues relevant to practitioners (Kurz-Kim).

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Research group

“International Integration”

JEL Codes: F15, F21, F31, F32, F36, F4, C2, C3, C68, E3

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General interest and Policy Relevance

The research agenda of the group is focused on a variety of aspects of international integration as reflected in goods and financial markets by trade, business cycle co-movements, growth and output as well as inflation and price level convergence, international capital flows such as foreign direct investment (FDI) or portfolio flows, and, finally, the growing institutional interrelation such as the establishment of European Monetary Union (EMU) by itself. More specifically, the following **topics** are dealt with:

- 1) How can international integration be measured? How far has the international interlinkage of markets proceeded, especially in Europe and between Germany and other economies?
- 2) What are the determinants of international integration? Which international transmission and integration mechanisms are particularly important, and how can they be identified?
- 3) What are the consequences of the growing international integration for the German economy and Europe?

The degree and the pattern of international integration may affect the adequacy of monetary policy arrangements, institutions and instruments as well as the effectiveness of monetary policy. The significance of the group's objects among academics and political circles is exemplified by conferences like, for instance, the planned ECB council seminar on “Cross-country divergences in the euro area – increasing imbalances or equilibrium adjustment”. The financial crises has provoked a debate on a new international architecture. The group aims to contribute to this debate if appropriate.

Existing Work in the Bundesbank

Existing work in the Bundesbank already addresses the questions outlined above to some extent. Regarding **topic 1**, **Eickmeier (2008)** assessed economic linkages at

business cycle frequencies by analysing the degree of business cycle comovements and heterogeneity in the Euro area, using a non-stationary dynamic factor model.

Fischer (2008) considers a more specific aspect of international interlinkage, namely the degree of price convergence within the European Monetary Union (EMU). One of the benefits which had been expected from the foundation of the EMU, was a reduction of product price differences between member countries. Within EMU, the abandonment of national currencies should have raised transparency and should have eliminated all the costs associated with the exchange of currencies thus cutting transaction costs and narrowing the scope for deviations from the Law of One Price (LOP). Using the example of washing machines, Fischer (2008) analyses the degree of price convergence within the EMU. Fischer's findings suggest the existence of some convergence clubs in Europe but their membership pattern is unrelated to membership in EMU. Furthermore, he confirms earlier findings of significant deviations from the LOP in EMU.

Regarding the determinants of integration (**topic 2**) outside members of the FDI-research network contributed to the role of taxes for FDI. Moreover, **Jochem** (2008) assesses the link between international financial competitiveness and incentives to FDI. He computes a financial index of international competitiveness which is given by the ratio of the market value to the book value of inward FDI stocks and is thus related to Tobin's q . Comparatively high revealed incentives to invest in the assets of a given country should cause an influx of foreign capital. For a panel of five advanced economies from 1980 to 2006 it is shown that price competitiveness, stable inflation rates and registered patents have a positive impact on the index. Institutional factors like EMU membership or Anglo-Saxon legislation also play a role. Financial competitiveness in turn encourages FDI inflows whereas it benefits fixed investment relative to M&A. There is also some evidence that an innovative environment accelerates investment decisions by promoting competition among investors.

Several papers shed new light on the effect of global integration on the macro-economy and the consequences for economic policy (**topic 3**). **Herrmann and Winkler** (2008a) come to the conclusion that better developed and more integrated financial markets increase emerging market's ability to borrow abroad. The degree of financial integration within the convergence clubs as well as the extent of reserve accumulation are found to be the most significant factors to explain divergent current account balances and their dispersion in the catching-up countries in Europe and Asia. The impact of international financial integration on national price levels under different exchange rate regimes was examined in **Hoffmann and Tillmann** (2008). It is shown that the effect of financial integration, i.e. moving from segmented to complete asset markets, is exchange rate regime-dependent. Under managed exchange rates, financial integration raises the national price level. Under floating exchange rates, however, financial integration lowers national price levels. Thus, the paper proposes a novel argument to rationalize systematic deviations from purchasing power parity. A further analysis of optimal exchange rate regimes in view of the ongoing financial integration is carried out in **Hoffmann** (2008). Hoffmann shows that financial market integration causes a monetary policy trade-off between stabilising domestic goods prices as opposed to stabilising the terms of trade. Therefore, the welfare ranking of different exchange rate regimes changes during the process of international financial integration. In a number of papers, Hoffmann investigated the

implications of different exchange rate regimes for the macro-economic environment (cf. **Hoffmann and Holtemöller**, 2008, and **Hoffmann and Kempa**, 2008).

The relationship between globalisation and inflation is assessed in **Eickmeier and Moll** (2008). They utilised a principal component analysis to estimate common (and thus globalisation-related) factors as well as country-specific components to assess the global dimension of inflation. They find that inflation and its components strongly comove. Global shocks mainly affect inflation through the common components of changes in unit labor costs and through import price inflation. Another result is that, in the past, central banks have indeed reacted to common components of inflation and the output gap.

Finally FDI data were used by outside members of the FDI-network extensively to study their labour market effects in Germany and in host countries (e.g. S. Becker and M. Muendler: Margins of multinational labour substitution; S. Becker, K. Ekholm, M. Muendler: Offshoring and the onshore composition of occupations, tasks and skills).

Ongoing and new Projects

Within **topic 1**, the measurement of international integration, current projects focus on **financial and goods market integration**.

Concerning the equity capital market, it is claimed that European integration lags behind national integration *inter alia* because national mergers exceed cross-border transactions by quantity as well as by volume. Such a comparison may, however, underestimate the current state of intra-European financial integration because it ignores geographical distance as a determinant of merger activity. In their project “A home bias beyond national borders in merger activity in Europe? – What about the integration of the ‘integrated market’?”, **Frey** investigates whether the supposed “border effect” still exists if geographical distance is controlled for, and if so, how large it is, in particular in comparison with the United States. As a first result, he finds that borders lose their importance as a barrier to mergers within Western Europe.

Turning from financial to goods market integration, differences in inflation and the price level between different countries of EMU represent another type of “border effect”. **Lommatzsch and Fröhling**, on the one hand, plan to examine convergence of inflation dynamics in a cross-country analysis for EMU countries. A lack of convergence in this area may have been caused by a flattening of the Phillips curve, i. e. a decline in the sensitivity of inflation to the business cycle, possibly owing to the effect of globalisation on prices.

Fischer’s project, on the other hand, is concerned with price level differences. The recently found results on relative price movements within Europe between 2000 and 2005 will be complemented by similar analyses covering an extended observation period which spans 1995 to 2005 and thus includes the time of euro introduction at the start of 1999. Moreover, alternative hypothesis on the reasons for the observed relative price movements will be explored.

The relative importance of **real and financial barriers to international integration** in the form of exports and FDI is empirically analysed in **Buch, Kesternich, Lipponer and Schnitzer's** new project. They explore whether financial constraints restrict cross-border market entry in addition to the commonly acknowledged productivity-related real barriers. It is thus assumed that financial factors at the affiliate and at the parent level affect firms' foreign activities, both along the intensive and the extensive margin.

In a second project, **Lipponer** resumes earlier work on alternative channels of integration, specifically FDI and **cross border services of banks**. The provision of a new and comprehensive database on the assets and liabilities of German banks enables him to scrutinise his earlier findings of a complementary relationship between the two channels. The project will center around foreign positions of German banks as well as international bank lending and strives to develop, for this purpose, a simple model of an internationally active bank.

Eickmeier's project "**The international transmission of US shocks and a disaggregated analysis of the trade channel**" rather focuses on the role of trade for spillovers from the US economy and, in particular, the relative importance of direct versus indirect trade linkages. For this purpose, exports and imports are broken down into trade with different partner countries and regions.

Apart from studies on the determinants of trade, an in-depths analysis of trade flows represents another strand of research within the second topic. It is hotly debated, for instance, whether German trade has become some sort of entrepôt trade to such a degree that German exports hardly contain any domestic value added. This would imply that one cannot interpret the enormous trade surplus of Germany as a sign of the strength of the German economy (Germany as a "bazaar economy"). **Stirböck's** project "Slicing-up the production chain: intermediary goods imports" is planned to throw some light on the composition of German imports and its implications for integration.

Issues related to topics 2 and 3 are also dealt with by projects which are classified in some other research groups: A project in the group "Money and monetary policy" considers the impact of globalisation on monetary policy transmission mechanisms (cf Eickmeier, Lemke, Marcellino, Has the monetary transmission mechanism changed?). The group "Monetary policy and asset prices" comprises projects that investigate exchange rates as asset prices (cf the projects by Reitz and Schmidt). As part of the research group "The role of frictions in goods, labor and financial markets for business cycles and monetary policy", Hoffmann and Krause assess monetary policy responses to global oil demand and supply shocks in a dynamic stochastic general equilibrium model of the open economy. A project which is part of the group "Forecasting and Monetary Policy" (cf Eickmeier and Ng) finally explores whether the use of international economic data can improve a GDP growth forecast.

Within the framework of **topic 3**, **Harms and Hoffmann's** project "**Private foreign borrowing and the choice of the exchange rate regime**" deals with the impact of a specific form of international integration, liability dollarisation. The theoretical and empirical analysis should illuminate how liability dollarisation affects the decision of a

central bank to announce a fixed exchange rate regime and to defend it in case of exogenous disturbances, an issue which is of some interest regarding the new “international architecture” debate. The first results can be summarised as follows: The theoretical model shows that the composition of external debt matters for governments’ choice to peg or float because raising the share of the private sector in external debt drives a wedge between winners and losers from appreciations and depreciations of the exchange rate. Consequently, the government has an incentive to smooth exchange rate fluctuations. Therefore, countries with a larger share of the private sector in total external debt (*ceteris paribus*) are more likely to implement fixed exchange rate. Empirically, a probit estimation indicates that the higher the share of the private sector in total external debt, the higher the incentive to stabilize the exchange rate.

Hoffmann and Schmidt (Composition of foreign assets: The valuation-effect and monetary policy) discuss a related issue. They assess to what extent the composition of the international investment position affects the transmission of monetary policy shocks.

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Research group

“Financial Stability”

JEL Codes: G2, G3

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General interest and Policy Relevance

Contributing to a stable and efficient financial system is an important mandate of the Bundesbank. Insofar the current crisis is a challenge and will without any doubt influence our financial stability research. The turmoil raises a range of questions. One topical issue is an analysis of banks’ behaviour during the crisis. Specifically, it is worth studying how banks have changed their lending behaviour, e.g. whether they have shifted loans from riskier to less risky investments, and how the financial market crisis is affecting the real sector, in particular whether a credit crunch is likely.

Another important issue is the implementation of the new regulatory framework (Basel II). In light of the recent crisis, it seems necessary to address, once more, the potential benefits and shortcomings of this piece of legislation. Could an earlier introduction of Basel II have helped mitigate the crisis? What risks would not have been taken under Basel II? Should the regulatory framework be improved and further rules added, taking into consideration e.g. liquidity effects? Does Basel II have the potential to amplify the business cycle? In the context of procyclicality, it is also worth studying whether accounting rules based on market values (IFRS) create procyclical effects. Other components of financial sector regulation such as the design of the deposit insurance system should also come in for critical review.

In addition to various new topics, several issues which have already featured on our research agenda over the last few years will gain importance, e.g. credit risk transfer, the role of liquidity risks or contagion. Stress testing – nowadays the main tool to assess the stability of financial systems – also remains an important area of research. The current financial crisis has shown the importance of the Bundesbank’s stress testing tools; the results of the credit portfolio and liquidity risk stress tests, in particular, have delivered valuable information with which to assess the risks to financial stability. However, more research seem necessary to explain the role of liquidity shortfalls.

Existing work

Projects in 2008 have focused on the following questions:

- *Systematic risk*: Koetter and Poghosyan (2008) study the influence of real estate prices on banks' distress, which is, theoretically, not clear: Higher real estate prices increase the value of collateral, which reduces the probability of bank distress. On the other hand, higher real estate prices may also indicate excessive expectations regarding the present value of real estate assets, which can increase PDs. The authors find that the level of real estate prices is of minor importance for bank distress, but that price-to-rent ratios (akin to the price-earnings ratio in the finance literature) are positively related to banks' PDs.
- *Contagion effects*:
 - Too-big-to-fail: Völz and Wedow (2008) examine whether CDS prices for banks are distorted by size effects, which would indicate that market participants believe in the idea of too-big-to-fail. The paper finds evidence to support this hypothesis. Moreover, the paper finds that some banks have already reached a size that makes them too-big-to-be-rescued, which is also (at least partly) reflected in CDS prices.
- *Stress testing*: Several research projects were carried out:
 - Interest rate risk: Interest income is the most important source of revenue for most German banks. Using a tracking bank approach, Memmel (2008) analyses the question, which interest rate scenario is the worst for German savings and cooperative banks, evaluating the effects of 260 historical interest rate shocks. He finds that a sharp decrease in the steepness of the yield curve has the most negative impact on banks' interest income.
 - Stress testing of real credit portfolios: A German pension insurer's credit portfolio is used to derive three typical bank portfolios, corresponding to a small, medium and large bank (Mager and Schmieder (2008)). In a severe multivariate stress scenario, IRB capital requirements increase by more than 80% with little differences between the three credit portfolios. If stress testing is additionally applied to correlation, the Value-at-Risk increases by up to 300% and portfolio differences materialise.
 - Portfolio stress testing approach for credit risk: Duellmann and Erdelmeier (2008) use a Merton-type model and stress the credit portfolios of 28 large German banks. The stress scenario is an economic downturn in the automobile sector. Although all banks in the sample have a relatively small share of their credit exposure in the automobile sector, the expected loss conditional on the stress event increases substantially, by 70-80%, for the total portfolio. This result, which is mainly driven by correlation effects with related industry sectors, confirms the need to adequately capture credit risk dependencies between sectors even if the stress scenario is confined to a single sector.

- Macro stress tests: An integrated micro-macro approach has been developed (De Graeve, Kick and Koetter (2008)). This framework considers not only the main sources of systematic risk spreading from the real sector to the banking sector, but also takes into account feedback effects (“second-round effects”) from the banking sector to the macroeconomy. They find that feedback effects seem to be quantitatively important.

Ongoing and new projects

A. Systemic risk

To measure the financial stability of individual German banks, the z-score methodology, a popular indicator of banks’ soundness, can be applied. The z-score considers the mean and the volatility of banks’ returns. It measures the number of standard deviations a return realisation has to fall in order to deplete equity and to cause a failure of the bank. The goal of the project is to compare stability across different banking groups rather than to make predictions about the stability of individual German banks. In this analysis, the differences in banking groups’ responses to macroeconomic shocks are investigated as are the differences in the impact of bank-specific variables (e.g. regional competition and sectoral diversification).² Other projects examine, for instance, how banks’ diversification across different income sources (e.g. interest rate income, fees from services) affect their stability.³

B. Contagion and lender of last resort

The current crisis has highlighted the importance of contagion effects. Several projects are planned:

- Interbank market: Whereas earlier work primarily considers the effects of interbank contagion on banks’ equity ratios and thus concentrates on solvency effects, this study is designed to take into account solvency effects and liquidity effects as well. Specifically, the question that will be addressed is how large are the contagion risks if a large bank in the system fails.⁴
- Credit risk transfer: Several studies analyse the role of innovative instruments like CDS and ABS for the increasing interdependencies of banks and the resulting contagion effects.⁵
- International transmission of shocks by banks: The current US crisis is likely to affect the relationship between German parent banks and their foreign subsidiaries. The project will look at the implications for lending towards foreign countries and aims to provide insight into international transmission of shocks by

² Ongoing research by Beck, Hesse, Kick and von Westernhagen.

³ Ongoing research by Busch, Kick and von Westernhagen.

⁴ Ongoing research by Memmel and Stein.

⁵ Ongoing research by Pausch.

banks.⁶ Another project uses a theoretical model to study the various implications for stability of interbank lending and multinational banks.⁷

- Bank runs: The role of institutional investors in panic is analysed, building on evidence from the open-end real estate fund crisis in Germany.⁸
- Lender of last resort: Research focuses on the circumstances in which intervention by an active lender of last resort can actually reduce the incentive to take risks in the banking sector.⁹

C. Implications of Regulation in the Banking Sector for Financial Stability

(1) Liquidity management and regulation

In the financial market crisis, liquidity management and liquidity regulation has become a crucial matter. In this context, the question is raised whether German savings banks hold more liquidity than required by regulators in order to reduce the probability of liquidity shortfalls.¹⁰ Additionally a project on liquidity holding of international banks is foreseen.¹¹ To monitor liquidity in the German financial markets, a quantitative liquidity indicator is being developed as a further improvement on the BoE's Summary indicator for market liquidity.¹²

For a related project by Dötz and Weth on the liquidity management by investment funds see the group "Monetary Policy and Asset Prices".

(2) Basel II and cyclicality

A frequently cited concern is that the Basel II framework leads to more procyclical behaviour by banks. More research is needed on the process by which banks set capital levels and the relative importance of the requirements of the various stakeholders, market participants and supervisory bodies. The working group "Task Force on the Impact of the New Capital Framework (TFICF)", which is jointly organised by the Committee of European Banking Supervisors (CEBS) and the Banking Supervision Committee (BSC) and co-chaired by the Deutsche Bundesbank, as well as the Basel "Capital Monitoring Group (CMG)" will examine whether regulatory capital requirements in the new capital framework are likely to become a major driver of bank behaviour at certain stages of the business cycle and whether changes to capital requirements are likely to have an impact on the supply of loans.¹³ In this context the

⁶ Planned research by Craig, Dinger and von Westernhagen.

⁷ Ongoing research by Dietrich and Fecht. Fecht, Grüner and Hartmann (2006/2007) analyze the stability implications of proceeding cross border interbank lending.

⁸ Ongoing research by Fecht and Wedow.

⁹ Ongoing research by Fecht and Schulz.

¹⁰ Ongoing research by Holl and Schertler.

¹¹ Planned by Fiorentino and Hainz.

¹² Ongoing research by Duellmann.

¹³ Ongoing research by Heid and Krüger.

question is raised whether the new capital framework has the potential to amplify the business cycle, and in this regard the following questions seem relevant:

- What are the main determinants of banks' desired or actual capital levels (e.g. regulatory capital, rating agencies' expectations, economic capital levels)? What impact does Basel II have on banks' capital setting processes?
- How much does the level of minimum required capital fluctuate over the business cycle? Are the countercyclical measures already incorporated in the new framework sufficient to dampen potential procyclical effects?
- Are cyclical capital requirements correlated with procyclical lending, i.e. do regulatory capital requirements have an adverse impact on bank lending during an economic downturn?
- Is it possible to quantify more precisely the impact of the stage of the business cycle on the level of minimum required capital as defined in the Basel II framework?
- Is an intensification of the Basel II regulations the right way to make banks' behaviour more risk sensitive (problem of procyclicality)?

(3) An assessment of Leverage Ratios and other simple yardsticks for regulatory capital requirements

The current crisis has stirred up the debate about the underlying concept of risk-sensitive minimum capital requirements and a potential extension by a leverage ratio. Some proponents of simple leverage ratios criticise the concept of risk-sensitive capital requirements as such because they believe this concept would automatically entail procyclical capital requirements. Others are concerned with the uncertainty of any external assessment of banks' risk and the need to avoid an unjustified capital relief of banks if the reported risk figures are too low. Another argument is based on the general notion of model risk which has arguably increased with the complexity of financial products and the rise of "mark-to-model" valuation. Critics of the leverage ratio argue that such simple approaches disengage bank-internal and regulatory risk assessment and in this way provide incentives for capital arbitrage. A leverage ratio loses its informative value if the risk is transferred off-balance by changes in the business, which could be observed in countries which already had leverage ratios in place. Furthermore, worries about capital arbitrage have been a key reason to replace the Basel I Accord by a new, more risk-aware framework. Risk-sensitive capital requirements at least narrow the gap between economic capital and regulatory capital and can help to align incentives of both parties. The intended research will evaluate the pros and cons from a theoretical and empirical perspective. The performance of a leverage-ratio concept in the recent financial crisis will be analysed.

(4) Does fair value accounting lead to asset price bubbles?

While fair value accounting has been criticised for its implications on profit volatility the feedback effect on asset prices has not yet received much attention. However, as

the accounting framework also affects the allocation of capital within financial institutions, those business departments which appear to be more profitable attract more capital. These funds will then be invested into specific sectors of the economy, which will further contribute to the asset price rise. Thus, a vicious circle of non-realised profits and price surges may ultimately lead to a creation of an asset price bubble, which poses a big risk to institutions that are exposed to these markets.

(5) Fair value accounting and cyclicity

There are concerns that fair value accounting leads to more procyclical behaviour of banks. If the banks' assets are marked to market, the banks' earnings and capital ratios become more volatile (compared with other accounting standards). There is empirical evidence that the banks try to keep their capital ratios relatively constant. Therefore, the increase in the volatility of the banks' capital ratios makes the banks react more strongly to changes in the economic environment. Several measures are discussed to reduce the cyclicity of fair value accounting, for instance the valuation of the banks' asset with the help of discounted cash-flows instead of market prices. Discounted cash-flows are said to better reflect the "true" value of an asset, being undisturbed by market exaggerations. However, this method is not undisputed as well, for instance the choice of the discount rate has a great impact on the value of the asset. The research in this area is twofold: first, to assess the cyclicity of fair value accounting and, second, to discuss different measures to reduce the possible cyclicity of fair value accounting.

D. Deposit insurance system

The crisis has underscored the importance of adequate deposit insurance schemes in order to avoid bank runs. However, the fact that banking has changed considerably over the last two decades and has become a global business for a number of banks gives rise to new problems. One issue is the credibility of such insurance schemes if banks are seen by depositors as being too big to rescue. Another issue is the rise of cross-border banking and the potential need for an international deposit insurance scheme. The advantages of sufficiently funded deposit schemes need to be weighed up against the problems arising from moral hazard. Previous research has derived optimal funding schemes in the case of idiosyncratic risks. More research has to be done on deriving optimal funding schemes in the case of systemic risks. One solution that has been proposed with regard to large drawdowns of deposit insurance funds is the implementation of a tiered system of insurance coverage, by which depositors with larger coverage would receive lower interest rate. In such system all deposits would be guaranteed – but only up to a certain amount. However, depositors may chose to have additional coverage, in which case they would have to pay the additional insurance premium. The advantage of such approach would be that it provides an incentive for depositors to spread their exposures more evenly among banks. In a similar vein it has been proposed to introduce re-insurance schemes into the system of deposit insurance funds, which would also allow for a better diversification of risk.

E. Forward-Looking Assessment of Systemic Risk

(1) Early warning systems

The current financial market crisis has highlighted the need for more research in the field of early warning systems. There is already a broad literature in this area, and the IMF, in particular, has been leading in the development of early warning system models (e.g. Kaminsky/Lizondo/Reinhart (1998) or Kaminsky/Reinhart (1999)). One obstacle these models face is that crises are mainly predicted with the aid of macro-economic variables. Forward-looking stability indicators for the banking system using micro data still need to be developed. The banking stability index presents one such indicator. The banking stability index provides a measure for the whole banking sector and allows to track the changes in the banking sector stability over time. The banking stability index is derived from weighted bank PDs from a Hazard-rate model whereby total assets of banks are taken as weights, interest spreads, and a German bank stock index (PRIMBNK-Index). The advantage of the banking stability index is that it allows for very timely assessment of the banking sector stability.¹⁴ Moreover, a “split population duration analysis” will be applied to estimate the probability of survival for banks which are at risk of default and to determine whether supervisory measures have an impact on the probability of survival and could prevent a bank default.¹⁵ Moreover, the data on large-scale payment systems can be used to develop early warning systems for bank failures in Germany. In fact, by comparing liquidity streams, their structure and peculiarities in regular times with periods of financial distress researchers might be able to identify proxies for warning indicators.¹⁶

Another approach is to try to identify asset price bubbles in the economy. In the past, banking crisis have often been preceded by large increases in prices of financial and real assets. When these bubbles burst, banks often need to write up large amounts of their exposures to these markets. One fundamental difficulty with this approach is that it is difficult to identify bubbles *ex ante* and to distinguish them from structural breaks. Therefore more research is needed to determine the link between the actual price and the price that is justified by “fundamentals” and whether deviations are a good indicator of future problems.

(2) Stress testing

Given the importance of stress testing in assessing financial stability, the Bundesbank’s existing stress testing tools need to be refined. Several research projects on stress testing are currently underway:

- One strand of Bundesbank stress testing concentrates on combining macroeconomic risk factors and sector portfolio models. In such a combined model, stress scenarios are simulated in a macroeconomic forecasting tool (like NiGEM) and linked by a macroeconometric regression approach into a credit risk portfolio model. The latter tracks each bank’s lending to different industry sectors, and the

¹⁴ Ongoing research by Kick, Pausch, Podlich and von Westernhagen.

¹⁵ Ongoing research by Kick and Koetter.

¹⁶ Planned research by Fiorentino.

portfolio model explicitly takes into account sector interdependencies.¹⁷ It is planned to apply this approach also to other countries.¹⁸

- In the field of macro stress tests, a new bank rating approach based on the “support vector machine (SVM)” methodology is currently being developed.¹⁹ This fulfils the need for better and more sophisticated rating tools which has emerged during the US subprime crisis.
- The “Three-Stage-Approach” to macroeconomic stress testing combines macroeconomic scenario analysis, GMM regression models to stress bank-specific risk factors, and bank rating. The goal of the project is to evaluate the effect of macroeconomic stress scenarios on banks’ probability of default.²⁰
- Besides, more work on liquidity risk stress testing is needed. The current approach focuses on the micro-systemic perspective and could be extended by analysing how different liquidity risk scenarios impact financial systems as a whole. In this context, one important – although challenging – aspect would be to include the interactions of liquidity risk with market and credit risk into stress tests,²¹ as well as feedback effects.

F. Other projects on financial stability assessment

In light of the current banking crisis, one question of interest is how German banks have restructured their international loan portfolios and what major changes have occurred in internal capital markets.²² A related topic is the impact of the crisis on risk taking by German banks, i.e. the question of whether banks have re-shifted their portfolios, moving from low-quality borrowers towards higher quality borrowers.²³

How distress and competition in the financial sector affect regional lending may also prove an issue, not only for banking stability but also for the economic growth prospects. In this context, regional lending under competition and bank distress (measured by bank PDs) is therefore analysed simultaneously and used to assess financial stability.²⁴ As competition in the banking market can have negative (lower profits) and also positive (pressure for higher efficiency) effects on financial stability, the relationship between competition, efficiency and financial stability is analysed in another research project.²⁵

¹⁷ Ongoing research by Duellmann, Erdelmeier, Kick, Segoviano and von Westernhagen.

¹⁸ Ongoing research by Podlich.

¹⁹ Ongoing research by Badunenko, Moro and Kick.

²⁰ Ongoing research by Heid and Kick.

²¹ Ongoing research by Bock, Düllmann and Holl.

²² Planned research by von Westernhagen.

²³ Ongoing research by Ongena and von Westernhagen.

²⁴ Ongoing research by Götz, Kick, Levine and von Westernhagen.

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Research group

“Risk Modelling and Financial Markets”

JEL Codes: C1, C6, D8, G1, G2, M4

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Advisors/visitors: ...

General interest and Policy Relevance

Research on risk modelling within the Bundesbank is focused on financial institutions and financial markets, owing to their high relevance to the stability of the financial system and the Bundesbank’s supervisory responsibilities. Although the emphasis is on a micro-perspective, research on risk modelling and financial markets can provide valuable input for macroprudential supervision and the assessment of systemic risks in the financial system. A significant part of the work on risk modelling has been input to international projects carried out by the Research Task Force (RTF) of the Basel Committee on Banking Supervision and related to the Basel II framework²⁶.

The enduring financial crisis has put banking regulation and quantitative risk modelling to a test. Four areas in particular will require further research efforts:

1. Prudential capital requirements for banks

Although Basel II has made a huge step to improve the risk sensitivity of regulatory capital requirements and to bridge the remaining gaps between regulatory minimum requirements and internal risk modelling, several aspects may still require further attention, including, for example, the overall level of capital and the impact of IFRS accounting rules.

2. The dependence structure in credit risk models

The understanding and the estimation of borrower-specific or facility-specific model parameters (exposure at default, probability of default and recovery rate) has much improved in the development phase and especially in the implementation phase of Basel II. This has been possible only because of substantial progress on collecting time series data. Although refinements of estimation and validation of model parameters still pose relevant research questions, the main focus has shifted to another core component of risk models, namely the dependence structure. Recent turbulences, in particular in the market of structured products, have shown the limits of certain risk models which are still established as market standards. These models are by con-

²⁶ See BCBS (2006).

struction unable to account, for example, for tail-dependence which was observed in recent asset price fluctuations. Further research is warranted to develop models which better capture the dependence structure while being sufficiently parsimonious to be applicable for risk management purposes. Refining stress test methodologies also offers an interesting way forward to account for model uncertainties. Another relevant question in this context is the potential of rating shopping, especially because of anecdotal evidence that recent changes in the rating methodology of rating agencies have had a substantial impact on their business volume.

3. The interaction of liquidity risk and accounting with market and credit risk

Downward spirals of falling assets prices while market liquidity dries up have been a characteristic of the recent financial turmoils and serve as an example advocating a better integration of liquidity in risk models. Fluctuations of market liquidity affect the time horizon over which assets can be managed and in turn over which risks should be measured. Traditional risk models do not account for this dynamic aspect of liquidity since the risk horizon is kept fix, for example 10 days for market risk and one year for credit risk. Incorporating the dynamic aspect of liquidity challenges this approach. Integrating these aspects is also important for the design of stress tests which commonly focus on an isolated risk category.

4. Asset pricing and the information value of financial markets

The financial crisis puts into question the traditional approach of assigning liquidity risk in risk management only a secondary role, mainly on the grounds that as long as the bank successfully manages the other risks, liquidity will “automatically” be provided by the market. Instead, to the extent that market-based funding has replaced traditional deposits, market risk and funding risk have become closely intertwined. Research to improve the understanding of this dependency and also of asset pricing in related markets is warranted. A relevant research aspect in this context is the informational value of market prices to forecast the evolution of asset prices and the risk premia required by investors.

Progress in the four designated research areas can contribute to further future developments of macro-prudential and micro-prudential supervision of banks in general and to address lessons from the recent crisis in particular.

More specifically, the recent market turmoil has demonstrated that prudential capital buffers play an important role as a cushion to absorb external shocks. Therefore, research on capital requirements for banks is useful from a short-term perspective.

A better understanding of the dependence structure of risks could provide a valuable input into the assessment of internal risk models currently used in the financial industry and also into the understanding of their limitations. Since academic research has outpaced industry practice over the last years, making the more advanced methodologies usable in practice is a primary goal from a mid-term perspective.

The interaction of different risk categories, in particular the role of liquidity, is also of interest from a mid-term perspective. Although academic research has only recently started to focus on this topic, the important role that structural changes in the banking industry (for example the emergence of the originate-to-distribute model) have played in the recent crisis call for early attention.

Research on the fourth topic on financial markets instead has a more short-term focus. Whereas the previous three topics are more closely related to banking regulation and supervision, the last is more relevant from a macro-prudential and a central bank perspective. It lends itself, for example, for the development of risk indicators which can help to forecast market turbulences or at least detect them at an early stage.

Recent Work

Existing work on risk modelling within the Bundesbank has focussed mainly on credit risk and its interaction with market risk. Work on financial markets is aimed at developing indicators for risk appetite and also for the overall level of liquidity in financial markets.

A. Credit risk modelling

An important constituent of this work stream is the estimation and validation of borrower-dependent risk parameters, namely the probability of default (PD) and the Loss Given Default (LGD), defined as $1 - \text{recovery rate}$. Work on PD and LGD estimation has been carried out under the aegis of an RTF project group on the use of vendor models.

Notwithstanding the importance of the estimation of borrower-dependent risk parameters, the following projects have shifted the main focus of this work stream to a portfolio perspective which requires the modelling of default dependences.

- An empirical estimation of asset correlations of European listed firms, based on the Moody's KMV model, and an evaluation of their impact on a portfolio VaR measure. A special attention is given to the time-series properties of asset correlations and VaR.²⁷
- A simulation study comparing the small sample properties (including the estimation error) of asset correlation estimators, applied either on historical default rates or on equity returns.²⁸
- An assessment of the impact of a downward momentum in external ratings on the VaR of credit portfolios.²⁹

²⁷ See Duellmann, Scheicher, and Schmieder (2008).

²⁸ See Duellmann, Küll, and Kunisch (2008).

²⁹ See Löffler, G. and Raupach, P. (2008).

- Based on unique data sets, including credit portfolios of real banks, different stress test methodologies have been analysed in order to explore the impact of adverse economic scenarios.³⁰

B. Interaction of market and credit risk

Work on the interaction of market and credit risk was carried out under the aegis of the RTF. This was also the topic of a joint conference with the RTF and the Journal of Financial Intermediation in Berlin in December 2007.

The theoretical and empirical result that splitting the returns of an asset portfolio into a pure market risk plus a pure credit risk component can lead to a substantial underestimation of risk³¹ brings the potential weaknesses of current risk modelling practice to the fore. It advocates a transition to a joint modelling approach, of which a proposal has also been presented at the conference.³² Capital markets can offer a valuable source of information on the dependency structure of credit risk and of parameter uncertainty.³³ They can also be used to study the dependence of credit-related traded assets (such as credit default swaps) that is due to a common dependence on macroeconomic variables.³⁴

Securitizations build a market segment where the interaction of market and credit risk becomes particularly important as they have made credit risk tradable. Theoretical research presented at the conference shows that if structured appropriately, securitization is economically valuable because it allows banks to focus on financial intermediation activities (borrower screening, monitoring), where banks have a comparative advantage, replacing risk-bearing (where they have little advantage) by risk-sharing.³⁵

Future and ongoing projects

The following overview lists research projects which are planned for an immediate start or have already been started. Further research will be carried out where concrete topics have not yet been identified.

(1) Credit risk and regulatory capital of securitization tranches

We apply selected static and dynamic, bottom-up and top-down models for the impact of securitization tranches on the loss distribution of a (real or representative) credit portfolio. The tranches' contribution to portfolio value-at-risk is a benchmark for the regulatory capital charge produced by the ratings based approach or the supervisory formula of Basel II. In an empirical analysis we compare the evolution of capital buffers based on these models with minimum capital requirements from both regula-

³⁰ See Duellmann, K. and M. Erdelmeier (2008) and Mager and Schmieder (2008).

³¹ See Breuer, Jandacka, Rheinberger, and Summer (2008).

³² See Böcker and Hillebrand (2008).

³³ See Haibin and Zhu (2008).

³⁴ See Tang and Yan (2007).

³⁵ See Jiangli, Pritsker and Raupach (2008).

tory approaches during the recent crisis. This project is related to the research area “Prudential capital requirements for banks”.

The following two projects are related to the research area “dependence structure in credit risk models”.

(2) Measuring concentration risk in credit portfolios – A comparison of methods

Various approaches have been developed to approximate the value-at-risk of a credit portfolio without resort to Monte Carlo simulations. This project explores the performance of these approaches in terms of the mean estimation error over a wide range of plausible parameter values.

(3) Concentration risk vs. specialisation benefits in German banks

Although credit concentrations c.p. increase portfolio risk, empirical studies have found that in Germany banks which are specialized in certain business sectors encounter on average lower loan loss provisions and are more profitable. Since concentration risks become important in the tail of the loss distribution, we employ the risk measure value-at-risk to study the aggregate affect of monitoring and higher sectoral concentration in order to explore the cumulative impact for a comprehensive sample of German savings banks and cooperative banks.

The following two projects are parts of the research area “Interaction of liquidity risk and accounting with market and credit risk”.

(4) The impact of credit risk, market risk and liquidity on credit portfolios

In this project we compare the credit risk in a multi-factor default-mode model (consistent with book-value accounting)³⁶ with a mark-to-market model that accounts also for interest rate risk (consistent with fair-value accounting). The comparison is made under neutral conditions as well as under stress conditions of the economy. The latter case captures a liquidity shortage which affects the appropriate time horizon of risk measurement. The analysis can provide valuable insights how default risk, migration risk, spread risk and the risk-measurement horizon interact.

(5) Issues applying IFRS to Micro-Hedges in Banks

With the implementation of the new IFRS accounting standards, hedge accounting in general and potential hidden risks in micro hedge positions in particular have become an important topic. This project explores the hedge efficiency of fair value hedges over time using a bond position hedged by an interest rate swap as example.

³⁶ See Duellmann and Erdelmeier (2008).

The following two projects relate to the research area “Asset pricing and the information value of financial markets”.

(6) Evaluation of feasible indicators of the “risk appetite” of investors in financial markets

While changes in risk appetite might be due to changes in the degree of risk aversion, investors’ demand for risky assets might also drop abruptly because of a sudden increase in the perceived riskiness of such assets. The dynamic stance of the general “risk appetite” of market participants thus needs to be taken into account when assessing the current conditions of financial markets, e.g. in terms of identifying potential dangers to financial stability. This project empirically explores the usefulness of selected indicators suggested in the literature.³⁷ A related project is carried out by Craig, Keller and Scheicher on “A comparison of risk aversion in equity options and credit default swap premia” who focus on risk aversion instead of risk appetite and on different markets.³⁸

(7) Liquidity indicators for financial markets

In order to assess liquidity in key financial markets (stock market, bond market, money market, credit derivatives market), we employ standard liquidity measures (market impact, bid-ask-spread). These market-specific indicators are aggregated to an overall market indicator.

The following projects do not belong to one of the four research areas because they are unrelated to the recent financial turmoils.

(8) Estimation of credit scores and default probabilities for non-financial institutions using an SVM model based on financial account statements

The reason for the good performance of Support Vector Machines (SVM) as a new non-parametric statistical scoring technique is its flexibility, which can be adapted to any data structure by getting rid of many of the assumptions of classical methodologies. The purpose of the research project is to develop an SVM model for the evaluation of German firms. Linked to this task is the development of a probability of default (PD) function for the SVM.³⁹

³⁷ See Uhlenbrock (2008).

³⁸ See research group „Monetary Policy and Asset Prices“.

³⁹ See Auria and Moro (2007).

(9) Improving the accuracy of insolvency prediction for German savings banks and credit cooperatives

This project employs a rating model based on the support vector machine methodology to seek to improve default probability prediction for German savings banks and credit cooperatives relative to a logit model approach.⁴⁰

(10) Empirical analysis of operational risk

This project will analyse the development of operational risk over time, especially the distribution amongst the risk categories and business lines, and consider in particular cumulative processes which may originate from a concentration of risks in certain risk categories or business lines over time. To the extent possible, the project will make use of operational loss data from data collection consortiums.

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Research group

“The financial system: Structural issues and its changes”

JEL Codes: E4, E5, G1, G2

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General interest and policy relevance

The aim of the research group is to investigate structural trends in financial markets, in particular in the European and German context. Research has recently focused on areas including:

- The role of financial innovation
- Consolidation in the financial sector
- Measuring the efficiency and productivity of financial institutions
- The bank-borrower relationship
- Market structure and competition
- The nexus between the financial sector and the real sector

The current financial crisis, the most severe in decades, has called into question many of the recent developments in the financial industry. For instance, the originate-to-distribute banking model, which many thought would replace banks' traditional loan business, is now being criticised for having led to severe distortions in the credit markets. The evolution of the risk transfer markets, which is said to have contributed to some of the excesses in the credit markets, is now also seen in a much more critical light. The research programme for this group reflects some of these new debates.

Recent Research

Financial innovation

Their business operations leave banks heavily exposed to credit risk. This has traditionally been managed using passive strategies such as portfolio selection and loan sales. The increasing availability of credit derivatives and synthetic structures has allowed credit risk to be more actively managed. **Pausch (2007)** looks into the effects of credit derivatives, in particular. Previous theoretical analyses have been unable to provide unambiguous results regarding the way credit risk transfer affects exposure to credit risk either at the bank level or at the level of the financial system as a whole. Unlike previous research, Pausch's paper assumes that credit derivatives' structure is determined endogenously rather than exogenously, which better reflects their OTC character.

Ongoing financial innovation and greater availability of information increase the tradability of bank assets and reduce banks' dependence on individual bank managers, as the significance of private information in the lending process declines. **Fecht and Wagner (2007)** show that this can have two opposing effects for banking stability: as the hold-up problem between bank managers and shareholders becomes less severe, deposits – an effective disciplining device – can be reduced. At the same time, the fact that bank managers' rents are diminished reduces incentives to properly monitor and screen borrowers.

Consolidation

Consolidation in the banking industry has led to a considerable reduction in the number of banking institutions worldwide. Several papers have looked into the reasons for and consequences of bank mergers in Germany.

However, the success of bank mergers remains a continuous matter of debate. **Behr and Heid (2008)** point out that the failure of empirical research to come up with a conclusive answer on the efficiency effects of bank mergers may be due to the severe selection bias afflicting many empirical studies that directly compare merging banks with non-merging banks. Results from a matching strategy that controls for these differences indicate that mergers have a neutral effect on profitability and a small effect on cost efficiency.

The consolidation process, which has been ongoing since the beginning of the 1990s, may have important implications for firms' financing conditions. Based on a panel dataset comprising merged data from the German credit register and balance sheet data provided by German firms and banks, **Marsch, Schmieder and Forster-van Aersson (2007)** find that – contrary to public fears – the ongoing banking consolidation in Germany is not having a significant negative impact on the financing of small and medium-sized enterprises (SMEs). Concentration in the banking market is insignificant for SME financing, and there is no significant difference between commercial banks, savings banks and private banks.

Despite extensive research interest over the past decade, the banking literature has not reached a consensus on the impact bank mergers have on deposit rates. In particular, evidence on the dynamics of deposit rates before and after bank mergers varies substantially across studies. A joint research project with the Cleveland Fed aimed for a comprehensive empirical analysis of a bank merger's impact on deposit rate dynamics based on US data (**Craig and Dinger, 2008**). The empirical results point to a significant negative impact of mergers on checking account rates. These results are consistent with the results of earlier studies supporting the structure-conduct performance paradigm.

Efficiency and productivity in banking

In a joint research project with the Central Bank of Italy, **Fiorentino, De Vincenzo, Heid, Koetter and Karmann (2008)** analysed bank privatisation and consolidation in Italy and Germany and their effect on banks' productivity growth. Both banking markets shared similar characteristics early in the 1990s but have since evolved in different directions. While Germany has kept its three-pillar system of private banks, public banks and credit cooperatives, Italy privatised its publicly-owned banks. At the same time, banks in both markets engaged heavily in mergers and acquisitions in an attempt to reap the benefits of scale economies. The study finds that privatised banks experienced a significant increase in their efficiency, in particular if they subsequently merged with other banks. In Germany, privatisation was ruled out as an option, but banks were able to increase their productivity through consolidation.

The bank-borrower relationship

In Germany, relationship banking has traditionally played an important role, especially for small and medium-sized firms, which fund themselves to a large degree with bank loans. Several studies tried to shed more light on the determinants of relationship banking in Germany. **Memmel, Schmieder and Stein (2007)** analyse which determinants influence the choice of a housebank and whether relationship lending has lost ground in Germany. To this end, they use a panel data set at the bank-borrower level. They find that especially small, young and R&D intensive firms and firms with high creditworthiness tend to rely on housebanks as their primary lender. Contrary to popular belief, there is no indication that relationship lending in Germany has waned in recent years.

Most of the examined firms engage in multiple bank relationships even if they have a housebank. A study by **Ongena, Tümer-Alkan and von Westernhagen (2007)** corroborates previous findings, showing that lending is very often concentrated and, consequently, that relationship lending is important, not only for the small firms but also for the larger firms in the sample. It also finds that risky, illiquid, large and leveraged firms spread their borrowing more evenly between multiple lenders. The degree of concentration increases with the profitability of the relationship lender. Relationship lending may encourage other banks to provide financing, especially if the relationship lender is a public-sector bank and if the other banks are large or do not have to tie up additional funds in capital.

Market structure and competition

The relationship between market structure, competition and profitability is complex and multifaceted. **Beckmann (2007)** aims to identify structural and cyclical determinants of banking profitability in 16 western European countries. The results show that financial structure matters, particularly through the beneficial effect of capital market orientation in the respective national financial system. Furthermore, greater diversification in terms of banks' income sources has a positive effect. The industry concentration of national banking systems, though, does not significantly affect aggregate profitability.

European retail banking markets are still far from being fully integrated, a fact that for many observers warrants further policy initiatives. Indeed, rate dispersion is remarkable, suggesting that further harmonisation of the legal and regulatory framework is necessary as a step towards market integration. However, while cross-country dispersion is, to some extent, indicative, rate differentials might also be driven by regional or even local economic determinants. For several banking products, local economic and socio-geographic determinants are found to go a long way towards explaining the observed price dispersion at the national level (**Fischer and Hempell, 2008**). The results lend support to the notion that the markets for some banking products are inherently local. Furthermore, recent increases in overall bank competition do not apply to all banking products alike. Most importantly and in line with banking theory, banks' franchises in local banking markets seem to be especially valuable for products where banks provide their customers with liquidity services.

The German banking industry is often described as a three-pillar system comprised of commercial, cooperative, and savings banks. This taxonomy serves as a natural definition of market segments. But in addition to this classification, banks could also be grouped within and across pillars according to other criteria, for instance, business model, financial health, or growth strategy. **Koetter and Poghosyan (2008)** suggest a latent class model that allows us to estimate different technology regimes that are independent of any definition of market segments. Four technology regimes are identified: large national universal banks with a wholesale focus, medium-sized innovative universal banks, very small specialised banks focused on relationship banking and a large group of small retail banks.

The nexus between the financial sector and the real sector

An ongoing harmonisation of regulation to foster an increasingly homogenous European banking system ultimately serves the purpose of enhancing competition and thus increasing economic prosperity. At the same time, regional differences persist across European banking markets. **Hasan, Koetter and Wedow (2007)** show that regional bank efficiency has a positive impact on regional growth.

Current projects, planned projects, and open research questions

Future projects will centre on the research areas described above. Some of these projects will follow up on previous research projects, others will tackle new research questions. Several research projects will address issues that have arisen during the

current financial crisis. In other cases, some of the more important issues have been raised, though concrete projects have not yet been defined

Financial innovation

The recent crisis has highlighted the role of financial innovation in assessing financial market trends. While stability issues are currently attracting the most attention in this field, more research is needed to address the relationship between stability and efficiency.

Banking and securitisation (Jiangli, Pritsker and Raupach)

In an ongoing research project Jiangli, Pritsker and Raupach contrast different funding possibilities open to banks, in particular debt issuance, equity funding, loan sales and, more recently, asset securitisation. Within a theoretical framework, they show that, where feasible, banks favour securitisation over loan sales. In doing so they earn higher profits and, despite having higher leverage, the risk of insolvency is lower. It is predicted that banks with a high franchise value will favour securitisation.

Optimal design of risk transfer instruments (Pausch)

Another immediate and pressing issue is asymmetric information and incentives in markets for new and innovative risk transfer instruments. In particular, as became obvious in the recent crisis, transferring credit risk may reduce lenders' incentives to monitor borrowers properly. Therefore the question is what contract design provides sufficient incentives that monitoring and screening is sustained. Retaining part of the risk to be transferred with the lender – which is also part of current policy proposals – provides a starting point to address the problem. However, due to the stochastic features of different types of instruments, the universal application of this approach is questionable and requires a more detailed analysis.

The micro structure of (credit) risk transfer markets (Pausch, Welzel)

The current crisis also raises issues regarding the micro structure of markets for new instruments of (credit) risk transfer. This is particularly true with respect to the role of third parties. For instance, rating agencies might act as providers of useful information and in this way enhance market transparency. However, given the current design of the rating process and the models applied in this context, one may question the reliability of rating agencies' information. Another aspect is the question whether some kind of central counterparty may enhance the efficiency of risk transfer markets. This includes the issue of standardization of (credit) risk transfer instruments which may, on the one hand, reduce transaction costs but, on the other hand, prevent market participants from an effective transfer of risk. A future research project will address these questions in detail.

Consolidation

Mergers and acquisitions are likely to continue to shape the financial sector in the foreseeable future. However, the crisis has cast into doubt the hypothesis that large banks have a comparative advantage over smaller banks (“too big to rescue” hypothesis) and the role of international diversification.

The effect of bank mergers on firms’ financing conditions (Behr, Heid and Tente)

In an ongoing research project, Behr, Heid and Tente analyse how acquisitions and mergers in the banking sector affect financing conditions for client firms. Previous research in other countries indicates that the target bank’s client firms might incur higher borrowing costs. However, the situation might be different in a country where relationship banking has traditionally played an important role. Preliminary results show that, on average, funding conditions do not change much following a merger but that firms with a higher risk profile may be more affected.

The effect of bank mergers on cost and profit efficiency (Behr and Heid)

In a follow-up project to Behr and Heid (2008), who measured the success of bank mergers, the new methodology is to be applied to measures of cost and profit efficiency. Previous studies in this field have often compared merging banks with non-merging banks, but – as Behr and Heid have shown – a severe selection bias might have influenced the findings.

Will the current crisis lead to a reversal of the consolidation process? (N.N.)

An interesting question for future research on the implications of the current financial crisis is whether the consolidation wave that has taken place over the last two decades will continue or whether, on the contrary, some the consolidation will be reversed. One argument in favour of further consolidation was the assumed economies of scale that mergers would help to achieve, another was the “too big to fail” hypothesis. On the other hand, as the recent crisis has shown, some banks might be too big to rescue. Since data with which to tackle this question will necessarily be scarce, future research will probably have to rely on theoretical modelling.

Measuring efficiency and productivity in banking

The focus of this research area is likely to shift from modelling issues to a more comprehensive view of efficiency. Though at the moment only one project has been defined, interest in this area remains high. One important topic that has attracted some attention recently is whether the expected surge in banking regulation will affect the efficiency of credit institutions.

The role of off-balance sheet items in determining cost efficiency (Fiorentino)

Statistical models to measure cost efficiency usually specify microeconomic cost functions, which relate total costs to output volumes and input prices. In doing so, these models often have to rely on balance sheet and P&L data. However, off-balance sheet items play an important role in generating income and hedging risk positions, in particular for large banks. This project tries to develop models to measure efficiency that are better at controlling for off-balance sheet items.

The bank-borrower relationship

The financial crisis, which at least in part resulted from the insufficient monitoring of subprime borrowers, has raised doubts about arm-length borrowing and may bring about a renaissance of traditional relationship banking. Further research is planned to better understand the borrower-lender relationship. In particular, it is important to recognise how the relationship is affected by the structure of the financial system and to what extent it guarantees companies access to loan capital in times of financial distress.

Creditor concentration in firms' borrowing relationships (Ongena, Tümer-Alkan and von Westernhagen)

This is a follow-up to a paper that was finished in 2007. Creditor concentration and how firms respond to external developments, for example bank mergers, is to be analysed in greater detail.

The role of housebanks in R&D financing (Memmel, Stein)

It has been argued that housebanks, because of their access to private information, are better able to assess R&D related projects, which otherwise carry high risks. The project aims at analysing this important question using German data.

Market structure and competition

Competition analysis continues to be an important area of research in this group. While in the past the emphasis has been on the determinants of competition, future research is likely to look at how competition affects market structure and the efficiency and stability of banks. More research is also needed to assess the effects of the current crisis on the structure of financial markets. One important question, for instance, is whether cross-border banking will decrease and what effect this will have on competition in the banking industry.

The relationship between efficiency and competition in the banking sector (Fiorentino, Heid, Kumbhakar)

The quiet life hypothesis, which is the focus of this project, states that monopoly power reduces the pressure on managers to maximise operating efficiency. Meas-

ures of competition are applied at the local and at the individual bank level, respectively. Preliminary results indicate that the German banking market is characterised by monopolistic competition. In addition, competition seems to have a positive effect on technological progress and on managerial efficiency.

Testing the structure conduct performance hypothesis against the efficient structure hypothesis (Goldbach and Schnabel)

The traditional structure conduct performance hypothesis claims that concentrated markets hamper competition and lead to monopoly rents. A contrasting view is put forward by the efficient structure hypothesis, which explains the correlation between concentration and profits by the fact that more efficient and therefore more profitable firms gain greater market share. The question which view better explains the data has not yet been conclusively answered for the German banking market. An ongoing research project applies a new measure of competition developed by J Boone,⁴¹ which is better founded in economic theory and therefore does not suffer from the deficiencies of the traditional market structure measures.

The nexus between the financial sector and the real sector

The interaction between the financial sector and the real sector continues to be an important area of research, although no specific projects have been defined for the immediate future. Clearly, the current crisis has raised important questions about the development of the financial sector, which should be addressed.

The effects of the current financial crisis on the real sector (N.N.)

The crisis has already led, and will continue to lead, to a significant de-leveraging in financial institutions. As a result, lending conditions will tighten. The crucial question is whether this will cause a credit crunch with potentially severe consequences for the real economy. Another important question that needs to be addressed is what effect de-leveraging will have on growth potential. On the one hand, better capitalised banks will reduce the risk of future banking crises. On the other hand, as capital is costly, we may be confronted with negative consequences for the real sector. (See also projects on integrating the financial sector in DSGE models as described in the “Money Group” and the “Frictions Group”.)

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