Research at DNB focuses on selected themes. Concentration on certain themes may contribute to:
1. enhancing the policy relevance of research efforts
2. improved internal and external recognisability of research
3. enhancement of research quality

Selecting policy relevant research themes that act as a framework for the consideration of new research proposals will increase the relevance of research efforts for the policy of DNB. Moreover, the internal recognisability of DNB research will increase. This may contribute to increased cooperation and interaction between research and policy staff. External recognisability too will benefit. Both vis-à-vis the ESCB and vis-à-vis the academic world, the research profile of DNB may be further reinforced. That will also advance the possibilities for attracting high-quality new researchers with an interest in one or more of the themes. In addition, concentration on themes will result in more critical mass, enabling the increased cooperation and intensified debates to contribute to further improvements in academic quality.

The themes will likewise be leading in giving shape to activities such as the visiting scholar programme, seminars, conferences and workshops.[1]

The focus on the themes listed below does not mean that *all* research must be governed by them. First and foremost, a substantial part of research capacity will continue to be directed towards modelling (Delfi and DSGE models). It is crucially important that DNB has a number of models available to support its policy. Also, research on subjects outside the framework will continue to be performed on a case-by-case basis, in response to specific questions from the Governing Board or consequent on recently completed doctoral research by newly hired staff members.

The Swank/de Haan memorandum, endorsed by the Governing Board, emphatically opts for a DNB-wide research programme: 'The (annual) research plan is to encompass all scientific research across DNB and will be drawn up under the direction of the Head of Research'.

Research will focus on five themes, described in more detail below. The themes have been selected on the basis of the following considerations:
- policy relevance: the themes are to be closely aligned with the responsibilities of DNB
- academic relevance: the themes are to offer sufficient scope for publications to appear in high quality academic journals
- the wish to build on niche positions DNB has acquired in certain areas of research; this applies to, for instance, themes #2 and #5 and to the subject of the payment system.
- recognisability for researchers outside Ebo.

As follows from the specific plans for 2010 (as listed below), the distribution of research time across the various themes is non-proportional. The research questions phrased in the detailed description of the themes are illustrative only and in no way exhaustive.

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[1] In 2010 a workshop on macroprodential instruments was staged. Currently work is going on towards a follow-up workshop. The annual research congress centres on theme #3. Furthermore, a congress on themes #2 and #3 is to be held jointly with the ECB and the University of Groningen.

1. Monetary strategy and price stability
To what extent should the ECB's monetary strategy be aimed at other objectives besides inflation (such as the prevention of asset bubbles and unbalanced house price rises)? How can (the persistence of) inflation differences within the euro area be explained? What is the relation between inflation expectations and inflation? How can the central bank influence inflation expectations? What is the relation between wage developments and inflation? What role is played by commodity prices? Can fiscal policy affect the credibility of monetary policy makers?

2. Central bank transparency and communications
How may central bank communication contribute to the realisation of monetary strategy objectives? What parallels exist between communication on monetary policy and communication on micro- and macroprudential supervision? How do supervisors communicate and how can the difference be explained? What determines the effectiveness of communications? How should one communicate in the event of conflicting objectives? How can communications help improve public awareness and what are the effects on the behaviour of the public? Can communication influence public confidence in policy makers?

3. Financial stability and macroprudential supervision
What is meant by the term macroprudential supervision? What instruments should be used in exercising it? What institutional form should such supervision take? What is the relation between monetary strategy and macroprudential supervision? What are the interactions between the financial system and the real economy? What role do global imbalances play in the genesis of financial crises? How may fiscal policy contribute to financial stability? How may central bank communications contribute to financial stability? How reliable are payment systems and can they respond adequately to changes in the larger payment system? Does competition on financial markets and between financial institutions contribute to financial stability? What role does contagion play in financial crises and how, if at all, is it affected by mutual exposures?

4. Microprudential supervision and conduct of financial institutions
By what factors is the conduct of banks, insurance companies and pension funds determined? Do the firm's ownership structure, size or type play a role? What is the influence of microprudential supervision and regulation on institutions' risk attitude? To what extent do other institutional factors play a role in financial institutions' behaviour? And what is the role of financial liberalisation?

5. Financial literacy and behaviour of households and companies
What role does financial literacy play in the financial behaviour of households? What factors determine households' payment behaviour or companies' payment streams? What do households expect from the supervision of financial institutions? How may the communication of supervisors influence households' literacy and behaviour? How does a household's indebtedness influence the way it behaves?

The research plans for 2010 are listed below. Some fit into more than one theme.

Bijlage:

Research programme DNB

1. Monetary strategy and price stability

Have market views on the sustainability of fiscal burdens influenced monetary authorities'
credibility?
Gabriele Galati, John Lewis, Steven Poelhekke, Chen Zhou

Over the past two years, most governments in industrial countries have supported their
domestic financial sector under stress and responded with fiscal stimuli to strong
declines in output growth. As the global financial system showed signs of recovery and
the global macro economy started to rebound, attention has focused on the
sustainability of the resulting growing debt burdens. We conduct an empirical study to
test whether views on the sustainability of fiscal burdens have influenced the credibility
of central banks' commitment to price stability.

A microeconomic experiment on the formation of inflation expectations
Gabriele Galati, Peter Heemeijer, Richhild Moessner (BIS)

The formation of inflation expectations is a crucial issue for monetary policy makers.
Empirical evidence on expectations is extremely hard to obtain, and experimental
economics has provided a fruitful avenue for research. We study how inflation
expectations at different horizons (one, two and ten years) have evolved from 2009 to
2010. Our empirical approach is based on a sort of field experiment, where participants
provide weekly information on their expectations. Participants are divided into three
groups, consisting of DNB economists, academics and students. To obtain information
that is as accurate as possible, participants are rewarded in relation to the ex post
accuracy of participants' individual answers.

Regional influences on ECB policymaking?
Janko Gorter, Jan Jacobs (RUG), Jakob de Haan

We estimate Taylor rule models for the euro area using Consensus data for expected
inflation and output growth for the period 1998.6-2007.12 to examine whether ECB
decisions have been affected by economic developments in individual euro area
countries. In contrast to previous findings by Heinemann and Huefner (2004), we
conclude that for our full sample period ECB policy decisions have not been influenced
by regional developments. Also regional inflation differentials have not affected ECB
policymaking.

Inflation differentials in the euro area and market flexibility
Jakob de Haan, Leo de Haan

This paper contributes to the ongoing search for determinants of inflation differentials
within the euro area, focusing on the influence of market flexibility on bilateral inflation
differentials. Using data for the countries in the euro area since the start of the currency
union, we consider as many variables as possible that have been suggested in the
literature to affect inflation differentials.

An experimental investigation of inflation and output gap expectations under different
monetary policy rules
Peter Heemeijer, Cars Hommes (UvA), Domenico Massaro (UvA), Tiziana Assenza
(University of Milan, UvA)

3

In recent macro-economic literature it is well established that expectations about macroeconomic variables play a crucial role in the transmission and effectiveness of monetary policy. Therefore, the way in which expectations are formed is key in understanding how different policy rules affect aggregate economic outcomes. In this paper we study, by means of a laboratory experiment with human subjects, individual expectation formation and its interaction with monetary policy. The experiments are based on a standard New-Keynesian model. In our analysis, we use an evolutionary model of individual learning to explain both individual forecasting behaviour and aggregate outcomes in the experiment. The results indicate that our heterogeneous expectations model outperforms homogeneous expectations benchmarks both in terms of in-sample forecasting error and out-of-sample predictive power.

An experimental investigation of inflation expectations in a multi-agent overlapping generations economy
Peter Heemeijer, Cars Hommes (UvA), Joep Sonnemans (UvA), Jan Tuinstra (UvA)

We investigate how individuals form inflation expectations by running an experiment using a basic Overlapping Generations (OLG) model. The student participants of our experiment predict inflation during 50 successive periods and are rewarded based on their accuracy. We include a central bank in the OLG model, which increases the money supply at a constant rate. Groups of participants are placed in OLG economies having either a "low" of a "high" money supply growth (in a similar experiment, Heemeijer et al. (2010), OLG economies consist of single participants). As in Heemeijer et al. (2010), we find that inflation stability is lower and volatility higher in the "high" money supply growth treatment. However, inflation volatility is smaller than in the corresponding treatment in Heemeijer et al. (2010). We also find a considerable heterogeneity in prediction rules within groups, and a strong correlation between the memory length of prediction rules and their accuracy.

Price dispersion squeezing during economic downturns
Marco Hoeberichts, Ad Stokman

In this paper we show that, next to the long-term influence of market integration on price level dispersion in Europe (see Faber, Stokman, 2009), market frictions (price rigidities) and market conditions are important in the short-run. We argue that during economic downturns, markets become more competitive. As a result price differences become smaller.

The zero lower bound, ECB interest rate policy and the financial crisis
John Lewis, Stefan Gerlach

This paper estimates a monetary policy reaction function for the ECB over the period 1999-2009. To allow for a potential shift in interest rate setting during the financial crisis, we permit a smooth transition from one set of parameters to another. The estimates show a swift change in the months following the collapse of Lehmann brothers and that the ECB cut rates more aggressively than expected solely on the basis of the worsening of macroeconomic conditions, consistent with the theoretical literature on optimal monetary policy in the vicinity of the zero bound.

Home equity, mobility and the macro economy
Vincent Sterk

I build a dynamic stochastic equilibrium model with credit constraints, geographical mobility, and labour market matching. After a decline in house prices, mobility falls as a result of declines in home equity. The reduction in mobility leads to a distortion of the matching process in the labour market and thereby a fall in real activity.

Trade costs slow down price level convergence in Europe
Ad Stokman

Price level convergence has made little progress since the introduction of the euro. To some this makes sense, as price level dispersion in Europe is close to intra U.S. state levels by now (Rogers, 2007, JME). I argue that the potential for a further decline in price differentials is substantial within Europe, but that this development been delayed by steeply rising trade costs.

2. Central bank transparency and communication

The dynamic voting patterns of the Bank of England's MPC
Jan Marc Berk, Beata Bierut, Ellen E. Meade (American University)

The literature on the behaviour of the Bank of England's Monetary Policy Committee (MPC) has focused on average static voting patterns. Providing statistical support for a dynamic pattern using a panel reaction function to analyze MPC votes over the 1997-2008 period, we find that internal and external members do not behave differently in their first year on the MPC. However, in their second and third years of tenure, internal members prefer higher policy rates and place a higher weight on output growth than external members. This suggests that differences in background cannot account for the differences in observed voting patterns.

How much does the public know about the ECB's monetary policy? Evidence from a survey of Dutch households
Carin van der Cruijsen, David-Jan Jansen, Jakob de Haan

Does the general public know what central banks do and does it matter? Using a survey of Dutch households, we investigate these questions for the case of the European Central Bank. Our findings suggest that knowledge on the ECB's objectives is far from perfect. Both a weak desire to be informed and unawareness of poor knowledge are barriers for improving the public's understanding of monetary policy. However, our results also show that more intensive use of information improves understanding, suggesting that the media channel may play an important and constructive role in building knowledge. Finally, our results show that better knowledge on monetary policy objectives improves an individual's ability to form realistic inflation expectations.

The role of information in decision-making
Maria Demertzis, Nicola Viegi (University of Pretoria)

This paper is an attempt to generalize some results that we have derived in previous papers on the role of inflation targets as coordination devices. This paper will generalize the framework for any case when there are strategic complementarities and where the information set-up in which agents operate is incomplete. The methodology used borrows from the seminal paper by Morris and Shin (2002) in terms of identifying the existing strategic complementarities and modelling the role of information. To this we apply the theory of focal points (Bacharach, 1993) to provide direction in terms of how a social planner (policy maker) can intervene and help direct beliefs.

A new perspective on the consistency of ECB communication
David-Jan Jansen, Jakob de Haan

We apply a content analysis method based on word frequencies to the ECB President's introductory statements. To use this method, we code introductory statements from the

early years of the Economic and Monetary Union using various indicators of ECB communication as well as actual policy decisions. Using this method, we are then able to present a fairly accurate picture of the ECB's monetary policy stance in subsequent years. Therefore, we conclude that the ECB's communication has been quite consistent over the last decade. However, our evidence also suggests that in the course of time ECB communications have changed. Still, adding more introductory statements to the set of reference texts improves our understanding of the monetary policy stance. From that perspective, the introductory statements continued to provide new relevant information to central bank watchers.

Transparency of banking supervisors
Franka Liedorp, Robert Mosch, Carin van der Cruijsen, Jakob de Haan

Transparency of supervisors has similar benefits as transparency of monetary policy makers. It enhances the legitimacy and predictability of the supervisor and stimulates the supervisor to take careful and consistent decisions. However, supervisors face more restrictions than monetary policy makers. For instance, supervisors cannot reveal much information on individual financial institutions. There is hardly any comparative research on the transparency of banking supervisors. We fill this gap in the literature. Following Eijffinger and Geraats (2006), who developed an index of the transparency of monetary policy makers, we construct an index of the transparency of banking supervisors.

Does central bank communication really lead to better forecasts of policy decisions? New evidence based on a Taylor rule model for the ECB
Jan-Egbert Sturm (ETH, Zuerich), Jakob de Haan

Nowadays, it is widely believed that greater disclosure and clarity over policy may lead to greater predictability of central bank actions. We examine whether communication by the European Central Bank (ECB) adds information compared to the information provided by a Taylor rule model in which real time expected inflation and output growth are used. We use five indicators of ECB communication that are all based on the ECB President's introductory statement at the press conference following an ECB policy meeting. Our results suggest that even though the indicators are sometimes quite different from one another, they add information that helps predict the next policy decision of the ECB. Furthermore, also when the interbank rate is included in our Taylor rule model, the ECB communication indicators remain significant.

3. Financial stability and macro-prudential supervision

Monetary policy and excessive bank risk taking
Itai Agur, Maria Demertzis

If monetary policy is to aim at financial stability, how would it change? To analyze this question, this paper develops a general-form, axiomatic framework. Financial stability objectives are shown to make a monetary authority more conservative and more aggressive. Conservative as it sets higher rates on average and aggressive because, in reaction to negative shocks, cuts are deeper but shorter-lived than otherwise. Keeping cuts short is crucial as bank risk responds primarily to stable low rates. Within the short span, cuts then must be deep to achieve standard objectives.

Labour market flexibility and the impact of the financial crisis
I Kadek Dian Sutrisna Artha (RUG), Jakob de Haan

The impact of the global financial crisis varies across countries. We examine whether cross-country differences in output loss and speed of recovery are affected by differences in labour market flexibility. By employing cross-country regressions and including control variables like trade and capital market integration, financial vulnerability, and institutional differences, we find that countries with low hiring cost suffered lower output losses due to the global financial crisis. Similarly, the duration of the crisis in countries with less regulated labour markets and low hiring cost is lower than that of countries with more rigid labour markets.

Can systemic risk arising from settlement risk exposures be eliminated?
Ron Berndsen

The aim of this research is to investigate whether it is possible to eliminate the occurrence of systemic risk arising within and from payment and securities settlement systems. To this end we follow a two-step approach. Firstly, we develop a model for representing settlement risk exposures in payment and securities settlement systems in a uniform way. Secondly, we generalize that model in order to arrive at a notion of systemic risk stemming from settlement risk exposures and investigate the feasibility of an elimination of that type of systemic risk by considering alternative settlement arrangements.

Impact of increasing bank capital and liquidity requirements on credit supply and interest rates
Beata Bierut, Jan Willem van den End

The tightening of the prudential requirements is likely to trigger behavioural responses of the banks. Higher capital requirements will reinforce the bank capital channel of monetary transmission and tighter liquidity requirements will increase bank funding costs and loan rates, reinforcing the interest rate channel. The required reduction of balance sheet mismatches due to tightened liquidity requirements is an incentive for banks limit their funding mismatch (through curtailing lending, increasing government bond holdings and central bank reserves and to lengthen the funding profile by increasing long-term bond issues). Such reactions will have an - until now largely unknown - impact on the yield curve. Our paper is aimed at providing quantitative empirical answers to these issues. We begin by estimating standard macro VAR (VEC) models (for the whole EA / for five EA countries: DE, FR, ES, NL, IT) and then extend them to incorporate variables capturing bank liquidity and capital effects. These results will be then used for an ex ante assessment of the impact of new capital and liquidity requirements on monetary transmission and the economy.

Complex theory and economic systems
Wilko Bolt, Maria Demertzis, Chen Zhou

We propose to look at complex systems as an alternative methodology applied to economics. This desire is motivated by the inability of current models to account for rather acute non-linearities that characterize the system. This amounts to looking at three distinct issues: 1) *Critical Transitions* This refers to techniques that are used in natural sciences to identify critical transitions in nature. The aim is to understand what the relevant variables look like right at the time of transition in order to be able to correctly identify that it is indeed a transition and not a random mean-reverting shock. The natural application to bank-related issues is to apply these techniques to historically identified crises (transitions) and examine whether they distinguish them from randomly occurring shocks. 2) *Heterogeneous Agents* This is an attempt to move away from the traditional rational expectations literature and allow for the fact that agents

are differentiated in terms of the way they form expectations. This also relates to learning algorithms for expectations and also draws heavily from the results learned from laboratory experiments. They are typically non-linear in the way they react to new information.3) *Networks* This includes the topology of networks, both in terms of describing them but also in terms of identifying robust architectures to systemic vulnerabilities. Work done in this area shows that it is not optimal for banks to connect beyond a given number of partners, as the accrued benefits of accessibility are overcome by the risk of contagion. It can be shown that such a trade-off is generated endogenously for a given network architecture. More generally one can examine whether this trade-off causes or is caused by certain network architecture. This part of the literature contributes to the definition and measurement of systemic risk.

Payments and electronics
Wilko Bolt, Bob Chakravorti (FRB Chicago)

The migration of cash and paper to electronic payments has given rise to important research questions regarding optimal pricing of electronic payments, burden sharing between players, payment competition and antitrust policy, and potential regulatory interventions. This chapter for the Handbook on the Digital Economy will first look at empirical evidence and then, using a theoretic framework, attempt to try answering these main questions.

Bank credit constraints and automatic stabilizers
Willem Heeringa, Job Swank

In this theoretical paper, we consider an economy in which individuals decide on consumption, saving and borrowing over a 2-period lifetime. Individuals are heterogeneous in that they are faced with common as well as idiosyncratic income shocks in both periods. In an attempt to smooth consumption over the lifetime, some of them will save in the first period, whereas others may want to borrow. Financial intermediation is performed by banks that either maximize expected profits or aim at curbing the probability of bank failure over a generation's lifetime. We show that under both strategies, it is optimal for banks to introduce a non-discriminatory credit constraint, as they don't know in advance which borrowers will default on their loans or are most likely to do so. Since individual borrowers have no information edge over banks on their future income prospects, credit rationing in our model is not caused by asymmetric information, as in Stiglitz and Weiss (1981), but results from incomplete information due to borrower heterogeneity. While underestimation of borrower heterogeneity (or tail density) always causes banking profits to be lower than anticipated, we also show that it does not necessarily increase the probability of bank failure under expected profit maximization. This depends crucially on the credit constraint profit maximizing banks would have imposed had the true tail density of idiosyncratic shocks been known. So, contrary to common wisdom, underestimation of tail density is not always a bad thing. We finally analyze within this framework how a public system of proportional income taxes and lump sum benefits can help stabilize consumption over a generation's lifetime and reduce the risk of intergenerational debt transfer due to bank failures.

The empirical relationship between demographics and real house prices: the Netherlands versus the US
Willem Heeringa, Job Swank

The aim of this paper is to investigate the empirical relationship between demographics and real house prices. Some people expect that the retirement of the baby boom generation could result into an asset price meltdown. The basic idea behind this is that

older generations will sell most of their assets after retirement in order to consume their wealth. Applied to the housing market, this could imply a fall in house prices when the babyboomers start to retire after 2010 (Mankiw and Weil, 1989). Several papers in the literature have investigated this hypothesis for the US, but (except for the UK) no such studies exist for European countries. In this paper, we apply a panel data approach on 76 regions of Netherlands to estimate the relationship between demographics and real house prices, while controlling for income differences. We repeat the analysis for the US at the State-level and compare the empirical results.

The private credit insurance effect on trade
Koen van der Veer

International trade relies on trade finance (credit or insurance) by financial institutions. Data limitations, however, have made it difficult to quantify the impact of changes in the supply of trade finance on trade. This paper is the first to establish a causal link between exports and the private supply of credit insurance. I overcome endogeneity issues by using a unique bilateral data set, which covers the activities from 1992 to 2006 of one of the world's leading private credit insurers. This database enables me to use the insurer's claim ratio -- a primary determinant of the supply of credit insurance -- as an instrument for insured exports. Subsequently, applying the method of instrumental variables and a variety of trade models, I consistently find a positive and statistically significant effect of private credit insurance on exports. The estimates are economically relevant and suggest that the decline in short term credit insurance exposure during the 2008-09 international trade collapse accounted for about 11 percent of the drop in world exports and 19 percent of the drop in exports from Europe.

Hidden linkages of exchange crises
Chen Zhou

Exchange rates are driven by the relative ratio of macroeconomic fundamentals such as money supply, real income, nominal interest rates and price level between the two underlying countries. This creates potential dependence of exchange rates with one common reference country. Empirical literature documented the tail dependence among exchange rates, i.e. two exchange rates with respect to one common reference country are likely to have extreme co-movements. This could be caused by the shocks on the macroeconomic fundamentals of the reference country. However, such extreme co-movements are more observed between industrial countries compared to emerging economies. This study intends to provide a theoretical model explaining such phenomenon. We further consider the potential extreme co-movements in tail independent case: the hidden linkages of exchange crises

Why does micro-prudential regulation fail?
Chen Zhou

Micro-prudential banking regulations such as capital requirement have been widely criticized during the unfolding of the crisis. The recent literature discussed two dimensions of problems that micro-prudential regulation cannot address: on the time dimension, it may cause the evolution of risk-taking by financial institutions, thus result in a pro-cyclicality problem; on the cross-sectional dimension, it may cause the inter-connectedness of banking crises, in other words, systemic risk. This study evaluates whether imposing a capital requirement can increase systemic risk. The intuition is that by its design, micro-prudential regulations should reduce individual risk taking of each financial institution, however, may increase the systemic linkage among them. The trade off between the two impacts may result in an increase or decrease of systemic risk.

4. Micro-prudential supervision and behaviour of financial institutions

Capital requirements and credit rationing
Itai Agur

This paper shows how higher capital requirements can lead to more stringent borrower rationing by banks. It extends the seminal Stiglitz-Weiss model of credit rationing to allow for bank default. Bank financing then matters for lending incentives. With more equity finance, a bank more strongly dislikes volatile borrower returns. Because of adverse selection among borrowers, it then rations more to obtain a safer pool of borrowers. Additionally, this effect is strengthened when creditors are not covered by deposit insurance. Thus, the rise of wholesale funding should have made credit supply more sensitive to capital requirements.

On the possibility of credit rationing in the Stiglitz-Weiss model: A comment
Itai Agur

The model of Stiglitz and Weiss (American Economic Review, 1981, 71(3)) is the seminal analytical work on credit rationing. However, in a recent paper, Arnold and Riley (American Economic Review, 2009, 99(5)) claim that the distributional assumption on which that model's main result depends cannot hold. This paper shows that Arnold and Riley's result is an outcome of their implicit assumption of a one-period Bertrand game between banks. In more realistic modes of bank competition, in which banks have some degree of monopoly power or interact repeatedly, Stiglitz and Weiss's result can hold.

Bank capital channel: evidence for the Netherlands
Robert-Paul Berben, Jan Willem van den End

Bank capital requirements are likely to become tighter in the (near) future. Is this paper, we assess the relationship between bank capital on the one hand and bank lending and bank interest rates on the other hand. We use bank-data for a panel of large Dutch banks. As a follow-up, a possible extension of Delfi, DNB's macro econometric model, with a bank capital channel will be considered.

Mean reversion in stock returns and the consequences for the FTK continuity test
Jaap Bikker (DNB, UU), Pieter van den Hoek, Laura Spierdijk (RUG)

In the public discussion on the future of the Dutch pension system, people suggest that the current funding shortages will disappear as stock prices are expected to recover. This implies the assumption that stock prices are, in the long run, 'mean reverting'. The existence of mean reversion has great implications for the FTK continuity test, investment policy of pension funds and, hence, their required buffers. Fama and French (1988) and Poterba and Summers (1988) (FFPS) find significant mean reversion in 96-maands returns on de CRSP NYSE index during 1926-1985. De Bondt en Thaler (1985, 1987) obtain similar results. The conclusion that stock prices are, in the long run, mean reverting, have been criticized or toned down by many authors.

  FFPS calculate returns over several years which partly overlap. Together with the relatively small sample size (1926-1985) this leads to various statistical problems which prevent the possibility to draw a conclusion on mean reversion. In the literature this is known as the problem of 'small sample bias'. Although some recent studies have attempted to examine mean reversion accommodating the statistical concerns mentioned above, the evidence for long-term mean reversion seems absent. The aim of

this project is to explore whether equity returns are mean reverting in the long term using statistical and econometrical responsible approaches, using bootstrap and simulation methods to determine the standard errors in models that employ overlapping samples. Further, following Balvers *et al.* (2000), we will apply panel data models for equity returns in several countries, in order to obtain more reliable estimates, using more data. Finally, we will investigate the consequences of our results for the FTK continuity test.

The impact of scale, complexity and service level on administration costs of pension funds: a cross-country comparison
Jaap Bikker (DNB, UU), Onno Steenbeek (APG, EUR), Federico Torracchi

Retirement savings and the way a society should institutionalize consumption postponement in favour of pension benefits, is currently on the agenda of politicians and economists in many countries. The magnitude of this topic even seems to expand during recent years. As small differences in administrative costs have a potential huge effect on accumulated returns, it is important to focus on these costs. Moreover, it is interesting to compare administrative costs of funds from various countries, thereby quantifying the effects of institutional differences on administrative costs in pension schemes of different countries.

 The data available includes levels of complexity and service for all pension funds. The question we, as supervisors, are interested in, is whether differences in costs between funds can be attributed to more complex products and/or a higher service level. The available information gives us a chance to look at possible trade-off in costs on the one hand and service and complexity on the other. If such a trade-off indeed exists, the costs of service and appropriateness can be determined. In short: do expensive pension funds deliver value for money? Furthermore we want to compare service levels and costs across countries.

Bank profitability during recessions
Wilko Bolt, Leo de Haan, Marco Hoeberichts, Maarten van Oordt, Job Swank

The current banking crisis and the concurrent severe economic recession revive the interest in the issue of cyclical behaviour of bank profitability. Our paper contributes to previous research on this topic in three different respects. First, we not only estimate the cyclical behaviour of total profits, but also of the three components that define it: net interest income, other income, and net provisioning plus operational costs. Second, we do this for two types of unbalanced panel data: aggregate bank data for 17 countries over three decades and individual bank data for 19 countries over a period of 18 years, respectively. Third, we assess whether the degree of pro-cyclicality of bank profitability is stronger for deep recessions than for mild ones. Our results confirm this asymmetry, for which loan-losses are found to be the driver.

Measuring bank competition across U.S. banks
Wilko Bolt, Dave Humphrey (FSU Tallahassee)

Adequate banking competition benefits consumers by reducing costs, lowering prices, and improving offered services. While the reverse may occur if competition is too weak, if it is too strong banks may seek greater risks in an effort to replace profits lost by lowering prices more than costs can be reduced. Unfortunately, standard indicators of bank competition may yield conflicting results. We propose an alternative measure that takes different bank activities (spread, non-interest income) into account. Should antitrust authorities or banking regulators be concerned? Yes, if prices of fee-based activities do not reasonably fall as underlying costs are reduced since this implies a lack

of competition. And yes if periods of strong loan demand did indeed result in higher real loan-deposit rate spreads, which may not be reversed when the supply of deposits outstrips the demand for loans in the future.

Equivalence of different regulatory pension regimes
Dirk Broeders, An Chen (Bonn University)

Countries apply different security mechanisms in defined benefit pension regulations. These mechanism are regulatory own funds, pension guarantee funds, sponsor guarantees and a reduction in indexation. This paper studies these mechanisms using contingent claims analysis. The key research question is under which circumstances (combinations) of the mechanisms offer similar security to the beneficiaries of a pension plan.

In this paper we assume that the technical provisions are calculated equally for all different solvency regimes. So we focus on the differences in solvency regimes. These can take different forms. (1) In order to prevent a situation of under funding a pension fund can hold additional assets, or regulatory own funds, that act as a security mechanism. (2) Sponsor support is defined as the ability and willingness of the corporate to support its pension scheme, i.e. to continue to pay sufficient contributions to ensure that benefits are paid as they become due, and to provide additional money for restoring the pension scheme's funding position, if the value of assets structurally falls below the value of liabilities. (3) A pension guarantee fund insures pension liabilities up to a certain amount. Typically, the insurance becomes in-the-money if the corporate behind the pension schemes defaults. (4) As a security mechanism reduction in future indexation provides no extra security to the beneficiaries, since it corresponds to a reduction in the purchasing power of benefits. However, since the amount of capital otherwise used for indexation will now be available to strengthening the funding ratio in the long term, the probability of insolvency is decreased. We compare these security mechanisms in an option framework.

Liquidity management of banks under stress
Jan Willem van den End, Leo de Haan

This paper investigates banks' adjustment behaviour with respect to their lending and borrowing when liquidity runs short in relation to supervisory minimum requirements. Supervisory liquidity data on Dutch banks over the period January 2003-December 2009 are used.

Investment behaviour of insurance companies
Janko Gorter (DNB, RUG), Jaap A. Bikker (DNB, UU)

In the literature, there are two opposing views of the impact of institutions' investment behaviour on asset prices (see, *e.g.*, Lakonishok *et al.*, 1992). According to the first view, institutional investors destabilize asset prices. Due to herding and positive feedback trading, institutions are supposed to move stock prices away from fundamentals and increase returns volatility. Another view is that institutional investors can be characterized as informed investors who speed up the adjustment of stock prices to new information thereby making the stock market more efficient. Institutions can create an informational advantage by exploiting economies of scale in information acquisition and processing. A number of empirical studies has examined the behaviour of institutions (Bikker *et al.*, 2007). While Grinblatt *et al.* (1995) find empirical evidence on positive feedback trading by US institutions, Lakonishok *et al.* (1991) and Gompers and Metrick (2001) do not.

This paper is the first to examine the investment behaviour of Dutch insurance companies, which administer over EUR 300 billion of funds. Enhancing DNB's

knowledge on their investment behaviour is useful, both from a financial stability perspective as from a supervisory perspective. We investigate rebalancing behaviour and investment returns to benchmarks. Our sample contains firm-year observations on all Dutch life and non-life insurers, both mutuals and stock companies for the period 1995-2006. Annual data allow for distinction between unit-linked investments and investments for account of the insurers. Data for pension funds are from Bikker *et al.* (2007).

Bank size, market concentration, and U.S. bank earnings volatility in the wake of the global financial crisis
Jakob de Haan, Tigran Poghosyan (IMF)

This paper examines whether the effect of the recent financial crisis on bank earnings volatility depends on bank size and the degree of concentration in the banking sector. Using quarterly data on all commercial, savings, and cooperative banks in the United States for the period Q12004-Q42009, we find that relative bank size has a negative effect on return volatility, while market concentration has a positive effect. We also find that larger banks located in more concentrated markets have experienced higher volatility during the crisis.

Central bank intervention in large-value payment systems: An experimental assessment of moral hazard risk
Peter Heemeijer, Ronald Heijmans, Frans van Winden (UvA)

We intend to do an experiment examining payment behaviour between banks within a large-value payment system supervised by a central bank. When individual banks coordinate on delaying payments, thus enlarging each other's credit risk, the central bank intervenes in the payment system. The central bank intervenes in two possible ways: either by providing liquidity to ensure early inter-bank payments (positive intervention), or by fining banks for coordinating on the late-payment equilibrium (negative intervention). When the central bank has a policy of positive intervention, there is a risk that banks will be motivated to pay late (i.e. moral hazard risk), knowing that additional liquidity will be provided in the case of late-payment coordination. The main objective of the experiment is to assess the severity of moral hazard risk in the case of positive central bank intervention. Also, the effectiveness of positive and negative central bank intervention will be compared.

The crisis as a wake-up call. Do banks tighten monitoring and screening during a financial crisis?
Neeltje van Horen

We examine whether the global financial crisis has prompted banks to screen and monitor borrowers more carefully. By analyzing a large set of syndicated loans to private borrowers over the period 2005-2009 we find significant changes in syndicate structure that point to an increased focus on screening and monitoring during the crisis. In particular, we document a considerable increase in retention rates among syndicate arrangers. These higher retention rates ('more skin in the game') are only partially caused by increased borrower risk. They mainly reflect that banks re-evaluated the importance of strict screening and monitoring when the crisis erupted: a wake-up call effect.

Learning by doing in foreign banking
Neeltje van Horen

Banks, as financial intermediaries, specialize in overcoming information asymmetries. The more a lender knows about its customer, the more it can mitigate principal agent issues such as moral hazard and adverse selection. This suggests that repeated transactions and increased familiarity with local conditions help banks to make better lending decisions and as such become more efficient. This beneficial impact of length of stay in a country on bank efficiency is likely even more pronounced for foreign banks as they have to deal with both a different work force and associated varying procedures as well as with a different informational environment. In this paper we examine whether foreign banks learn by analyzing the impact of the age of the bank on its cost to income ratio, and how the learning of foreign banks differs from that of domestic ones. In addition we attempt to determine which home and host characteristics and bank characteristics affect the speed of learning. We use a large panel data set capturing almost all foreign bank entry in both developing and developed countries between 1995 and 2006.

Banking risk and regulation: Does one size fit all?
Jeroen Klomp (CPB), Jakob de Haan

Using data for more than 200 banks from 21 OECD countries over 2002-2008, we examine whether the impact of bank regulation and supervision on risk-taking behaviour differs across banks. Our indicators of supervision and capital adequacy have a significant impact on 'capital and asset risk', while our indicators of activity restrictions, supervision, private monitoring, and liquidity significantly affect 'liquidity and funding risk'. However, quantile regressions suggest that the effect of regulation and supervision differs across banks: most indicators of bank regulation and supervision do not have a significant effect on risk-averse banks, while they do affect riskier banks.

Contextual determinants of banks' liquid buffers
Iman van Lelyveld, Robert Zymek (Bank of England, Pompeu Fabra).

Banks' role in maturity transformation combined with a first-come, first save constraint imply that banks are susceptible to bank runs and thus can suffer from – temporary – illiquidity. The supervisory community has realised this and is working hard in coming to a joint framework for liquidity regulation and supervision (see WGL (2009) for an overview of the state of play in the literature). Objections to such a common framework have been raised as 'contextual factors' would make it impossible to achieve a level playing field; The depth of the financial market, the quality of regulation and competition have for instance been mentioned as such factors (BCBS, 2008). This paper will examine the economic importance of many of the factors mentioned in the debate.

We will provide the first formal analysis of the determinants of banks' liquid asset holdings across countries. Using balance-sheet data for nearly 7,000 banks from 30 OECD countries over a ten-year period, we will assess the relevance of a number of country-specific institutional and policy variables in explaining the size of banks liquid asset buffers. Our setup will be similar to Aspachs, Nier and Tiesset (2009) but we will use a worldwide dataset. Using several measures of bank's liquidity as dependent, we intend to explain these by firm specific controls, macro economic controls, and variables that measure contextual factors as mentioned in the literature.

How do interbank market exposures affect bank risk? Evidence from a spatial lag model.
Franka Liedorp, Iman van Lelyveld, Lydian Medema (RUG), Michael Koetter (RUG), Ruud Koning (RUG)

The inter-bank market is crucial in transferring funds through the financial system. At the same time, the inter-bank market is prone to contagion risk and a breakdown may pose a serious threat to financial stability, as highlighted by recent events. We test if

entanglement in the inter-bank market is a channel through which banks affect each others riskiness. We use a spatial lag model, borrowed from regional science, to test if an individual bank's z-score (a kind of distance-to-default measure of risk) is affected by z-scores of other banks through the inter-bank market. Both inter-bank borrowing and lending risks are assessed. We employ a panel data model where we explain our risk measure (z-score) with bank specific variables, time specific fixed effects and the bank´s involvement in the inter-bank activities. This last vector is based on quarterly inter-bank exposures of Dutch banks with each other between 1998 and 2008.

An empirical analysis of interbank contagion during the sub-prime crisis
Mark Mink (DNB, RUG), Jakob de Haan (DNB, RUG), Jan P.A.M. Jacobs (RUG)

An important task of the Eurosystem is to promote international financial integration amongst its Member states. Doing so might complicate the Eurosystem's task of safeguarding financial stability in the Union, since adverse idiosyncratic shocks spill over more easily between countries with closely linked financial sectors. As the sub-prime crisis underlines, such contagion effects are especially likely to occur in the banking sector because of so-called financial fragility (De Bandt and Hartmann, 2000). Inspired by these considerations, we will analyse international interdependencies in bank fragility and will pay particular attention to experiences during the current market turmoil. The economic literature has suggested several measures of bank fragility (see Gropp, Vesala and Vulpes, 2004, for a discussion). On the basis of insights from Mink, Jacobs and De Haan (2007), Mink and Mierau (2009), and Mink (2009) we will empirically analyse interdependencies between fragility indicators of individual banks, and analyse developments in interdependencies between the fragility of national banking sectors. Insights obtained from Harding and Pagan (2006) can be used to analyse whether during the sub-prime crisis interdependencies amongst banks differed statistically from those during more tranquil times.

The impact of bank regulation and supervision on bank soundness
Choudhry Tanveer Shehzad (RUG) and Jakob de Haan

We examine the effect of different dimensions of bank regulation and supervision on financial soundness analyzing around 400 banks for the period 2005-2008. We find that various dimensions of bank regulation and supervision have different effects on our proxies for financial soundness as suggested by the IMF. Better supervisory control tends to improve bank asset quality, liquidity, banking stability, and profitability, but has no effect on capital adequacy. Moreover, regulations restricting bank activities and increased private sector monitoring of banks do not improve financial soundness.

5. Financial literacy and behaviour of households and firms

Do lifecycle saving schemes provide a route to early retirement? The maturing of the Swiss occupational pension system
Monika Buetler (FGN-HSG Universität St. Gallen, CEPR & CESIfo), Federica Teppa

Life-cycle savings schemes, as already implemented or discussed in many countries, typically increase the replacement rate of high-income earners relative to that of lower income individuals as they strengthen the link between life-time earnings and future pensions. These schemes reduce the negative incentives to work implied by social security and the tax system which are usually made responsible for the increase in early retirement. Nonetheless, the decision to leave the workforce or not may not only be the result of a substitution effect but also of an income effect: If leisure is a normal good,

high replacement rates may induce them to retire early even if work is not implicitly taxed. This paper illustrates this possibility with the case of Switzerland's maturing second pillar. Mandated in 1985, the Swiss occupational pension scheme has increased old age income for middle and high-income earners, while at the same time the benefit structure of the first pillar has remained unchanged.

We use different data sources to show that the propensity to retire early has increased over the period 1990-2003. Moreover, early retirement is more prevalent among middle- income earners for which income effects are likely to be particularly strong. Taken together the Swiss case is consistent with the interpretation that life-cycle savings schemes indeed provide a route to early retirement.

Expectations of banking supervision: evidence from a survey of Dutch households
Carin van der Cruijsen, David-Jan Jansen, Jakob de Haan, Robert Mosch

We report the outcomes of a web-based survey of Dutch households on their expectations of banking supervision. First, we describe the respondents' knowledge on supervision. Second, we give information on their expectations regarding various aspects of supervision and discuss to what extent these expectations are realistic. Third, we test if and how these expectations depend on individuals' experiences with bankruptcy and bailouts, their knowledge on supervision, their desire to be informed on supervision, their media use, and background characteristics.

Household financial market expectations and investment choices in a financial crisis
Michael Hurd (RAND and NBER), Maarten van Rooij, Joachim Winter (University of Munich)

Despite its importance for the analysis of life-cycle behaviour and, in particular, retirement planning, stock ownership by private households is poorly understood. For instance, in contrast to the predictions of standard models of life-cycle behaviour and portfolio choice, relatively few households hold stocks while those who do hold stocks often trade too much or not at all. The current study uses repeated observations of private households' financial market expectations collected at relatively high frequency in the CentERpanel to investigate the effect of the autumn 2008 financial crisis, i.e. a crash on the stock market, a high volatility of stock returns and an increased uncertainty on future economic developments, on the level and volatility of stock market expectations and its effect portfolio investment choices (i.e. buying or selling stocks, bonds and mutual funds). The hypotheses we test include (i) the stability of expectations over time; (ii) the reaction of expectations to new information on stock markets, e.g. the emergence of a stock market crash; and (iii) the relationship between expected returns and actual trades.

Card acceptance and surcharging: the role of costs and competition
Nicole Jonker

Several cost studies reveal that debit card payments are very often more cost efficient than cash or credit card payments. Previous research shows that a higher acceptance rate among merchants will encourage consumers to use their debit card more frequently, as will less debit card surcharging. The aim of this study is to gain insight into the factors influencing merchants' acceptance and surcharging decisions. We summarise the main behavioural relationships found in the theoretical literature and we evaluate these relationships empirically, using survey data collected by DNB among 1,008 Dutch merchants in 2007. The survey results reveal that both the costs associated with card acceptance for merchants as well as the competitiveness of the market influences merchants' acceptance and surcharging decisions. The results confirm the predictions from the theoretical literature.

Choice of payments instruments and ethnicity
Anneke Kosse and David-Jan Jansen

The role of demographic factors in choice of payments instruments has been well researched. However, little attention has been paid in the literature to the specific role of ethnicity. In August 2009 a special survey was conducted to gather information on payments by ethnic minorities in the Netherlands. Using this survey, we are able to establish differences in payments behaviour based on ethnicity. Using regression analysis, we will investigate whether ethnicity still plays a significant role when controlling for various covariates, such as income, education, gender, type of transaction, and transaction volume.

Debitcard usage: the impact of newspaper articles about skimming fraud
Anneke Kosse

Skimming fraud is one of the main forms of payment fraud at points of sale and automated teller machines in the Netherlands and it has increased materially over the past few years. Although the size of this fraud is relatively small in comparison with total retail payments, these incidents receive a fair amount of attention from the media and might therefore affect consumers' payment behaviour and in the end the overall efficiency of the payment system. Using time series analysis, we will analyse, after having corrected for calendar and seasonal effects, to what extent daily debitcard usage is affected by publications of newspaper articles about skimming. To this end, daily debitcard transaction data (split up by region) have been collected from 2005 – 2009, as well as all skimming articles published during this period in national and regional newspapers.

Macro and micro drivers of house market dynamics: An application to Dutch data
Federica Teppa, Gabriele Galati

What is the role of micro and macro factors in determining house prices? We address this question empirically by using survey data on housing and mortgages from the DBN Household Survey. The data set covers the period 1993–2008. We look at both short-term determinants of house prices (e.g. financing conditions) and long-term factors (e.g. demographical changes). The data also allows us to analyse the characteristics of households who during the sample period switch from being tenants to being home-owners and vice versa.

Other research projects:

Employment protection, technology choice, and worker allocation
Eric J. Bartelsman (VU University Amsterdam, TI), Pieter A. Gautier (VU University Amsterdam, TI), Joris de Wind

Using country-industry panel data from the EUKLEMS, we find that countries with stricter employment protection legislation (EPL) have smaller and less productive high-risk innovative sectors. We develop a two-sector matching model with endogenous technology choice, i.e. firms can choose between a safe sector with stable productivity and a risky sector with productivity subject to sizeable shocks. In the absence of EPL, the risky sector is relatively attractive because firms have the option to fire workers, which bounds the downward risk. Recent evidence from Brynjolfsson, McAfee, and Zhu (2009) shows that the adoption of new information and communication technologies (ICT) since the mid-nineties is associated with an increase in the variance of firm performance. We argue that this increased variance has boosted average productivity

because the option to fire workers gives firms opportunities to exploit the good projects and exit the bad ones. As EPL makes it more costly to exit, countries with stricter EPL have been less able to exploit the new ICT. The described mechanism can explain a considerable portion of the slowdown in productivity in the EU relative to the US since the mid-nineties.

Key elements in banknote design
Hans de Heij

Commissions to design a new banknote are typically unclear, hiding many implicit aspects. This study aims to make these key elements more explicit in order to make them more manageable. The field work of the research that takes place in 2010 falls apart in 2 items, i.e., a) anti-forgery devices, and b) calling card function of the banknote. The research includes a listing of the relevant DNB studies done at the time of the successful guilder notes, using the DNB archive. The key elements of banknote design falls apart in two separate groups of key elements, related to: a) the product, i.e., the banknote; b) the process, i.e., the design management. Both product and process are divided into six fields of key elements, and each element is subdivided in several subjects.

Estimating agricultural commodities' extreme price risk
Maarten van Oordt, Philip Stork (Massey University), Casper de Vries (EUR)

Price risk is among the most substantial risk factors for farmers. How should we quantify a farmer's most extreme price risk? We use thirty years of daily futures price data to show that the returns of nine agricultural commodities closely follow a power law in the tail of their distributions. Extreme Value Theory, which is particularly suitable for the analysis of very rare events, is applied to estimate Value-at-Risk and Expected Shortfall risk measures. Back-testing and data-frequency robustness tests further verify the usefulness of these risk measurement methods but also indicate specific features any inexperienced user should be aware of.

Reduced rank time-varying Vector Autoregressions
Joris de Wind (DNB, UvA) and Luca Gambetti (UAB, RECent)

The time-varying Vector Autoregressions of for example Primiceri (2005) and Cogley and Sargent (2005) seem to be over-parameterized. They assume that the vector of time-varying coefficients follows a random walk with full rank covariance matrix. Principal component analysis, however, suggests that only a few factors are important in driving the coefficients. Therefore, we reduce the rank of the covariance matrix of the random walk. We rewrite the reduced rank model using an underlying factor structure, which we can estimate much faster than the full rank model. Because the reduced rank model is not subject to over-parameterization as much as the full rank model, we can include more variables and/or more lags.

Determining the forecasting power of survey indicators in real-time
Joris de Wind, Jasper de Winter

Research in the area of forecast aggregation has shown that combining forecasts generally leads to improvements in forecast accuracy as is well documented for GDP forecasts (Stock and Watson, 2004; Marcellino, 2004; Timmerman, 2006). We intend to use the technique of forecast averaging to determine the predictive content of survey indicators. The basic idea is that the predictive content (of groups) of indicators can be determined by determining the weight in the averaging scheme. We aim to compare the predictive content of survey indicators with other indicators (e.g. industrial production, exchange rates) containing information about future GDP. We will explicitly model the main advantages of survey information, i.e. the short publication lag and the lack of

data-revisions. To investigate the advantage of the short publication lag we will analyze the predictive content of survey indicators as more information becomes on GDP development comes available within a quarter. Presumably the advantage of timeliness gradually disappears when more information is released about the quarterly GDP growth. If data permits we will use real-time data to investigate the presumed advantage of a lack of revisions of this type of data (Croushore, 2006). We intend to apply these techniques to the euro area and the five biggest euro area countries. Our main contribution to the literature is to determine under what circumstances confidence indicators have additional predictive content.