ARTICLES

EXTENSIONS TO THE MODELS FOR ASSESSING MONEY AND CREDIT

The ever-changing economic and financial landscape in the euro area, not least during the recent financial crisis, constantly poses new questions and challenges to the ECB's broad-based monetary analysis, as indeed to any policy-oriented analytical endeavour. These require the adoption of new perspectives, the mobilisation of additional sources of information and the development and extension of analytical tools.

In recent years, it has become necessary for the ECB's monetary analysis to identify more clearly any warning signals from money pointing to systematic downside risks to price stability. Moreover, it was faced with bouts of heightened uncertainty, which threatened to blur the information content of monetary developments. In addition, it had to deal with the possibility that the availability of bank credit could be restrained, to different extents depending on the country, economic sector and size of the borrowing company. This article looks at some of the recent extensions to the models used by the ECB's broad-based monetary analysis that address these challenges.

1 INTRODUCTION

Any analytical framework intended to provide input to a monetary policy-making process is constantly confronted with an evolving economic and financial landscape, advances in methodologies and techniques, as well as the increased and improved availability of information. This holds for the ECB's monetary analysis framework as much as for any other policy-oriented analytical endeavour. Maintaining the policy relevance of the analysis of developments in money and credit therefore requires consistent investment in the analytical tools that support it and that, together with the expert institutional knowledge, form the bedrock of monetary analysis. At the ECB, this investment has been continuous and was formalised in 2007 through the ECB Governing Council's endorsement of a research agenda to enhance monetary analysis.[1]

Efforts to improve the monetary analysis, however, did not cease with the completion of this agenda. The additional challenges posed by the financial crisis have intensified the need for extensions and refinements in the applied tools. During the crisis, for instance, it became necessary for the ECB's monetary analysis to identify more clearly monetary regimes which may expose the euro area monetary policy framework to entrenched downside risks to price stability. Moreover, the crisis brought about episodes of heightened uncertainty, which threatened to distort the information value of monetary developments for future economic activity. Finally, stress originating in the banking sector brought to the fore concerns that constraints in the availability of funding to the real economy could be restraining economic activity. The significant heterogeneity of this phenomenon across countries, as well as across borrower sector and firm size, posed an additional challenge. This article illustrates some of the extensions to the models used by the ECB's broad-based monetary analysis that were made to address these challenges. In this sense, the article provides an interim account of selected ongoing work at the ECB to further enhance its monetary analysis.

2 USING MONETARY DEVELOPMENTS TO ASSESS INFLATION TRENDS AND ECONOMIC ACTIVITY

Money-based inflation risk indicators have been used in the ECB's monetary analysis from the outset of Monetary Union. These tools provide a convenient way to summarise and synthesise a vast

1 The avenues for research pursued and the corresponding results are described in Papademos, L.D. and Stark, J. (eds.), *Enhancing monetary analysis*, ECB, Frankfurt am Main, 2010. A summary was also presented in "Enhancing monetary analysis", *Monthly Bulletin,* ECB, November 2010.

amount of detailed information. They are, therefore, an integral element of the overall assessment of risks to price stability in the medium to long term, exploiting the robust leading indicator properties of broad money growth for trends in inflation. At the same time, the informational content of monetary variables is not exhausted in the medium to long-term link between money and price developments. Monetary developments can, for instance, be used to derive information on business and financial cycle dynamics. This section presents some recent extensions to the analytical toolkit applied by the ECB for exploiting policy-relevant information embedded in money.

2.1 USING M3 TO PREDICT SHIFTS IN THE INFLATION REGIME

The ECB's monetary policy strategy assigns a prominent role to monetary analysis for identifying risks to price stability over medium to longer-term horizons. This role recognises that the policy-relevant information in monetary developments about the outlook for prices is concentrated in the low-frequency movements of monetary quantities (i.e. averaging over long periods of time). A particularly pertinent way of operationalising this role is, therefore, to use the informational content of money to provide early warnings of shifts between distinct inflation regimes. The ECB's monetary analysis has, for some time now, deployed such an approach, using the model of Amisano and Fagan (2010).[2,3] This approach considers two possible inflation regimes: a "low" inflation regime (featuring a mean inflation rate of 1.6%) and a "high" inflation regime (featuring a mean inflation rate of 3.8%). The "low" inflation regime therefore nests both "benign" inflation outcomes broadly consistent with the Governing Council's aim of maintaining inflation around levels "below, but close to, 2%" over the medium term, and inflation outcomes that fluctuate within lower numerical ranges which – if sustained – can be viewed as being less consistent with that aim. The decision to use two inflation regimes was motivated by the fact that very low inflation outcomes had been very rare in the history of the euro area and its constituent Member States.

However, it became necessary to distinguish more precisely monetary regimes that are clearly consistent with the Governing Council's aim described above from monetary regimes that may expose the euro area monetary policy framework to systematic downside risks to price stability. The original approach was therefore extended to allow for downside departures from the "benign" price stability regime, despite the empirical challenges referred to above.

Under the extended model, euro area HICP inflation has three regimes: (i) a "low" inflation regime with a state-specific mean calibrated at 0.5%;[4] (ii) a "medium" inflation regime, which is interpreted as being compatible with the Governing Council's 2003 communication on its policy aim over the medium term; and (iii) a "high" inflation regime, in which inflation is well above values compatible with price stability.

2 See Amisano, G. and Fagan, G., "Money growth and inflation: a regime switching approach", *Working Paper Series*, No 1207, ECB, Frankfurt am Main, June 2010, and Amisano, G. and Fagan, G., "Money growth and inflation: a regime switching approach", *Journal of International Money and Finance,* Vol. 33, 2013, pp. 118-145.

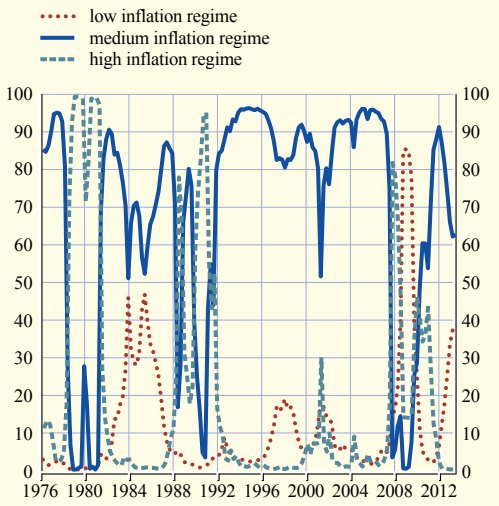
3 For the use of the Amisano and Fagan model by the ECB, see the box entitled "Monetary developments as indicators of inflation" in "Enhancing monetary analysis", *Monthly Bulletin,* ECB, November 2010, and "Money-based inflation risk indicators: principles and approaches" in Papademos, L.D. and Stark, J. (eds.), *Enhancing monetary analysis*, ECB, Frankfurt am Main, 2010, Chapter 4.

4 The calibration of the low inflation regime needed to balance the scarcity of observed low inflation periods against the need for empirical robustness. Experimenting with different values for the low inflation regime mean, however, did not yield qualitatively different results. For the extended model, see Amisano, G., Colavecchio, R. and Fagan, G., "A money-based indicator for deflation risk", *DEP Discussion Paper*, Macroeconomics and Finance Series 1/2014, Hamburg University, January 2014.

The model can be used to map observed inflation outcomes onto probabilistic statements about being in each of the three regimes at any particular point in history.[5] These are characterisations of observed inflation readings and not predictive statements about future inflation regimes.

Chart 1 Inflation regime allocation probabilities

(probabilities in percentages)



Source: ECB calculations based on extensions to the Amisano and Fagan model.

From a policy perspective, what is of central interest is how this approach exploits the leading indicator properties of money to provide early warnings about future shifts in the inflation regime. As in the original specification of the Amisano and Fagan model, the probabilities of switching from one regime to another (i.e. transition probabilities) are allowed to vary over time as a function of a smoothed measure of euro area M3 growth. Importantly, it is the lagged values of this measure that are used in the estimation of the transition probabilities. This feature implies that the model can be used to estimate transition probabilities for up to nine quarters ahead. It should be highlighted, however, that the uncertainty surrounding these estimates increases as the projection horizon is prolonged.

Two results of the new specification of the Amisano and Fagan model are worth mentioning. First, the probability that the model assigns to the medium inflation regime is 63%, as of the third quarter of 2013 (see Chart 1). Therefore, despite a decline in that estimated probability over the recent past, the model continues to view a regime consistent with price stability as the most probable characterisation of the current state of inflation.

Second, the probability that the euro area will remain in the medium inflation regime in the future, given that it is currently in such a regime, remains very high (more than 90%) throughout the period until the fourth quarter of 2015 (see Chart 2). By contrast, the probability of a transition from a medium inflation regime to a low inflation regime is estimated to be rather small (below 10%), albeit higher than before 2011 (see Chart 3).

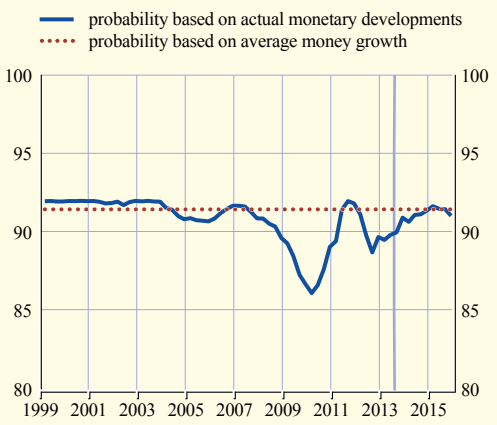
The influence of the recent subdued pace of monetary expansion in raising the probability of a low inflation regime since early 2012 can be gauged by comparing the solid line in Chart 3, i.e. the estimated transition probability using actual monetary developments, with the dotted horizontal line. The latter shows the probability of moving from the medium to the low inflation regime computed by setting the monetary indicator variable equal to its sample mean.[6] The probability corresponding to actual monetary developments is currently higher than the probability corresponding to average

5 Inflation regimes themselves are unobservable but should be understood as reflecting persistent inflation readings close to a regime-specific central value. Therefore, single inflation readings cannot be mechanically assigned to a specific regime by comparing them with a predefined set of thresholds. Instead, the model can be used to estimate the probability that, at each point in time in the available history, inflation was in each of the three possible regimes. These are smoothed probabilities, i.e. they take into account the entire sample evidence and not just the latest data point.

6 The transition probability corresponding to M3 growth set at the ECB's reference value (i.e. 4.5% per annum) is close to the one corresponding to average money growth.

Chart 2 Probability of remaining in the medium inflation regime given that the economy was in the medium inflation regime in the previous quarter

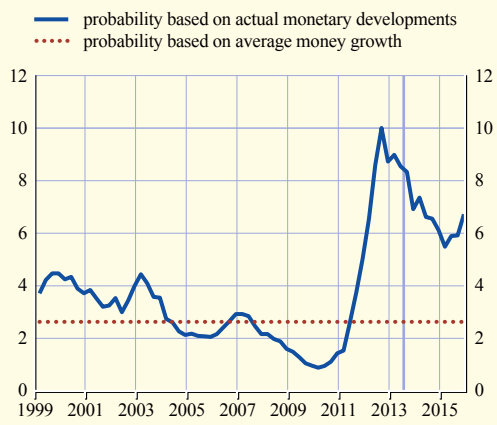
(probabilities in percentages)



Source: ECB calculations based on extensions to the Amisano and Fagan model.
Notes: The vertical line denotes the start of the period for which actual observations for inflation are not available. The latest observation is for the third quarter of 2013.

Chart 3 Probability of moving from a medium to a low inflation regime

(probabilities in percentages)



Source: ECB calculations based on extensions to the Amisano and Fagan model.
Notes: The vertical line denotes the start of the period for which actual observations for inflation are not available. The latest observation is for the third quarter of 2013.

monetary conditions and is projected to remain higher. By nature, this approach does not offer an interpretation of the economic mechanisms that give rise to the leading indicator properties of monetary developments for inflation. Such an interpretation requires a structural approach. Box 1 offers some insights from using a structural approach to identify the common economic factors that drive monetary and price developments and whose influence is apparent earlier in monetary dynamics than in inflation.

Overall, the results of this three-state money-based early warning indicator of risks to price stability suggest that the probability that price developments may become entrenched in a low inflation regime, although not negligible, remains contained. By relying on transmission channels that use non-standard indicators of risks to price stability, this analysis affords a valuable cross-checking perspective on inflation projections, which are based mainly on real economic indicators.

Box 1

THE LINK BETWEEN MONEY AND INFLATION THROUGH THE LENS OF A STRUCTURAL MODEL

This box sheds light on the common factors underlying the dynamics of monetary aggregates and those of inflation through the lens of a structural model estimated using euro area data from 1999 onwards.[1] The structural nature of the model helps to explain observed economic fluctuations in terms of exogenous drivers (i.e. structural shocks), each of which has

1 The model is known as the Christiano, Motto and Rostagno, or CMR, model and belongs to the family of Dynamic Stochastic General Equilibrium (DSGE) models. It includes 16 variables, ranging from economic activity to product and labour markets, money, credit and the financial side of the economy. See Christiano, L., Rostagno, M. and Motto, R., "Financial factors in economic fluctuations", *Working Paper Series,* No 1192, ECB, Frankfurt am Main, May 2010.

different implications for macroeconomic dynamics. In particular, it is possible to measure the contribution of each shock to the dynamics of a given observable variable.[2]

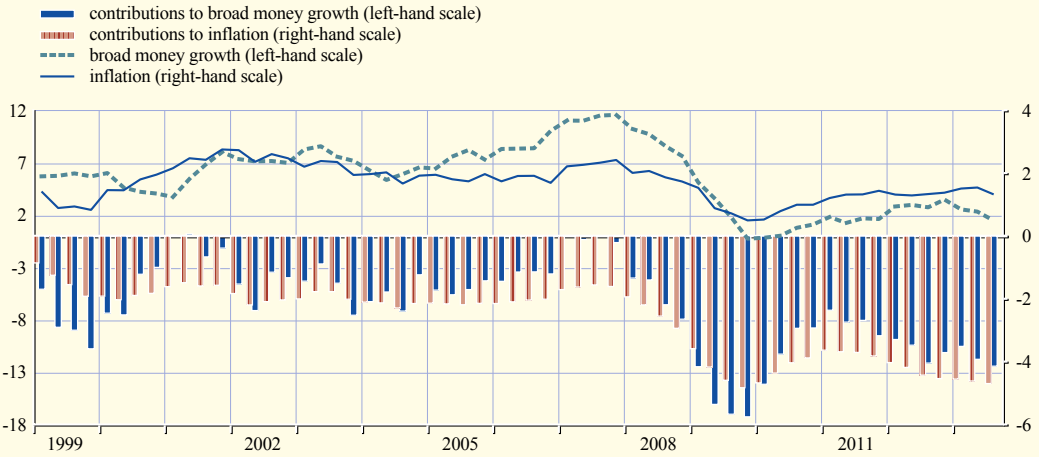
The box focuses on identifying the common underlying drivers of money growth and inflation. It is not intended to study the long-term relationship between money and the price level, as documented in Benati,[3] but rather the exercise answers the questions: what are the structural shocks that make money growth and inflation move in the same direction in the short to medium term and what is the typical lead/lag structure of the shocks which, according to the model, contribute most to money growth and inflation? The analysis is based on the period from the first quarter of 1999 to the third quarter of 2013.

The evidence from the model suggests that two types of shocks are particularly important in generating co-movements of M3 growth and inflation. The first type of shock originates mainly within the financial and monetary side of the economy, and is related to the degree of riskiness in financial contracts and the valuation of borrowers' wealth. The second type of shock originates within the real side of the economy, and is mainly related to demand for consumption and investment.

Chart A presents the contributions of these shocks in explaining broad money growth and inflation. The shocks contributed negatively and in a sizeable manner to M3 growth and inflation,

Chart A Broad money growth, inflation and shock contributions

(annual rate of change; contributions in percentage points)



Sources: ECB, Eurostat and ECB calculations based on the CMR model.
Notes: Contributions to money growth and inflation stem from historical shock decompositions and include contributions from overall riskiness and consumption/investment demand. The latest observation is for the third quarter of 2013.

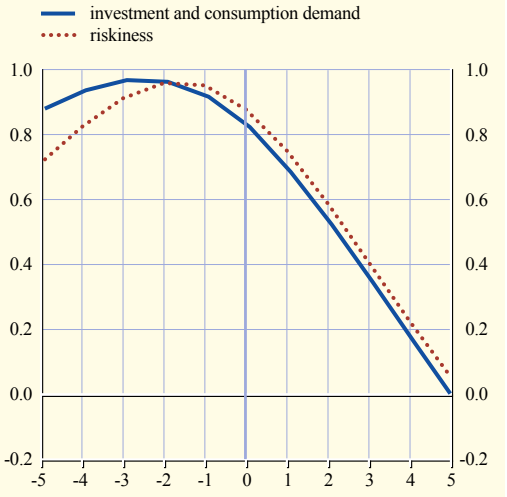
2 For shock decompositions of euro area variables see Fahr, S., Motto, R., Rostagno, M., Smets, F. and Tristani, O., "A monetary policy strategy in good and bad times: lessons from the recent past", *Economic Policy*, Vol. 28, 2013, pp. 243-288, or the box entitled "Monetary developments and macroeconomic dynamics: a structural interpretation" in "Enhancing monetary analysis", *Monthly Bulletin*, ECB, November 2010.

3 The structural model focuses mainly on the relationships at business cycle frequencies, although monetary variables and the price level co-move in the long run. For work on the short and long-term relation between money and inflation, see the box entitled "Short and long-term causality of M3 to inflation in the euro area", *Monthly Bulletin*, ECB, July 2007, and specifically for the long-term relationship, see Benati, L., "Long run evidence on money growth and inflation", *Working Paper Series*, No 1027, ECB, Frankfurt am Main, March 2009.

especially between 2008 and 2010. This is in line with an interpretation by which financial sector stress and the sudden fall in investment implied a strong reduction in loan and money creation. As a result, inflationary pressures also subsided, albeit to a smaller degree and with a lag.[4]

To analyse the typical lead/lag structure between money growth and inflation, Chart B shows the dynamic correlation of the contribution of these two types of shocks to money growth and inflation at different leads and lags. Negative/positive numbers on the horizontal axis represent quarters for which the contributions to inflation lag/lead those to M3 growth. The chart shows that contributions to money growth lead those to inflation by a few quarters, whereby the exact lead structure depends on the type of shock. An increase in money growth due to these types of shocks is hence expected to be followed by increases in inflation a few quarters further on. Monetary aggregates are therefore helpful in assessing the transmission of these shocks to future inflation rates.

Chart B Correlation between shock contributions to broad money growth and inflation



Source: ECB calculations based on the CMR model.
Notes: Values on the horizontal axis indicate leads and lags of inflation (annual change of GDP deflator) relative to broad money growth (M3). Negative values indicate quarters by which inflation series is lagged compared with M3 growth.

Two main transmission channels may explain the lead/lag structure of the contributions between the variables in this model. First, positive shocks related to investment and consumption demand spur additional expenditures, which require the creation of monetary means of payment. As expenditure grows, inflationary pressures are generated. Second, favourable shocks related to riskiness and the value and availability of collateral for greater borrowing and investment affect loan dynamics and money and, at the same time, boost demand and inflation.[5]

Overall, the analysis shows that shocks originating within the financial and monetary side of the economy play a crucial role in explaining the co-movement of money growth and inflation. It thereby confirms earlier evidence that developments in monetary aggregates do contain information about the outlook for inflation. Hence, money-based inflation forecasts can improve forecasts based on the economic analysis, as found in Fischer et al.[6]

4 Inflation did not fall by the entire contribution from the shocks because of counteracting effects from other shocks, in particular, declines in productivity.
5 The dynamic response to a riskiness shock is also discussed in the box entitled "Bank behaviour and macroeconomic developments" in "The supply of money – bank behaviour and the implications for monetary analysis", *Monthly Bulletin*, ECB, October 2011.
6 Fischer, B., Lenza, M., Pill, H. and Reichlin, L., "Monetary analysis and monetary policy in the euro area 1999-2006", *Journal of International Money and Finance*, Vol. 28, 2009, pp. 1138-1164.

2.2 THE LEADING INDICATOR PROPERTIES OF M1 FOR ACTIVITY

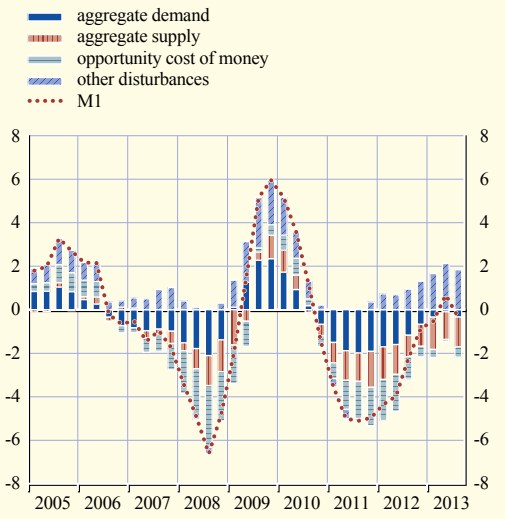
A well-established empirical fact in the euro area is that turning points in real M1 tend to lead those in real GDP.[7] Economically, this relationship is likely to stem from the fact that liquid balances are

7 See the box entitled "Stylised facts of money and credit over the business cycle", *Monthly Bulletin*, ECB, October 2013.

held in M1 mainly for transaction purposes and, therefore, an increase in such balances is a harbinger of increased spending. At times, however, other motives for holding M1 can become relevant and possibly dominant. For instance, at times of elevated uncertainty, portfolio considerations may favour highly liquid, non-risky assets, such as deposits included in M1. In this case, the question arises as to whether these portfolio-driven flows into M1 may distort or even destroy the leading indicator properties of this aggregate for real economic activity.

Chart 4 Driving forces behind developments in real M1

(annual rate of change; deviations from average; contributions in percentage points)



Sources: ECB and ECB calculations.
Notes: This breakdown of the annual growth rate of real M1 is based on an average growth rate of 5.5% between 1999 and 2013. The latest observation is for the third quarter of 2013.

To address this issue, the dynamics of real M1 are interpreted using a time-varying parameter vector autoregression (TV-VAR) model.[8] The TV-VAR approach offers a highly flexible statistical representation of the data, allowing changes over time in the dynamic relationship between the variables. It is, therefore, particularly appropriate as a framework for assessing the informational content of monetary variables in a period when the very low level of short-term rates may have altered the preference of money-holders for liquid instruments and the historical relationship of M1 with other economic variables.[9]

Economic theory can inform the TV-VAR model so that it can be used to decompose observed M1 developments into the contributions of the various underlying forces that are driving them.[10] Such a decomposition is provided in Chart 4, which identifies the contributions to real M1 growth of disturbances to spending preferences of the private sector and to productivity, as well as of disturbances to the level of the opportunity cost of holding M1. This decomposition shows how aggregate demand and productivity forces have shaped the cyclical component of real M1 growth, notably the drag that these two forces exerted on M1 growth both during the recession of 2007/08 and more recently.

The decomposition also suggests that M1 dynamics were significantly influenced by "other" factors. Notably, these factors pushed real M1 growth up between the fourth quarter of 2008 and the third quarter of 2010 and then again starting in the third quarter of 2011.[11] Both periods were

8 The model, which also features stochastic volatility, is based on the methodology presented in Gambetti, L. and Musso, A., "Loan supply shocks and the business cycle", *Working Paper Series*, No 1469, ECB, Frankfurt am Main, September 2012. The specification used here includes real GDP, the GDP deflator, a short-term money market interest rate and M1 deflated using the GDP deflator.

9 Indeed, recent empirical macroeconomic literature has shown that multivariate models with time-varying parameters and stochastic volatility provide some advantages for structural analysis in the presence of potential changes of relationships which may have taken place in recent years owing to the short-term interest rates approaching the zero lower bound. See, for example, Baumeister, C. and Benati, L., "Unconventional Monetary Policy and the Great Recession: Estimating the Macroeconomic Effects of a Spread Compression at the Zero Lower Bound", *International Journal of Central Banking*, Vol. 9-2, 2013, pp. 165-212.

10 More formally, this involves imposing identifying sign restrictions, derived from theoretical models such as Andrés, J., López-Salido, J. D. and Nelson, E., "Money and the natural rate of interest: Structural estimates for the United States and the euro area", *Journal of Economic Dynamics & Control*, Vol. 33, 2009, pp. 758-776.

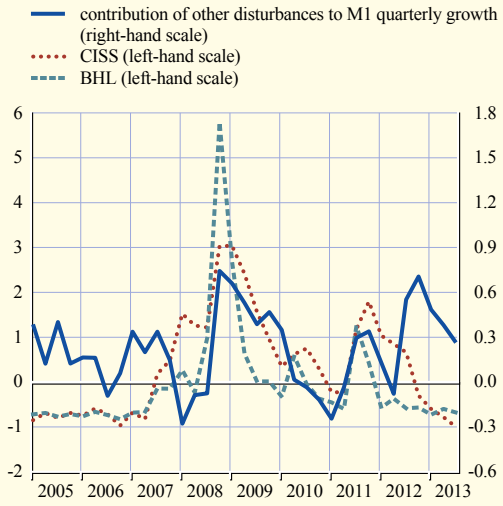
11 In the latter episode, the impact only became visible in the contribution to the annual growth rate in the fourth quarter of 2011.

characterised by heightened financial stress, the first as a result of the collapse of Lehman Brothers. In the second period, the intensification of tensions in European sovereign bond markets led to heightened financial stress in the euro area banking sector and the broader financial system. Stress in financial markets is generally associated with increased uncertainty regarding the valuation of financial and real assets and, therefore, has an effect on portfolio allocation decisions. Typically, uncertainty increases the value of waiting, thus providing incentives to postpone spending and investment decisions and, therefore, to hoard money. Insofar as this is the case, increased holdings of M1 will not herald imminent increases in spending. Chart 5 shows that the contribution of "other" factors to M1 growth is quite closely related to measures of financial uncertainty during this period, as was also the case around the collapse of Lehman Brothers. This suggests that the contribution of those factors can at least partly be attributed to shifts in demand for M1 related to uncertainty.

Under the influence of the positive contribution of "other" factors in late 2011, as shown in Chart 5, real M1 growth registered a turning point almost two years (about seven quarters) ahead of the subsequent turning point in the growth of real GDP (see Chart 6). This represents a deviation from the regular lead of three to four quarters in the association between real M1 turning points and the turning points in real activity. However, a counterfactual measure of M1 growth that excludes the contribution of "other" factors – and can thus be seen as being mostly immune from the impact of uncertainty-related money demand shifts during this episode – only registered a turning point in the fourth quarter of 2011. This corresponds to a lead of only five quarters relative to the trough in real GDP growth, which is broadly in line with the historical regularity. Hence, by filtering the observed

Chart 5 Measures of financial uncertainty and the contribution of "other" factors to M1 quarterly growth

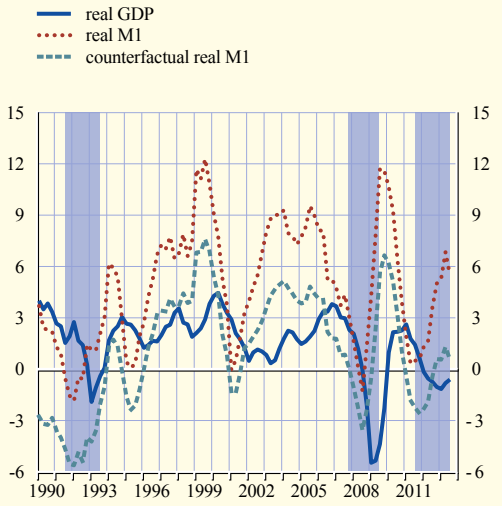
(contributions in percentage points; index)



Sources: Thomson Reuters, ECB and ECB calculations.
Notes: "CISS" is the Systemic Stress Composite Indicator. For further details, see Hollo, D., Kremer, M. and Lo Duca, M., "CISS - a composite indicator of systemic stress in the financial system", *Working Paper Series,* No 1426, ECB, Frankfurt am Main, March 2012. "BHL" refers to the index derived in Bekaert, G., Hoerova, M. and Lo Duca, M., "Risk, uncertainty and monetary policy", *Journal of Monetary Economics,* Vol. 60, 2013, pp. 771-788. The uncertainty measures have been normalised to zero mean and a standard deviation of 1. The latest observation is for the third quarter of 2013.

Chart 6 Real GDP growth, real M1 growth and real adjusted M1 growth

(annual rate of change)



Sources: ECB, Eurostat and CEPR.
Notes: Shaded areas delimit euro area recessions as identified by the CEPR Business Cycle Dating Committee. For the derivation of the adjusted real M1 series see the main text. All variables are deflated by the GDP deflator. The latest observation is for the third quarter of 2013.

M1 developments for the impact of uncertainty, the consistency of the leading indicator properties of M1 for turning points in real GDP could be largely restored. The use of such a "corrected" M1 series as a leading indicator for economic activity thus avoided the misinterpretation of headline M1 figures during this episode. While important, this analysis is partial and the relationship between narrow money, measures of uncertainty and economic activity needs to be integrated in a more formal way in economic models.

3 DISSECTING AGGREGATE MFI LOANS TO THE EURO AREA NON-FINANCIAL PRIVATE SECTOR

GENERAL CONSIDERATIONS

In recent years, developments in euro area loans to the private sector have been affected by special factors associated with the economic and financial crisis. These range from persistent changes in risk aversion and risk perceptions by economic agents involved in credit markets (i.e. lenders, actual or potential borrowers and investors) to a number of non-standard monetary policy measures aimed at restoring the proper functioning of the monetary policy transmission mechanism. Moreover, the sovereign debt crisis, among other factors, has led to heightened heterogeneity across countries along various dimensions, including an atypical fragmentation of credit markets.

These developments have given rise to new challenges in the analysis of non-financial private sector loans. To address them, new data have been made available, ranging from new survey data such as the "Survey on the access to finance of small and medium-sized enterprises in the euro area"[12] to individual MFI data (since September 2012, see Box 2). Beyond new data, modelling advances have been necessary to analyse loan growth in the current environment. Selected recent advances are illustrated in the following sub-sections, which include extensions of available frameworks for loan demand modelling, new models for conditional forecasting of loans and extensions of empirical models for structural analysis, namely for the identification of loan supply restrictions. The advances presented here should be seen as illustrative examples of techniques used to analyse loan growth, which are continuously being enhanced.

ADVANCES IN LOAN DEMAND MODELLING

The decline observed in the annual growth of loans to the private sector since mid-2011 has given rise to a number of important questions of policy relevance. One key issue is whether the banking sector is channelling enough funds to non-financial corporations and households to support the recovery of private investment and consumption, or whether remaining structural challenges or other impairments are dampening the prospective recovery. In this respect, assessing developments in bank loans to the non-financial private sector, i.e. loans to households and loans to non-financial corporations, becomes a central task. On the one hand, this results from the continued primary importance of MFI loans as a source of financing for non-financial corporations (as well as for households) in the euro area, although the role of corporate debt issuance has increased since the crisis started.[13] On the other hand, non-financial corporations and households represent the key sectors driving private domestic demand, while non-monetary financial intermediaries (i.e. insurance corporations and pension funds and other financial intermediaries) tend to base their decisions on financial considerations, leading to more volatile lending flows to this sector.

12 These survey data are available from 2009 onwards. For the latest available data, see the box entitled "Survey on the access to finance of small and medium-sized enterprises in the euro area: April to September 2013", *Monthly Bulletin*, ECB, November 2013.

13 See, for example, the Structural Issues Report on "Corporate finance and economic activity in the euro area", by the Task Force of the Monetary Policy Committee of the ESCB, *Occasional Paper Series*, No 151, ECB, Frankfurt am Main, August 2013.

Thus, a central question is whether the provision of loans by MFIs to the non-financial private sector is sufficient to support the upturn in economic activity. This issue can be addressed by carrying out simulations which take into account the state of the business cycle and historical relationships between variables in the context of standard loan demand models. However, such models need to be adapted to the current circumstances. Not only do they need to focus on the non-financial private sector, as opposed to the whole private sector, so as to abstract from excessive volatility arising from purely financial market forces, but additional factors that have become potentially important drivers of bank loans should also be taken into account. The latter include the ECB's non-standard monetary policy measures introduced in the euro area in recent years to support the banking system and thus, indirectly, also credit markets (from the "enhanced credit support" measures from October 2008 onwards to the two three-year longer-term refinancing operations announced in December 2011). In addition, the crisis has put serious pressure on firms' and banks' profits and balance sheets and has led to substantial changes in risk aversion and perceptions.

Given the above considerations, the standard loan demand model used in the euro area since the start of Stage Three of EMU in the context of the quarterly ECB/Eurosystem staff macroeconomic projections and of the monetary analysis, based on the vector error-correction model (VECM) approach, has seen considerable changes.[14] These include a shift in the focus from loans to the private sector to loans to the non-financial private sector and the inclusion of the euro overnight index average (EONIA) spread (i.e. the EONIA minus the rate for the main refinancing operations) and risk variables as exogenous variables in the model. The EONIA spread is used to evaluate the extent to which the ECB's non-standard liquidity provision measures have alleviated the funding constraints of banks and have indirectly supported the provision of bank loans to the real economy during the crisis period. In turn, the risk variables are used to assess by how much the deterioration in the profitability and balance sheets of banks and higher risk aversion and perceptions could have limited bank credit growth in recent years.[15]

Such a framework helps to assess whether developments in MFI loans to the non-financial private sector are in line with the prevailing macroeconomic and financing conditions and historical regularities. More precisely, this can be undertaken by carrying out a forecast of MFI loans from 2005 onwards (i.e. from the period just before the strong growth of loans was observed between 2006 and 2007) conditional on the parameters estimated using data up to mid-2010 (i.e. just before the sovereign debt crisis) and on actual developments of the explanatory variables over the whole sample period.[16] The simulations based on the latest version of the extended VECM suggest that, until the third quarter of 2013, the profile of loans to the non-financial private sector in the euro area was broadly in line with the current state of the business cycle, financing conditions and historical regularities (see Chart 7). However, since mid-2013, the level of lending growth has reached the lower end of the uncertainty bound. As a result, euro area loan growth may be characterised as weak, but probably reflecting forces that can be explained on the basis of the prevailing economic

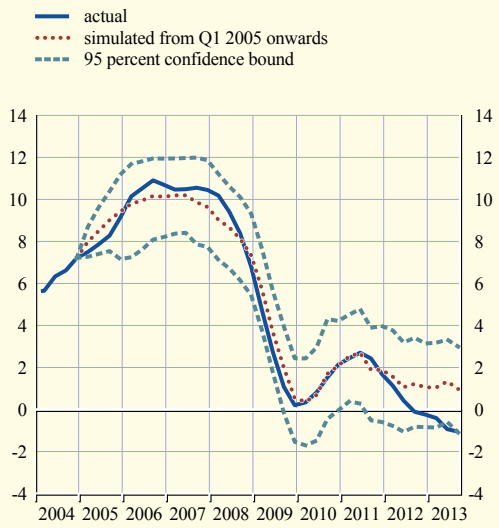
14 These models do not only explain loan growth on the basis of short-term movements in the explanatory variables, but they also provide quantitative estimates of the long-run "equilibrium" level of loan growth and thus allow to monitor the build-up of exuberances and their corrections over time. For early applications to euro area data, see Calza, A., Gartner, C. and Sousa, J., "Modelling the demand for loans to the private sector in the euro area", *Applied Economics*, Vol. 35, 2003, pp. 107-117. For the use of sectoral loan demand models in the context of the quarterly ECB/Eurosystem staff macroeconomic projections and other more recent applications, see Papademos, L.D. and Stark, J., op. cit. (especially Annex 6 of Chapter 7).

15 Other changes include replacing short-term and long-term market interest rates with the composite market interest rate, computed as the weighted average of short-term and long-term market interest rates using the shares of outstanding amounts of short-term and long-term loans to non-financial corporations and households in total loans to the non-financial private sector as weights, as a cost variable, and including real house prices into the long-term relationship to be able to assess the impact of housing market dynamics on loans.

16 It was necessary to extend the estimation period beyond the start of the simulation to capture the impact of non-standard measures and bank-specific risk on loan dynamics during the financial and sovereign debt crisis. Indeed, the values for EONIA spread and bank-specific risk were insignificant before the crisis.

Chart 7 Actual versus simulated developments in MFI loans to the non-financial private sector in the euro area

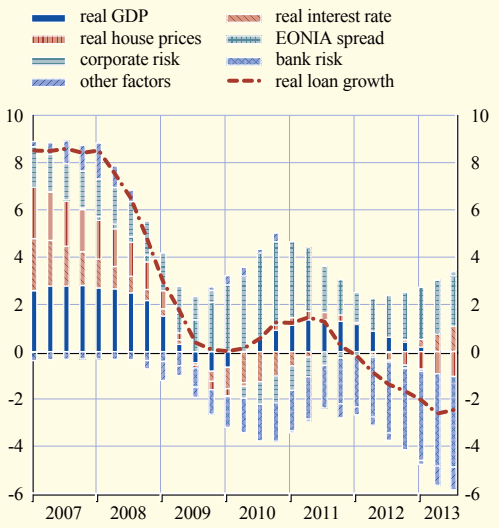
(annual percentage changes)



Sources: ECB, Eurostat, Moody's and ECB calculations.
Notes: Based on a vector error correction model with three lags according to Akaike information criterion. The model relates real MFI loans to the non-financial private sector (adjusted for loan sales and securitisation) to real GDP, house prices, the composite market interest rate, the EONIA spread, corporate risk and bank risk. Simulated from the first quarter of 2005 onwards, with the model parameters estimated for the period from the first quarter of 1985 to the second quarter of 2010, conditional on actual developments of explanatory variables. The latest observation is for the third quarter of 2013.

Chart 8 Non-financial private sector loan growth decomposition in the euro area

(annual percentage changes; contributions in percentage points)



Sources: ECB, Eurostat, Moody's and ECB calculations.
Notes: See Chart 7. Corporate and bank risks are derived by regressing non-financial corporations' expected default frequencies (NFC EDFs) against real GDP and bank EDFs against NFC EDFs, respectively. The residuals obtained from these regressions are then used in the loan equation to separately proxy corporate and bank-specific risks and to differentiate these risks from a macro risk. The model estimation period ranges from the first quarter of 1985 to the first quarter of 2013. The latest observation is for the third quarter of 2013.

conditions. At the same time, in view of potential endogeneity problems, these results should be interpreted with caution.[17]

An additional application of the extended VECM approach, which can provide useful information for interpreting loan developments, is represented by a decomposition of loan growth in terms of the explanatory factors driving it. While this model is not a structural model and, therefore, does not allow for causality analysis, the decomposition can provide useful information in terms of approximate driving forces. Based on the extended VECM, the strong growth in lending to the non-financial private sector up to 2007 was mostly explained by robust developments in real economic activity, continuous increases in real house prices and an underpricing of risk (see Chart 8). The current weakness in loans to the non-financial private sector is explained by a number of factors. First, the low level of economic and housing market activity. This is signalled by the broadly zero contribution to loan growth from economic activity and a negative contribution from house prices in recent quarters.[18] Second, bank-specific risks also continue to strongly dampen lending growth. This is likely to mirror the banks' still weak capital positions and their limited ability to absorb new adverse shocks and loan write-downs. These factors may limit banks' risk-taking and the granting of credit to the real economy, despite the recapitalisations of banks in the past quarters. At the same

17 More precisely, developments in model fundamentals depend also on credit availability and financing conditions, suggesting that endogeneity problems may affect them.
18 Over the model estimation period, the average contribution of real GDP to annual real loan growth has been around two percentage points, compared with the current broadly zero contribution.

time, the VECM would support the view that the ECB's liquidity providing operations implemented so far and the low level of monetary policy interest rates remain the only factors supporting loan dynamics. More specifically, they have alleviated banks' funding pressures, contained credit supply effects and lowered the financing costs of banks and the broader economy. This is evident from the positive contributions of the EONIA spread and real interest rates on loan growth in recent quarters. Adding thus the contribution of the EONIA spread factor and the bank risk factor enables a better picture of the actual impact of bank-specific factors to loan dynamics to be derived.

ADVANCES IN CONDITIONAL FORECASTING MODELS OF LOANS TO NON-FINANCIAL CORPORATIONS

One of the main features of the financial crisis which has hit the euro area economy over the past few years has been the emergence of significant fragmentation, among other dimensions, across euro area countries. Credit markets have not been immune from this fragmentation. For monetary policy, this aspect of the crisis did not imply a change in the ECB's role in macroeconomic stabilisation, which remains the maintenance of price stability. However, it has implied adjustments in the intensity and choice of instruments of monetary policy to repair the transmission of monetary policy by reducing fragmentation in the economy.[19] Overall, in the context of monetary analysis, the emergence of significant financial fragmentation warranted a refinement in the tools needed to assess credit market developments. More precisely, while the euro area remains the reference geographical and economic aggregate for the ECB's economic and monetary analysis, financial fragmentation and the increased heterogeneity of credit market developments among euro area countries during the financial crisis warrants complementing the euro area perspective with a country one.

An example of such an endeavour in the context of monetary analysis is represented by a recently developed multi-country Bayesian VAR (BVAR) for loans to non-financial corporations, which extends the model of Giannone, Lenza and Reichlin (2012).[20] Such a modelling approach has the advantage over other modelling frameworks, such as the VECM discussed above, that it allows for a large set of variables to be analysed simultaneously, without incurring the so-called curse of dimensionality typically arising in a data-rich environment. Moreover, by comparing results of the euro area aggregate VECM with the country-specific results from the BVAR, findings and interpretations can be cross-checked across tools.

The recently developed multi-country BVAR model helps to assess loan developments not only from a country-specific perspective, but also from a more specific sectoral perspective, with loans to non-financial corporations being the centre of attention. This focus can be justified by the fact that sectoral loans exhibit different cyclical properties and are driven by somewhat different determinants, aspects which may be particularly important when analysing developments at the country level. More precisely, the model includes 30 macroeconomic and credit variables for the four largest euro area economies, i.e. Germany, France, Italy and Spain.[21]

19 For an elaboration of such analysis, see the speech by Benoît Cœuré on "Monetary policy in a fragmented world" at the 41st Economics Conference of the Oesterreichische Nationalbank, Vienna, 10 June 2013.

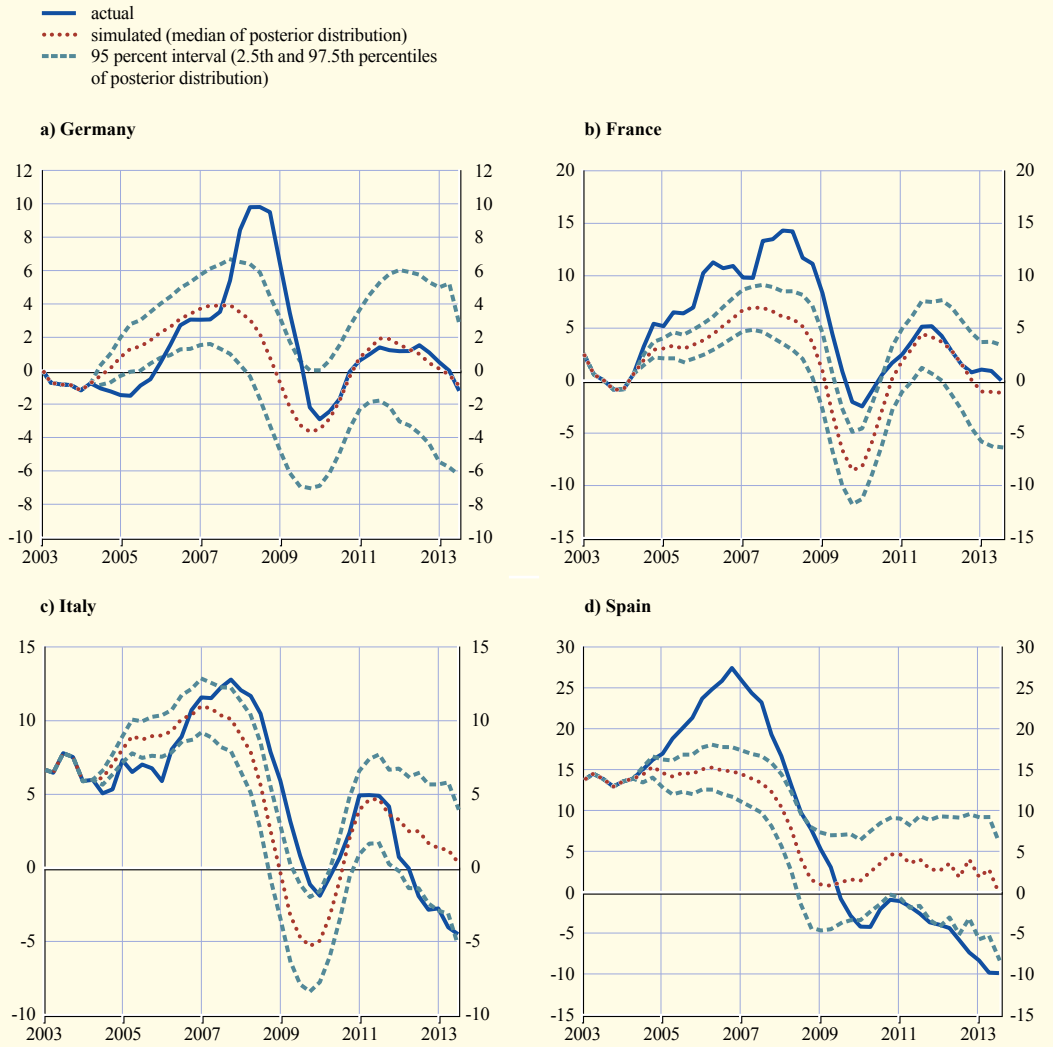
20 Giannone, D., Lenza, M. and Reichlin, L., "Money, credit, monetary policy and the business cycle in the euro area", *CEPR Discussion Paper,* No 8944, April 2012. For more details, see Altavilla C., Giannone, D. and Lenza, M., "The financial and macroeconomic effects of the OMT announcements", *CSEF Working Paper,* No 352, January 2014.

21 The variables included for each country are: real GDP, GDP deflator, M3, loans to non-financial corporations (NFCs), ten-year government bond yields, lending rates to NFCs, the Expected Default Frequencies (EDFs) for NFCs; and, for the euro area: the EONIA rate and a measure of euro area bond market volatility. The EDFs are computed by Moody's Analytics and measure the default probabilities of NFCs under alternative macroeconomic scenarios. The implied bond volatility for the euro area (changing composition) is constructed by averaging the (end-of-period) implied volatility on call and put options of the Eurex Generic 1st "RX" Future. This future contract is based on long-term notional debt securities issued by the German Federal Government with a term of between eight-and-a-half and ten-and-a-half years.

This framework can be used to address the question of whether observed dynamics of loans to non-financial corporations conform to what can be expected on the basis of the current stage of the business cycle and historical regularities, based on a simulation similar to that carried out using the VECM, with minor differences mainly dictated by technical differences between the two models. By way of illustration, observed non-financial corporation loan dynamics are compared with the forecasts from the third quarter of 2004 onwards for non-financial corporation loans conditional on pre-credit boom relationships between variables (i.e. parameters of the model estimated over the sample from the first quarter of 1991 to the second quarter of 2004) and on observed

Chart 9 Actual versus simulated developments in loans to NFCs based on a multi-country Bayesian VAR

(annual percentage changes)



Sources: ECB and ECB estimates.
Notes: The model includes Germany, France, Italy and Spain. Variables included: for each country: real GDP, GDP deflator, M3, credit to NFCs, ten-year government bond yields, lending rates to NFCs, EDFs for NFCs; for the euro area: EONIA, euro area bond market volatility. Simulated from the third quarter of 2004 onwards with the model parameters estimated for the period from the first quarter of 1991 to the second quarter of 2004 (i.e. out-of-sample simulation) conditional on actual developments of explanatory variables. The latest observation is for the third quarter of 2013.

macroeconomic developments (i.e. actual developments for all explanatory variables except loans over the forecast period).

The results of the simulation suggest that, in all four countries, non-financial corporation loan growth was excessive for some period before the crisis (see Chart 9). Such evidence stands in contrast to the results of the euro area VECM, which did not provide evidence of excessive lending over that period, possibly because the latter model included a component that captured the underpricing of risk. This difference can thus be explained in part by different technical modelling choices and different variables. As regards the evidence for the most recent quarters, the simulation based on the BVAR suggests that in Germany and France, over the past four years, non-financial corporation loan growth has been broadly in line with the state of the business cycle and with past regularities. By contrast, in Italy and especially in Spain, recent non-financial corporation loan growth appears to be weaker than what could be expected on the basis of historical regularities. These results appear to be consistent with the results of the VECM, indicating what might be behind the recent evolution of observed non-financial private sector loan growth close to the lower bound in the simulation based on the latter model, thereby offering some support to the robustness of such results. At the same time, the BVAR simulation suggests that, currently, the level of outstanding loans to non-financial corporations implied by the conditional forecasts is close to the actual one observed in both Spain and Italy, suggesting that the recent weakness in non-financial corporation loan growth represents mainly a correction of the excessive loan growth prevailing in previous years.

ADVANCES IN EMPIRICAL STRUCTURAL MODELLING OF LOAN SUPPLY SHOCKS

From a monetary policy perspective, it is important to understand the main driving forces of loans to the private sector. In this respect, a core question is the relative importance of demand versus supply forces. For example, at the current juncture it is necessary to assess whether the weakness in loan growth is mainly due to insufficient demand for loans from potential borrowers or, to a larger extent, to supply restrictions associated with problems in the banking sector, such as funding difficulties, which impair the supply of loans to households and non-financial corporations. Indeed, in cases of excessively weak loan growth due to insufficient private sector demand, the central bank may, under some conditions, intervene optimally with standard monetary policy measures to support the overall economy. In the opposite case of weak lending activity resulting from loan supply restrictions – for example, associated with malfunctioning interbank markets – the central bank might implement temporary non-standard monetary policy measures to support the banking sector, by reducing impairments which limit the optimal provision of loans to the private sector, thereby supporting indirectly the recovery in economic activity. At the same time, from a policy perspective, it is essential to differentiate the role of credit markets as sources of disturbances or shocks from their role in propagating shocks that originate in other sectors of the economy, such as unexpected changes in investors' confidence or unanticipated technological innovations. Indeed, banks' balance sheet conditions are an important determinant for the provision of loans to households and to non-financial corporations. These conditions change both endogenously due to economic conditions and exogenously due to factors directly affecting banks capital and financing capacity.

Different approaches can be used to disentangle demand from supply forces driving lending flows, as well as loan changes associated with credit supply shocks from those arising from the propagation of other shocks through the credit markets. These range from the assessment of available survey data to model-based estimates of loan supply restrictions.[22] While survey data and reduced-form models can provide useful indications on the role of demand and supply forces driving credit, only

22 For a more detailed discussion, see, for example, the article entitled "Recent developments in loans to the private sector", *Monthly Bulletin*, ECB, January 2011.

structural models can allow for a causal analysis. In this respect, a recent example of an extension of an empirical structural model aimed at identifying loan supply shocks is represented by the development of a structural vector autoregression (VAR) model with time-varying parameters and stochastic volatility (TV-VAR), similar to the model on the leading indicator properties of M1 for activity, as presented in Section 2.2.[23] The model focuses on loans to the non-financial private sector and allows for the identification of loan supply shocks in the euro area. The adoption of a framework allowing for time-varying parameters and stochastic volatility is important, as recent years have seen changes in the macroeconomic environment, including a structural decline in macroeconomic volatility starting between the mid-1980s and the early 1990s, depending on the countries considered, changes in the volatility of shocks and possibly further gradual structural changes in the economy, for example persistently affecting economic agents' risk aversion, as a result of the recent unusually long and deep economic and financial crisis. Thus, a TV-VAR model provides one avenue for deriving estimates of the impact of loan supply shocks capturing changes in the parameters and stochastic volatility characterising macroeconomic, monetary and financial variables. Loan supply shocks are identified by assuming that, if adverse, they are associated with a decrease in loan volumes and an increase in lending rates – based on the assumption that banks would implement such unexpected loan supply restriction by restricting loan volumes and/or by increasing the lending rate such that, at aggregate level, both effects would be visible. Moreover, it is assumed that, among other effects, such shocks would lead to a decrease in real GDP and a decrease of HICP inflation, as the adverse effect of such shocks on households and non-financial corporations would lead them to reduce their expenditure, thereby reducing aggregate demand.[24]

The evidence based on the TV-VAR model suggests that signs of time variation can be found for the euro area between 1980 and 2013, both in the parameters and in the volatility of residuals. For example, the variance of the equation of loan growth shows signs of change over time, having increased in the most recent years of the sample (see Chart 10). This can be interpreted as reflecting the increased volatility which has characterised macroeconomic and credit conditions since the start of the crisis, supported by the fact that the variance of the equations of most of the other variables in the model, including real GDP growth, exhibits a similar increase in the most recent years of the sample.

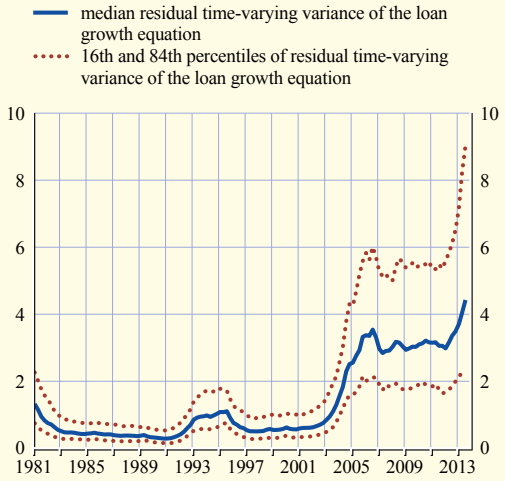
To address the issue of the relative role of demand versus supply forces driving loan growth, and the role of credit markets as originators of disturbances versus propagators of shocks other than loan supply shocks, a counterfactual exercise may be carried out. More precisely, once the model is estimated, it is possible to derive the evolution of the variables in the model in the absence of loan supply shocks (conditional on the estimated parameters and variances and the identification scheme adopted), i.e. by setting the contribution of loan supply shocks to zero over the whole sample. Such an exercise suggests that loan supply shocks have a non-negligible impact on the euro area economy in selected episodes. For example, during the recession experienced in the euro area between 2008 and 2009, associated with the intensification of the financial crisis starting with the collapse of Lehman Brothers on 15 September 2008, non-financial private sector loan growth fell from a peak of close to 10% in late 2007 to slightly negative levels in late 2009. According to the TV-VAR model, in the absence of loan supply shocks, counterfactual loan growth would have decreased from around 9% to just below 2% (see Chart 11). In other words, while loan growth declined during

23 See Gambetti, L. and Musso, A., "Loan supply shocks and the business cycle", *Working Paper Series*, No 1469, ECB, Frankfurt am Main, September 2012.

24 More precisely, the identification is achieved via sign restrictions on the impulse response functions. Thus, for example, it is assumed that an adverse loan supply shock would be associated with a negative response of loan growth and a positive response of the lending rate and would lead to negative responses of real GDP growth, inflation and the short-term reference interest rate.

Chart 10 Stochastic volatility of the loan equation of a TV-VAR model

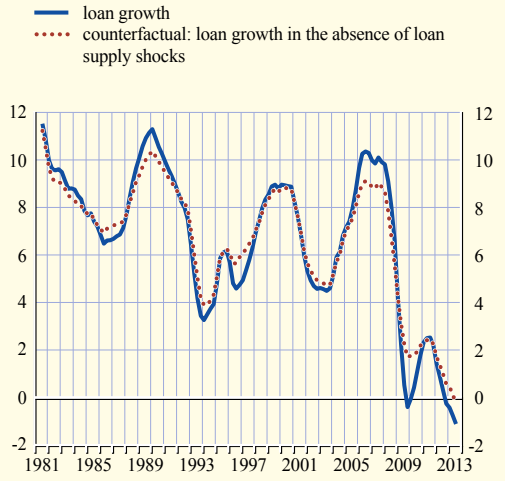
(percentages)



Sources: ECB and ECB estimates.
Notes: Residual time-varying variances of the loan growth equation (median, 16th and 84th percentiles). The model includes five variables: real GDP quarterly growth, HICP quarterly inflation, three-month EURIBOR, quarterly growth of loans to the non-financial private sector and a corresponding composite lending rate (see Gambetti and Musso, 2012, for details on data sources, model specification, estimation and shock identification). Estimation is carried out with Bayesian methods. The latest observation is for the second quarter of 2013.

Chart 11 Loan growth: actual and counterfactual based on a TV-VAR model

(annual rate of change)



Sources: ECB and ECB estimates.
Notes: Observed loan growth and counterfactual loan growth (i.e. loan growth in the absence of loan supply shocks). See the notes to Chart 10 for details on the model.

that period by more than ten percentage points, in the absence of loan supply shocks, it would have decreased by about seven percentage points, suggesting that adverse loan supply shocks explain about 30% of the decline. Thus, the model suggests that the main forces driving the fall in loan growth over this period are likely to be associated with factors other than unanticipated loan supply restrictions, and most likely can be related, to a large extent, to a fall in demand in the recessionary environment. At the same time, it also indicates that loan supply shocks had a non-negligible impact on credit markets. A similar exercise indicates that, of the most recent loan growth decline, from the third quarter of 2011 to the third quarter of 2013, about 25% can be explained by the estimated loan supply shocks. In this case, too, the recession that started in 2011 is likely to have led to a significant fall in loan demand, although bank balance sheet conditions probably played some role in explaining the decline in loan growth.

Box 2

EXPLOITING THE CROSS-SECTIONAL DIMENSION FOR MONETARY ANALYSIS: THE USE OF INDIVIDUAL MFI DATA

The fragmentation of financial markets across borders and between institutions in the aftermath of the collapse of Lehman Brothers became more acute after the onset of the sovereign debt crisis in early 2010. Fragmentation rendered further enhancements to monetary analysis

increasingly necessary as it impaired the transmission of monetary policy along multiple dimensions. Disruptions along a spatial dimension arose once euro area countries' response to monetary policy easing became more diverse, particularly in stressed countries; along a vertical dimension, once these impairments became increasingly pronounced over time, in parallel to the exacerbation of the sovereign debt crisis; and, lastly, along a horizontal dimension as individual MFIs' responses to monetary policy became affected by their individual characteristics.

Crucially, the analysis of the latter dimension, which highlights the importance of individual bank characteristics, has not been supported in the past by standard monetary analysis tools. Aggregated monetary data alone were unable to support either the analysis of the distributional effects of money and credit, or the analysis of the heterogeneous cross-sectional behaviour of MFIs. The use of individual MFI data has helped to bridge this gap. Once individual bank characteristics can be linked to specific funding and lending outcomes, more accurate information on the relevance of supply-side constraints can be extracted.

This box introduces the new ECB datasets which contain individual MFI data for a sample of MFIs located inside the euro area. It then illustrates how granular data improve the analysis of MFI lending by shifting the analytical focus beyond a mere country or sectoral perspective, and delving into banks' heterogeneous lending behaviour by classifying MFIs according to their respective borrower type. The box demonstrates how the new dataset helps to pin down some of the impairments which developed in the monetary policy transmission mechanism.

Data on individual MFIs for monetary analysis

Since the end of September 2012 the ECB has been receiving from NCBs individual MFI data of a sample of euro area banks for the purposes of monetary analysis. Balance sheet indicators are reported on a monthly basis to the NCBs under ECB statistical requirements defined in Regulation ECB/2008/32.[1] Interest rate indicators stem from Regulation ECB/2009/07[2] and have been reported for a finite period of time. The datasets, which are treated as strictly confidential, are transmitted and used within the Eurosystem in accordance with Regulation (EC) No 2533/98 as amended, meaning that they focus on monetary analysis and are accessed by a limited number of named staff. The reporting sample of MFIs has been defined to ensure sufficient coverage of euro area MFI balance sheet developments. Accordingly, the dataset accounts for approximately 70% of outstanding amounts of main assets, loans to non-financial corporations (NFCs) and to households.

The asset side indicators collected include: loans to households, NFCs and governments, private and public sector securities, external and other assets (which include inter-MFI loans and loans to non-monetary financial intermediaries other than insurance corporations and pension funds, i.e. other financial intermediaries). On the liability side, the dataset includes information on deposits from the non-financial private sector (with household and NFC deposits separately identifiable), the public sector and other financial intermediaries, as well as securities issued by MFIs and external liabilities. Loan data are adjusted for securitisation activities.

1 Regulation ECB/2008/32 of 19 December 2008 (OJ L 15, 20.1.2009, p. 14) will be in place until January 2015 when ECB/2013/33 (OJ L 297, 7.11.2013, p. 1) will enter into force.
2 Regulation ECB/2009/07 of 31 March 2009 (OJ L 94, 8.4.2009, p. 75) will be in place until January 2015 when ECB/2013/34 (OJ L 297, 7.11.2013, p. 51) will enter into force.

The use of individual MFI data to assess the supply of bank credit to SMEs

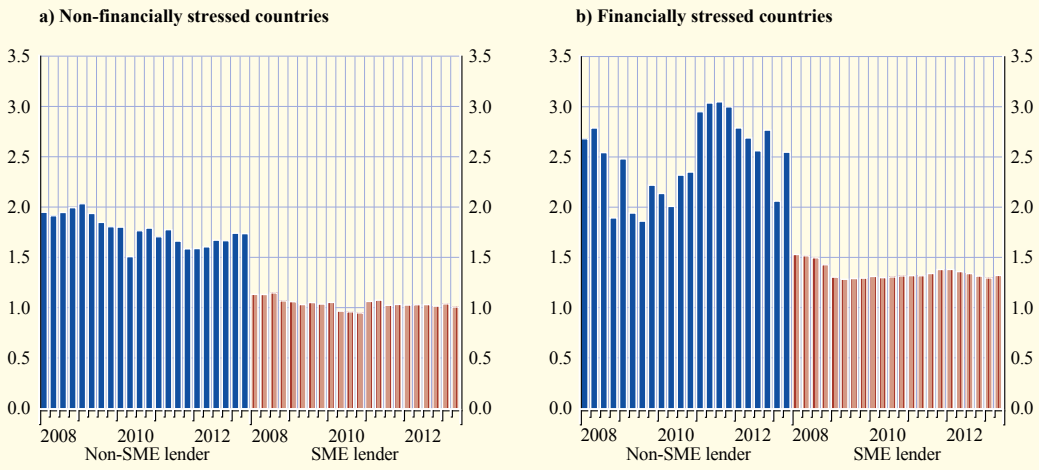
Using this wealth of information, lending dynamics may be analysed by investigating the balance sheet characteristics of different categories of banks, as well as by taking a more standard approach and dissecting loans to the non-financial private sector from a country, sectoral or temporal perspective.

This exercise shows that the higher cost of credit witnessed by small and medium-sized enterprises (SMEs) in recent periods is explained, in part, by the adverse funding conditions experienced by MFIs that focus on lending to SMEs, as well as by the deterioration in the latter's creditworthiness. In addition, by linking together balance sheet data and information on the use of collateral in Eurosystem refinancing operations at the individual MFI level, the exercise also shows that SME lenders in financially stressed countries rely more heavily on NFC-related collateral in Eurosystem credit operations. This development, coupled with recent ECB policies to extend the eligible collateral set, may eventually yield the positive effect of further supporting lending to SMEs.

SME lenders are identified using each MFI's ratio of loans to SMEs to total loans to non-financial corporations.[3] To preserve data confidentiality, MFIs located in countries which have been subject to heightened financial pressure are pooled together ("financially stressed") and their developments are measured against those of MFIs located in other euro area countries ("non-financially stressed").[4] The following illustration investigates the period from July 2007 to July 2013.

Chart A Loan to deposit ratios of individual MFIs by country group and lender type

(cross-sectional means)



Source: ECB.
Notes: Quarterly data, winsorised at the 1st and 99th percentile. The latest observation is for the second quarter of 2013.

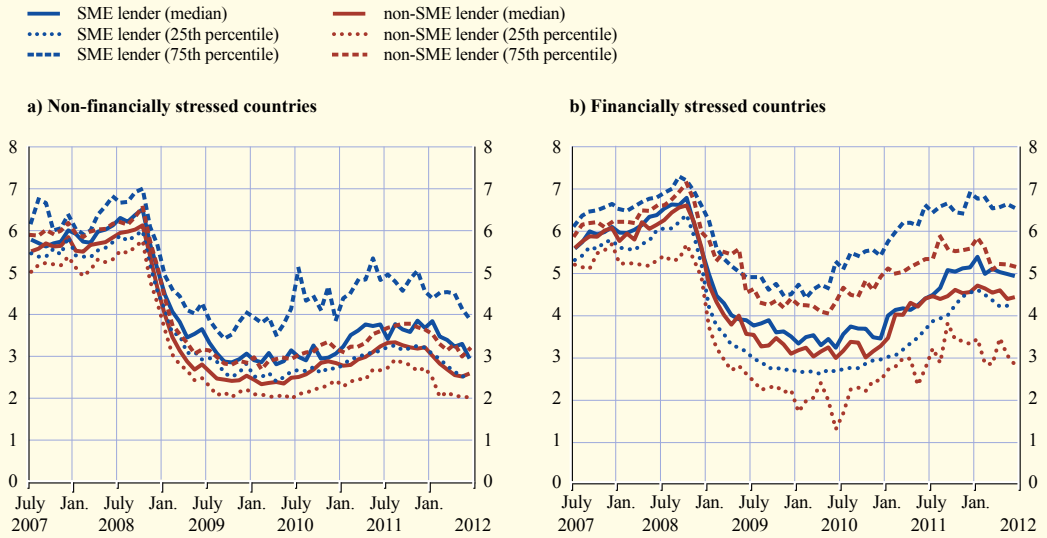
3 The average ratio of new business volumes of small loans (less than €1 million) to total new business volumes of loans to NFCs between July 2011 and June 2012 serves as a proxy.
4 The financially stressed economies included in the analysis are: Ireland, Greece, Spain, Italy, Cyprus, Portugal and Slovenia.

On average, SME lenders in financially stressed countries are found to have higher loan to deposit ratios compared to their analogues in non-stressed countries (i.e. larger than 1, see Chart A) suggesting that bank loans have in general been financed using less stable sources of funding.[5] SME lenders in financially stressed countries have also seen considerable reductions in funding from the interbank market and from abroad which, albeit substituted by Eurosystem credit, has led to the emergence of funding difficulties for these MFIs. Lastly, SME lenders appear to fund themselves at higher costs compared with non-SME lenders, particularly in financially stressed countries. Their retail and wholesale funding costs, proxied by composite deposit rates (which exclude overnight deposits) and credit default swap spreads, have been more expensive. These results even hold when taking the banks' size into account. Furthermore, these funding constraints have been correlated with higher interest rates on small loans to NFCs (i.e. loans below a size of €1 million), which are considered to be a proxy of loans to SMEs (see Chart B). However, the evidence that these constraints also correlate with weaker credit flows by SME lenders in financially stressed countries is not as compelling.[6]

Lastly, the exercise shows that the various changes in the Eurosystem's collateral framework, regarding additional credit claims (ACCs) and asset-backed securities (ABSs), particularly support SME lenders in the financially stressed countries who rely more strongly on NFC-related collateral in their operations with the Eurosystem. Regarding the composition of this NFC-related collateral, credit claims account for the largest share of NFC-related collateral for banks

Chart B Interest rates on small loans to NFCs with an initial rate fixation of up to one year

(percentages per annum)



Source: ECB.
Notes: Charts refer to rates on small loans to NFCs with an initial fixation period of up to one year granted by 181 MFIs. The latest available observation is for June 2012.

5 Part of the difference might reflect that retail funding in Spain and Italy is raised through retail bonds. A cross-check against available aggregate data on short-term debt securities in Spain and Italy, however, reveals that the amounts outstanding are too low to have a major impact on the calculated loan-to-deposit ratios.

6 The above results are obtained using a mean comparison exercise, whereby each individual variable is regressed on an SME lender dummy and its interaction term with a dummy equal to 1 between June 2011 and June 2013. These interaction terms test whether there are significant differences (a) between SME lenders and non-SME lenders within the same country and (b) whether the difference emerged or intensified during the most recent period.

in non-stressed countries, whereas in financially stressed countries, ACCs and ABSs, backed by NFC loans, make up a significantly larger share – especially for SME lenders. Insofar as these measures may have a positive impact on lending, SMEs may be expected to benefit from policy changes affecting collateral eligibility.

Concluding remarks

Impairments in the transmission mechanism of monetary policy, which stem from the heterogeneous behaviour of individual MFIs, have required the development of new tools for monetary analysis. The use of individual MFI data proposes to fill this gap by shedding light on this heterogeneity and enabling a link between macro and micro-level developments. This box introduces the new individual MFI datasets and illustrates how they can be used to enhance the ECB's policy assessment with respect to lending to SMEs. It shows that SME lenders in financially stressed economies face a more challenging funding environment, both compared with SME lenders in non-stressed economies and non-SME lenders in the same country group, and that these difficulties correlate with higher interest rates on small loans to NFCs.

4 CONCLUSION

Addressing the challenges that the economic and financial environment poses to the real-time monetary policy analysis requires continuous efforts to extend and advance the underlying analytical framework and tools. In recent years, the analysis of money and credit in the euro area has been faced with protracted weakness in monetary dynamics in a context of, most recently, low inflation outcomes, bouts of heightened uncertainty, stress in bank capital and funding, and large heterogeneity in MFI lending dynamics across countries as well as across borrower sector and size, to name but a few of the issues. This article illustrates how extensions and advances to the ECB's analytical toolkit are being developed to address some of these challenges. In some cases, these extensions have provided novel ways to interpret and assess money and credit developments, while in others, they have added technical sophistication and analytical rigour to the less formal assessments that unavoidably need to be drawn in a real-time policy environment. As the evolving economic environment constantly poses new challenges, efforts to enrich further the analytical framework of the monetary analysis will continue.