

ARTICLES

THE SUPPLY OF MONEY – BANK BEHAVIOUR AND THE IMPLICATIONS FOR MONETARY ANALYSIS



The ECB's monetary policy strategy assigns a prominent role to monetary analysis as one element of the two-pillar framework for the assessment of risks to price stability in the euro area. Monetary analysis ensures that the important information stemming from money and credit is considered in the monetary policy decision-making process and provides a cross-check from a medium to long-term perspective of the assessment of risks to price stability based on the economic analysis.

Through an analysis of money and credit developments, this article looks at the impact of banks' intermediation activity on the macroeconomy with respect to both conjunctural developments and the assessment of nominal trends. Persistent changes in banks' behaviour are likely to affect the economy in an enduring and significant manner. The analysis of money and credit growth is thus crucial for conducting an appropriate monetary policy.

I INTRODUCTION

The role of monetary analysis in the ECB's monetary policy strategy is founded on the robust positive relationship between longer-term movements in broad money growth and inflation, whereby money growth leads inflationary developments. This relationship is found to hold true across countries and monetary policy regimes.¹ Accordingly, when trying to identify the contributions to monetary growth that are associated with risks to price stability, it is necessary to look for changes of a persistent nature or that are driven by factors beyond the normal needs of the economic cycle. In this respect, the supply of money and credit may be affected by persistent advances in banks' intermediation capacity, thus contributing to longer-term price developments in asset and goods markets, and in the short-term by market perception of the financial soundness of banks. Thus, from a monetary analysis perspective, understanding developments in banks' behaviour is an important element in deriving the signals for risks to price stability.

Section 2 of the article develops a framework for understanding why advancements in the bank intermediation process may have led to persistent developments in money and credit growth, ultimately affecting macroeconomic developments relevant for monetary policy. Section 3 discusses selected examples, which illustrate how banking operations in the euro area have undergone significant changes in the

past decade. On the liability side of the balance sheet, the internationalisation of interbank funding is a significant development while, on the asset side, the growing use of loan sales and securitisation activity stands out. Section 4 concludes.

2 WHAT ROLE FOR BANK BEHAVIOUR IN MONETARY ANALYSIS?

Bank behaviour is one important determinant of money and credit developments, both of a cyclical and of a more persistent nature. Neglecting this role is akin to assigning financial intermediaries only a passive role in the economy. In recent years, against the background of the financial crisis, it has become increasingly evident that such a passive view of banks is unwarranted.

2.1 MONEY DEMAND VERSUS MONEY SUPPLY

The volume of broad money in the economy is the result of the interaction of the banking sector (including the central bank) with the money-holding sector, consisting of households, non-financial corporations, the general government other than central government, as well as non-monetary financial intermediaries. Broad money comprises currency in circulation and

¹ See Papademos, L. and Stark, J. (eds.), *Enhancing Monetary Analysis*, ECB Frankfurt am Main, 2010, Chapter 1 and the references cited therein.

close substitutes, such as bank deposits, and is informative for aggregate spending and inflation. It thus goes beyond those assets that are generally accepted means of payment to include instruments that function mainly as a store of value.

Empirical models for money holdings are applied for two purposes. First, they are used to guide the analysis of monetary developments, as a means of quantifying the contribution of various economic determinants to money growth in order to provide a deeper understanding of the causes of money growth. This is necessary in order to develop a view of underlying monetary expansion. Second, the models provide a normative framework to assess whether the stock of money in the economy is consistent with price stability and to interpret the nature of deviations from this norm. An understanding of why the money stock deviates from an equilibrium level, defined on the basis of empirical regularities, is therefore essential from a monetary policy perspective.²

Identifying whether monetary developments are driven by money demand or money supply is of prime relevance when assessing the relationship between money, asset price developments and wealth. Indeed, the holdings of broad money, as one element in the portfolio of economic agents, are determined by the size of agents' wealth. At the same time, asset prices, and thus the overall wealth position of agents, may be influenced by money supply. The assessment of monetary developments is therefore closely linked to an assessment of the sustainability of wealth and asset price developments.³

If the observed level of money is assessed as being consistent with the level of prices, income and interest rates, then money growth reflects the economic situation. Risks to price stability resulting, for example, from strong economic growth would be visible in money.⁴ If, however, observed monetary developments do not evolve in line with expectations based on the historical relationship with prices, income and interest rates, then the appropriate monetary policy

response will depend on the underlying forces leading to this deviation.

If the inconsistency is the result of demand considerations, resulting, for instance, from heightened financial uncertainty, monetary policy should not necessarily react to monetary developments. For example, the increase in M3 holdings in the period from 2001 to mid-2003 that was identified as resulting from a shift in preference towards holding safe and liquid assets owing to heightened uncertainty was not linked to the emergence of risks to price stability (see Chart 1, which shows the difference between the broad monetary aggregate M3 and M3 corrected for the estimated impact of

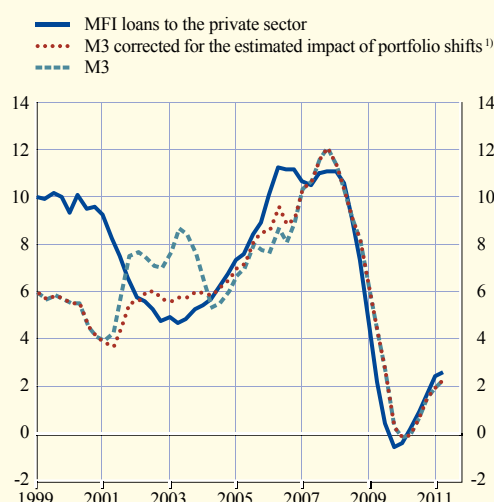
2 See Papademos, L. and Stark, J. (eds.), *Enhancing Monetary Analysis*, ECB Frankfurt am Main, 2010, Chapter 3.

3 See the article entitled "Asset price bubbles and monetary policy revisited", *Monthly Bulletin*, ECB, November 2010.

4 However, even in this case, money can play an important informative role owing to errors or revisions in the measurement of other macroeconomic variables such as output. See Coenen, G., Levin, A. and Wieland, V., "Data uncertainty and the role of money as an information variable for monetary policy", *European Economic Review*, Vol. 49, No 4, May 2005, pp. 975-1006.

Chart 1 Broad money and loan growth

(annual percentage changes; adjusted for seasonal and calendar effects)



Source: ECB.

1) Estimates of the magnitude of portfolio shifts into M3 are constructed using the approach discussed in Section 4 of the article entitled "Monetary analysis in real time" in the October 2004 issue of the *Monthly Bulletin*.

portfolio shifts). By contrast, if monetary developments deviate from the economic determinants as a result of a shift in money supply that is caused either by a structural change or a shift in the perception of risks, this would call for an adjustment of monetary policy to the extent that the deviation is likely to affect inflation. Explanations relating to money supply are often linked to the intermediation and the money creation processes, and highlight the interdependence between the credit and the money markets.⁵

In principle, it is possible to distinguish between money supply and money demand at a conceptual level in a static setting. However, in a dynamic context, it is difficult to assess which of these forces is mainly driving actual developments, as the determinants of money growth often affect both sides, and demand and supply interact.

2.2 MONEY SUPPLY AND MONETARY POLICY

Money supply originates in the behaviour of the central bank and banks. A common distinction made in this respect is the supply of “outside money” provided by the central bank – consisting of banknotes and banks’ reserves with the central bank – and “inside money” created by banks, consisting mainly of deposits.

Pedagogical accounts of how monetary policy exerts an influence on the supply of broad or inside money in the economy traditionally rely on the money multiplier approach. According to this approach, the money supply process is essentially driven by the actions of the central bank, which conducts monetary policy by adjusting the level of outside money. The volume of broad money supplied to the economy is then simply determined as a multiple of the monetary base, depending on the size of the money multiplier. The concept of the money multiplier derives from the basic feature of deposit banking that, under normal conditions and when there is confidence in the banking system, banks only need to maintain a fraction of the deposits they have accepted in the form of highly liquid, cash-equivalent assets (such as central bank reserves). The rest of the deposits can be used to acquire higher yielding, less liquid assets, in particular loans. According to this framework, therefore, when the central bank increases the volume of reserves it makes available to banks, the latter can create additional deposits equal to a multiple of this increase (see Box 1 entitled “Multiplier analysis of the effect of monetary policy on money supply”).

5 See Brunner, K. and Meltzer, A., “Money Supply”, in Friedman, B. and Hahn, F.H. (eds.), *Handbook of Monetary Economics*, Vol. I, North-Holland, Amsterdam, 1990, p. 396.

Box 1

MULTIPLIER ANALYSIS OF THE EFFECT OF MONETARY POLICY ON MONEY SUPPLY

The money multiplier framework has a long and distinguished pedigree in the literature.¹ Multiplier analysis is based on the assumption that the central bank unilaterally sets the level of the monetary base, i.e. the monetary base is the instrument of monetary policy. The money multiplier then determines the supply of broad money, while short-term interest rates adjust in order to establish equilibrium between money demand and money supply. Clearly, this account contrasts with the way in which monetary policy is, in general, implemented in practice. In fact, as noted in the main text of this article, central banks set an official interest rate and then supply the volume of reserves necessary in order to steer short-term market interest rates close to the official interest rate.²

1 See, for instance, Keynes, J.M., *A Treatise on Money*, Macmillan, London, 1930 and St. Martin’s Press, New York, 1971; and Friedman, M. and Schwartz, A., *A Monetary History of the United States, 1867-1960*, Princeton University Press, Princeton, 1963.

2 For reasons why central banks predominantly choose to implement monetary policy through steering interest rates rather than manipulating the monetary base, see Goodhart, C.A.E., “Money, Credit and Bank Behaviour: Need for a New Approach”, *National Institute Economic Review*, No 214, October, 2010, pp. F1-F10.

However, in a situation where nominal interest rates are at, or close to, their zero lower bound, it might be argued that the central bank could provide additional stimulus to the economy by engaging in large-scale provision of central bank reserves in order to engineer an increase in the supply of money in the economy through the money multiplier. While such policies can indeed have a stimulating impact on the economy, this does not arise from a mechanical link to the supply of broad money implied by the multiplier approach. This points to what is perhaps a more fundamental drawback of the money multiplier framework: the money multiplier approach assumes that both banks and the money-holding sector respond in a predictable way to an adjustment of the monetary base by the central bank. Portfolio behaviour in the multiplier framework lacks behavioural content, as banks always exhibit the same preference between central bank reserves and other assets, while the money holding sector is assumed also to have a fixed preference between currency and deposits.³ Actual portfolio behaviour is, however, affected by the prevailing rates of return and evolving perceptions of risk, as well as a host of other factors.

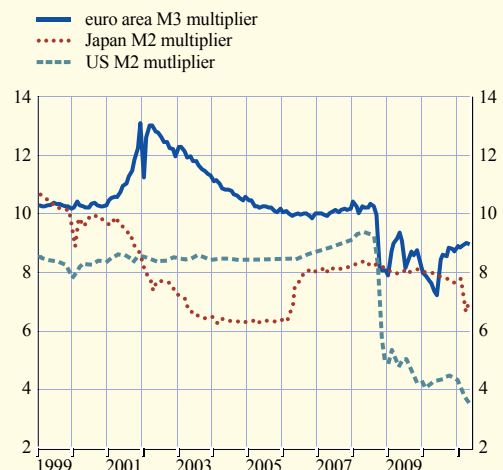
The significance of this shortcoming is borne out by recent experience, when the volume of reserves provided by central banks in a number of economies increased in an unprecedented manner in response to the financial crisis that followed the collapse of Lehman Brothers in the autumn of 2008. As shown in Chart A, this led to a large decline in the broad money multipliers, as the increase in central bank reserves did not trigger a proportionate reaction in broad money.⁴ By contrast, in the context of increased uncertainty regarding the strength of the balance sheets of their counterparties in the interbank markets and in the face of concerns regarding their capacity to absorb liquidity shocks, banks decided to increase their holdings of central bank reserves. The increase in central bank reserves did not therefore initiate the predetermined portfolio allocation envisaged by the multiplier approach. To further illustrate this point, a decomposition of the change in the M3 money multiplier in the euro area can be calculated. The M3 money multiplier can be defined as follows:

$$MM = \frac{1 + \frac{C}{D}}{\frac{R}{D} + \frac{C}{D}}$$

where C denotes banknotes in circulation, D denotes deposits (strictly the instruments included in M3 other than currency) and R represents credit institutions' reserves with the Eurosystem (current accounts and use of the

Chart A Broad money multipliers in the euro area, the United States and Japan

(in multiples of the monetary base)



Sources: ECB, BIS and ECB calculations.

³ There is, however, literature in the money multiplier tradition that provides behavioural content to this type of analysis, albeit in a stylised manner. See, for example, Brunner, K. and Meltzer, A.H., "Some Further Investigations of Demand and Supply Functions for Money", *Journal of Finance*, Vol. 19, 1964, pp. 240-283 and Rasche, J.H. and Johannes, J.M., *Controlling the Growth of Monetary Aggregates*, Kluwer Academic Publishers, Boston, 1987.

⁴ In the case of Japan, the decline in the money multiplier occurred earlier, as the Bank of Japan started to implement a policy to expand its reserves in 2001.

deposit facility). Changes in the M3 money multiplier (MM) can therefore be decomposed into the contribution due to changes in the currency-to-deposits ratio (C/D) and that due to changes in the reserves-to-deposits ratio (R/D). Chart B documents how the decline in the M3 multiplier in late 2008 was mainly due to the large change in the reserves-to-deposits ratio, reflecting the sizeable accumulation of central bank reserves. By contrast, the episode around the euro cash changeover in 2002 was driven by changes in the currency-to-deposit ratio, as the euro cash changeover affected the public's currency-holding behaviour, in particular concerning a de-hoarding of currency in the run-up to the euro cash changeover and a gradual re-hoarding of currency in subsequent years.⁵ Both Chart A and Chart B document how, during the period from 2005 to 2008, the M3 money multiplier in the euro area was rather stable at its pre-2001 level, and did not thus provide any indication of the changes in bank intermediation that were ongoing during this period (see Section 3). This reflects the fact that credit institutions' reserves with the Eurosystem during this period were developing in line with minimum reserve requirements.

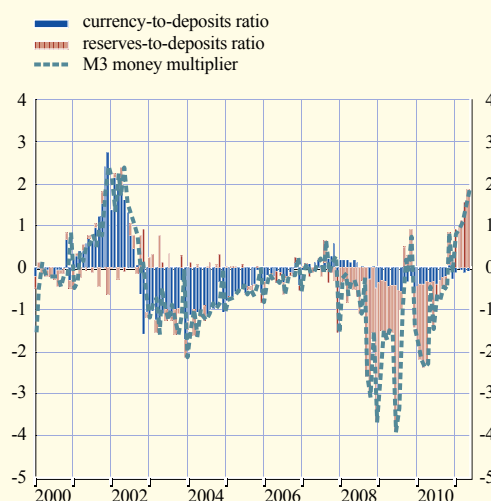
Overall, the mechanical link between monetary policy and the supply of money that is embedded in the money multiplier approach is not a particularly useful framework either for understanding changes in monetary aggregates or for designing appropriate monetary policy responses, even in an environment where the zero lower bound for nominal interest rates may become binding. Instead, the influence of monetary policy on money supply is exerted in a more nuanced manner, as outlined in the main text of this article.

⁵ See the article entitled "The demand for currency in the euro area and the impact of the euro cash changeover", *Monthly Bulletin*, ECB, January 2003.

In contrast to the textbook account, the implementation of monetary policy is typically done by steering short-term money market interest rates and accommodating the demand for outside money. Changes in these interest rates alter the opportunity costs of money holdings and thereby affect the demand for broad money. However, monetary policy also has a distinct, albeit non-mechanical, impact on the supply of money to the economy. For instance, declines in monetary policy interest rates will also positively affect the net worth of banks, resulting in an easier funding environment for banks and thereby

Chart B Decomposition of changes to the M3 multiplier in the euro area

(annual percentage changes; percentage point contributions)



Sources: ECB and ECB calculations.

increasing their capacity to extend credit. At the limit, the adequacy of the bank's capital position may quantitatively determine its operation.

2.3 BANKS AS A SOURCE OF BROAD MONEY SUPPLY

Monetary policy influences the supply of money through the effects it has on banks' intermediation activity. However, the majority of the changes in money supply occurring in the economy result from developments in the way that banks conduct their business.

More specifically, a bank is an institution, the core operations of which consist of granting loans and supplying deposits to the public. Through the duality of lending and deposit issuance, banks fulfil a number of functions: they offer liquidity and payment services, undertake the screening and monitoring of borrowers' creditworthiness, redistribute risks and transform asset characteristics. These functions will often interact within a bank's intermediation process.

Banks may intermediate between savers and borrowers by issuing securities and lending the receipts onward. Such lending activity will require the processing of detailed and often proprietary information on borrowers and the monitoring of the projects that have been financed. Such credit is, however, also provided by a number of non-monetary financial intermediaries, such as insurance corporations, as well as pension and investment funds, and is not specific to banks.

Banks may also lend to borrowers, but thereby create deposits (initially held by the borrowers). The deposits constitute claims on the bank that are capital-certain and demandable, that is redeemable at a known nominal value.⁶ These deposits have as a key feature the provision of liquidity services to their owner and, in some cases, such as overnight deposits, can also be used for payment services. As described by Diamond and Dybvig,⁷ this transformation of illiquid claims (e.g. bank loans) into liquid claims (e.g. bank deposits) is a key defining element of a bank.⁸ Non-monetary financial

intermediaries do not provide their customers with liquid deposits.

Banks' liquid deposit liabilities constitute the core of broad monetary aggregates, and banks thus play a leading role in the supply of broad money. Changes in banks' behaviour will alter the money supply.

A wide range of determinants affecting banks' intermediation activity has been identified in the literature, such as banks' risk aversion, borrowers' creditworthiness, the regulatory framework, the availability of capital buffers and the spread between lending rates and funding costs, known as the "intermediation spread". This spread represents the remuneration that banks can obtain for the service of intermediating between depositors and borrowers through their balance sheet. In a competitive equilibrium, it will equal the marginal cost of banks, which results from the costs of originating and servicing the loans, the provision of transaction services and the risk of default. Different explanations have been put forward in the literature for this spread (see Box 2 entitled "Bank behaviour and macroeconomic developments").

6 See Freixas, X. and Rochet, J.-C., *Microeconomics of Banking*, 2nd edition, MIT Press, Cambridge, Massachusetts, 2008.

7 Diamond, D.W. and Dybvig, P.H., "Bank runs, deposit insurance, and liquidity", *Journal of Political Economy*, Vol. 91 (3), 1983, pp. 401-419.

8 Liquidity is a complex and multi-faceted concept. For an exposition of the liquidity provision by the banking system, see, for instance, von Thadden, E., "Liquidity", *Cahiers de Recherches Économiques du Département d'Économétrie et d'Économie politique (DEEP)*, Université de Lausanne, Faculté des HEC, 2002.

Box 2

BANK BEHAVIOUR AND MACROECONOMIC DEVELOPMENTS

Triggered by the financial crisis, there is renewed interest in academic research on the role played by banks in macroeconomic developments. Banks' intermediation activity is explained on the basis of a variety of approaches, which emphasise different aspects of the banking sector's economic functions. This box describes some of the core mechanisms proposed in the recent literature to explain the spread between deposit and loan rates.

Explaining the spread between deposit and loan rates

Traditional macroeconomic models without financial intermediation describe the transmission mechanism of monetary policy through a single (risk-free) interest rate. As indicated by Meltzer and Nelson¹, the characterisation of the financial sector in such a simplified manner is likely to miss important elements in the macroeconomic adjustment mechanisms. A key aspect that is absent from the traditional framework is an account of how different interest rates embody time-varying risk premia. Developments in money and credit may be informative as regards the evolution of the (unobservable) risk premia, both for the bank and for the non-financial private sector.

One strand in the recent academic literature seeks to explain the existence of different bank interest rates on loans and deposits on the basis of monopolistic competition in the banking sector. In this case, banks earn a positive profit margin because they can set the level of bank interest rates such that deposit rates are below the interbank rate and loan rates are above it. In addition, the bank faces costs in adjusting its interest rates and will take the pricing decision of competitors into account in order to preserve long-term customer relationships. This shields borrowers from market rate fluctuations.² The adjustment costs imply a sluggish adjustment of retail interest rates to changes in the monetary policy rate, as actually observed in euro area data, and provide more scope for financial quantities to play a role in the propagation of monetary policy.

The explicit characterisation of the impact of asymmetric information on the relationship between borrowers and lenders is a further approach to describing banks. This strand of the literature focuses on the prevalence of superior information with regard to the success of investment projects on the side of the borrower vis-à-vis the bank. The approach thus distinguishes between borrowers that are able to repay their loans and those that are not. The spread between loan and deposit rates in part insures the bank against the costs resulting from defaulting borrowers.³ A similar approach focuses on the depositor-bank relationship, and introduces superior information on the part of the bank with regard to the investments it funds with the deposits it receives. This agency problem leads to a restriction of the maximum leverage that the bank can undertake and thereby imposes a relationship between capital and loan supply. In this approach, the default risk of banks can disrupt the intermediation process and raises the cost of credit to the economy.⁴

Several approaches emphasise the use of resources in the context of financial intermediation. Banks can be seen as possessing several technological tools to provide the intermediation service and manage their assets and liabilities. As a result of the default risk of borrowers, in their lending business, banks may use resources to screen loan applicants and monitor the projects the banks finance or hedge their exposure.⁵ The resources involve, for instance, a monitoring effort of its

1 See Meltzer, A., “Monetary, Credit and (Other) Transmission Processes: A Monetarist Perspective”, *Journal of Economic Perspectives*, Vol. 9(4), 1995, pp. 49-72; Nelson, E. “The future of monetary aggregates in monetary policy analysis”, *Journal of Monetary Economics*, Vol. 50, pp. 1029-1059.

2 See Gerali, A., Nerri, S., Sessa, L. and Signoretti, F., “Credit and Banking in a DGSE model of the euro area”, *Journal of Money, Credit and Banking*, Supplement to Vol. 42, September, 2010, pp. 107-141.

3 See Curdia, V. and Woodford, M., “Credit frictions and optimal monetary policy”, revised draft of paper prepared for the BIS annual conference on 26-27 June 2008, “Whither Monetary Policy?”, Lucerne, Switzerland, 2009.

4 See Gertler, M. and Karadi, P., “A model of unconventional monetary policy”, *Journal of Monetary Economics*, Vol. 58, 2011, pp. 17-24; Gertler, M., Kiyotaki, N., “Financial Intermediation and Credit Policy in Business Cycle Analysis”, in Friedman, B. and Woodford, M. (eds.), *Handbook of Monetary Economics*, Vol. 3, North-Holland, Amsterdam, 2010.

5 Goodfriend, M., and McCallum, B., “Banking and interest rates in monetary policy analysis: a quantitative exploration”, *Journal of Monetary Economics*, Vol. 54, 2007, pp. 1480-1507.

staff both on the borrower and on the value of collateral that the bank receives. For instance, a positive shock to the value of the collateral that is pledged to banks implies a lower risk for the bank and thus the bank can grant more loans for a given amount of monitoring effort. This increase leads to a higher supply of money. Chart A illustrates quantitatively the response of consumption and inflation to such a shock.

With regard to the management of its liabilities, a bank can devote resources in terms of staff and capital in order for its customers to have access to liquidity services.⁶ For instance, electronic payment technologies, such as internet banking, and the use of debit cards on deposits allow the payer to make a transfer to the recipient's account without losing interest before the payment and without incurring transaction costs.

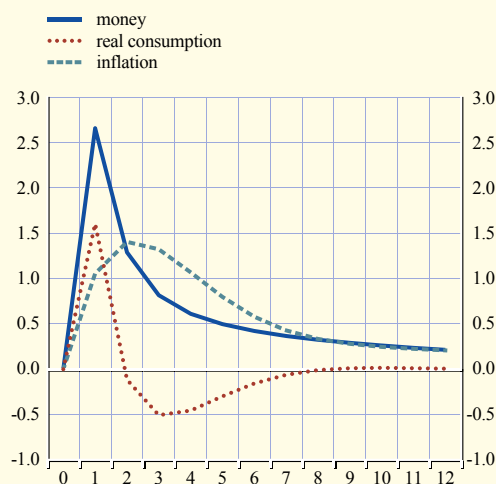
An increase in banks' perceived risk management capabilities, for instance, through the widespread use of credit scoring, may give the impression that there is less uncertainty about the borrowers' capacity to repay loans than there was in the past. A perceived improvement in their risk management leads banks to charge a lower premium to borrowers and to boost credit. On the funding side, the increase in loans is financed by trying to attract all sources of funds via offering higher rates. Therefore, loans and M3 tend to grow at a similar pace. The impact on economic activity is positive and upward pressure on inflation is observed (see Chart B).

Outlook

Each of the mechanisms discussed above focuses on a specific element of banking. At the same time, the variety of approaches indicates that banking cannot be characterised by a single dominant mechanism. This has two implications for monetary policy analysis: first, the effects derived from individual

Chart A Responses to an improvement in collateral value

(quarterly percentage changes)

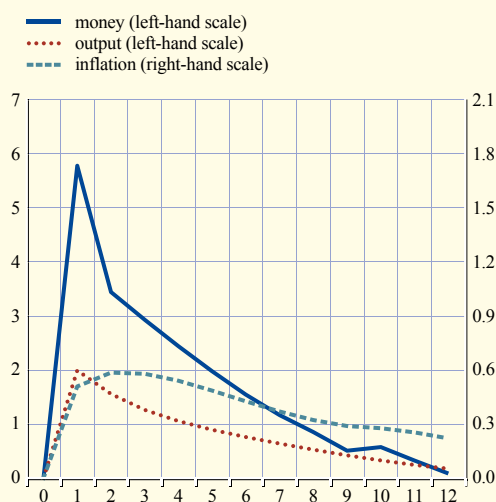


Source: ECB estimates.

Notes: Based on a modified version of the model by Goodfriend, M. and McCallum, B., "Banking and interest rates in monetary policy analysis: a quantitative exploration", *Journal of Monetary Economics*, Vol. 54, 2007, pp. 1480-1507. The responses result from an unexpected 1% increase in the value of collateral.

Chart B Responses to an improvement in the perceived riskiness of borrowers

(quarterly percentage changes)



Source: ECB estimates.

Notes: Based on a modified version of the model by Christiano, L., Motto, R. and Rostagno, M., "Financial factors in economic fluctuations", *Working Paper Series*, No 1192, ECB, Frankfurt am Main, May 2010. The responses result from an unexpected 1% decline in the riskiness of the lending activity.

6 Christiano, L., Motto, R. and Rostagno, M., "Financial factors in economic fluctuations", *Working Paper Series*, No 1192, ECB, Frankfurt am Main, May 2010.

mechanisms may only explain in part the role of banks in the intermediation process and the broader economy. Second, it is difficult to construct a model of a bank that fully integrates the different mechanisms, and no such model is currently available in the academic literature. For this, it would be necessary to know how the different mechanisms interact and which of the mechanisms were indeed the most relevant when confronted with reality.

The size of banks' balance sheets and the maturity structure of assets and liabilities is key to the generation of liquidity. Taking the view that banks manage their assets and liabilities independently of each other overlooks the structural interdependence between the asset side and the liability side of the balance sheet.

First, at the individual bank level, once granted to customers, credit lines have very similar implications in terms of liquidity risk to overnight deposits, as the customers can draw down the deposits and the credit lines at their discretion, thereby gaining access to liquidity on demand in order to accommodate unpredictable needs. The bank, however, will need to hold available a cash buffer in order to meet these demands. If the withdrawals are sufficiently uncorrelated, banks may be able to gain risk-reduction synergies by offering both products, while a non-bank financial intermediary would not be able to benefit from such synergies.⁹ Ultimately, it is the provision of liquidity to the economy that has macroeconomic implications.

Second, the availability of deposits, the remuneration of which adjusts sluggishly to changes in the market rates – a feature typical of “core” deposits, such as time and savings deposits held by the non-financial private sector – allows banks to engage in contractual agreements with borrowers, which would not be possible if the intermediary were to fund these activities at market rates.¹⁰ Deposits shield the bank's costs of funds from movements in market interest rates and thus allow banks to provide to borrowers the extra insurance services against adverse financial developments.

Lastly, lending to borrowers that necessitates a high monitoring effort on the part of banks, such as loans to small and medium-sized

enterprises, is most efficiently funded with core deposits, as these deposits are the least subject to withdrawal risk. Sluggishness in withdrawal can be related to the liquidity services provided by the bank, switching costs for depositors or deposit insurance.¹¹

These considerations support the view that developments related to banks' access to liquid deposits have significant implications for the intermediation activity in addition to those resulting from bank credit developments. From the perspective of the bank, the structure of its financing is important for its value. In addition to the mix of debt and equity, it is also the maturity composition of the debt that matters.¹² Improvements in banks' management of liabilities that render their funding more flexible and thus the provision of liquid deposits easier should be seen as increasing the economy's money supply.

2.4 BROAD MONEY SUPPLY AND THE MACROECONOMY

In the short run, changes in the demand for money resulting from movements in output, interest rates or liquidity preferences will be satisfied by banks. However, over more protracted horizons,

9 See Kashyap, A., Rajan, R. and Stein, J., “Banks as Liquidity Providers: An Explanation for the Co-Existence of Lending and Deposit-Taking”, *NBER Working Paper*, No 6962, 1999.

10 See Berlin, M. and Mester, L., “Deposits and Relationship Lending”, *The Review of Financial Studies*, Vol. 12(3), 1999, pp. 579-607.

11 See Song, F. and Thakor, A., “Relationship Banking, Fragility, and the Asset-Liability Matching Problem”, *The Review of Financial Studies*, Vol. 20, No 5, 2007, pp. 2129-2177.

12 Only in a world in which the unrealistically strict assumptions of the Modigliani and Miller theorem hold, would the value of the bank not depend on the composition of liabilities. See DeYoung, R. and Yom, C., “On the independence of assets and liabilities: Evidence from U.S. commercial banks, 1990-2005”, *Journal of Financial Stability*, Vol. 4, 2008, pp. 275-303.

banks will adjust the supply of money and credit as well as bank interest rates in accordance with their business strategy.

Changes in the money supply can have an impact on the economy through two general transmission channels.¹³ The first channel rests on the effect of the availability of credit in the economy and the second one on the effect of liquidity on the allocation of asset portfolios. These channels are not mutually exclusive, but rather complement each other. They are presented below in a stylised manner.

AVAILABILITY OF CREDIT

In the first channel, improvements to the intermediation process, for instance, owing to changes in banks' access to funding, will ease financing conditions for households and firms. This can be reflected in lower lending rates, more attractive non-price elements of loan contracts, such as higher loan-to-value ratios, and ultimately enhanced availability of credit. In an environment where some economic agents are constrained in their capacity to spend by their currently available income and liquid assets, an easier access to funds will increase real consumption and real investment expenditures, and ultimately lead to inflationary pressures. An example of this is where, owing to their ability to securitise loans, banks fund the demand for credit from households more easily and are prepared to provide mortgages to a wider group of households on easier terms, which has an impact on housing investment and consumption.¹⁴

An additional element that can give rise to changes in the availability of credit to households and firms arises from advances in bank risk management techniques, in particular, with regard to funding risk that comprises both the actual mismatch in the residual maturity of assets and liabilities, as well as the inability to liquidate assets quickly or to roll over existing sources of funding.¹⁵ Enhanced risk mitigation for a given level of funding and bank capital allows banks to take on more credit exposure.¹⁶ A further element that may affect banks' ability to provide intermediation relates to developments

in their capital position. Events giving rise to an improvement in banks' capital positions may increase their capacity to expand their asset holdings, thereby potentially inducing a leveraging process. As a result of this mechanism, what may appear to be small increases in the value of the banking firm from the perspective of the aggregate economy, may be amplified in terms of the effects they have on the broader economy through the easing of credit constraints.¹⁷

These mechanisms highlight the existence of binding credit constraints in the economy. To the extent, however, that the changes in the intermediation process give rise to lower costs for banks, this can be passed on to customers as higher deposit rates and/or lower lending rates. This impact on interest rates will affect the net present value of investment projects and the inter-temporal allocation of consumption. On aggregate, it will affect spending and ultimately inflation. In addition to the level of bank interest rates, the changes in the intermediation process may also affect other features of the pass-through, such as the speed of adjustment of bank interest rates to market rates.

LIQUIDITY EFFECT

Economic agents that borrow from banks generally do so in order to purchase goods and services, thereby transferring the newly-created deposits to other agents in the economy.

13 See also the article entitled "The role of banks in the monetary policy transmission", *Monthly Bulletin*, ECB, Frankfurt am Main, August 2008.

14 This process is highlighted in the literature on the bank lending channel, see Bernanke, B. and Blinder, A., "Credit, Money and Aggregate Demand", *American Economic Review*, Vol. 78, 1988, pp. 435-439.

15 Fender, I. and McGuire, P., "Bank structure, funding risk and the transmission of shocks across countries: concepts and measurement", *BIS quarterly review*, September 2010, pp. 63-79.

16 See Borio, C. and Zhu, H. "Capital regulation, risk-taking and monetary policy: a missing link in the transmission mechanism?", *Working Paper Series*, 268, BIS, December 2008; Maddaloni, A. and Peydro, J.-L. "Bank Risk-Taking, Securitization, Supervision, and Low Interest Rates: Evidence from the Euro Area and U.S. Lending Standards", *Review of Financial Studies*, Vol. 24(6), 2011, pp. 2121-2165.

17 Woodford, M. "Financial Intermediation and Macroeconomic Analysis", *Journal of Economic Perspectives*, Vol. 24(4), Fall 2010, pp. 21-44. See also Aghion, P., Hemous, D. and Kharroubi, E., "Credit constraints, cyclical fiscal policy and industry growth", *Working Paper Series*, No 340, BIS, February 2011.

This provides scope for a second channel through which improvements in intermediation and payment systems have macroeconomic implications by means of liquidity effects and portfolio adjustment. In the short term, these deposits can be held as a liquidity buffer, but over the medium term – unless the demand for money on the part of these agents has changed – economic agents will not be prepared to hold the “extra” deposits. In this situation, some agents may wish to repay their loans to the bank, thereby leading to a re-absorption of the deposits. Alternatively, agents will use the “extra” deposits to purchase additional goods and services, placing the sellers in a similar situation. Eventually, the circulation of deposits around the economy will lead to a higher demand for goods and services, contributing to inflationary pressures and thereby bringing real money holdings into balance with money demand.¹⁸ Other agents in the economy may use these “extra” deposits to purchase assets in order to rebalance their portfolios given the different risk and return properties of money, bonds and equity. This adjustment will place upward pressure on the prices of the alternative asset categories, thereby reducing yields and increasing the net present value of real capital investment.¹⁹

Both the availability of credit and the liquidity effects induce a higher aggregate demand. However, some advances in banking that free resources from the intermediation process also alter the production capacity of the rest of the economy. This effect tends to mitigate the inflationary pressures. By contrast, other changes that do not free resources for the rest of the economy, for instance changes in the assessment of risks by banks, mainly affect aggregate demand and thus have a stronger inflationary effect. All three effects need to be considered in the conduct of monetary policy.

3 RECENT DEVELOPMENTS IN BANK FUNDING

In recent years changes have occurred to the way in which credit institutions conduct financial intermediation, which are likely

to have persistent effects on their asset and liability management practices. Concrete illustrations of changes in banks’ funding are provided below against the background of the discussion in Section 2.3 on the role of banks in broad money supply. Innovations in information processing, communication technology and financial markets, such as electronic trading platforms, credit scoring and asset securitisation or the internationalisation of bank funding, have all influenced banks’ resilience to funding risk. Improved management of funding risks allows banks to conduct more maturity transformation, using liquid deposit funding more abundantly, thereby contributing to a greater supply of money.

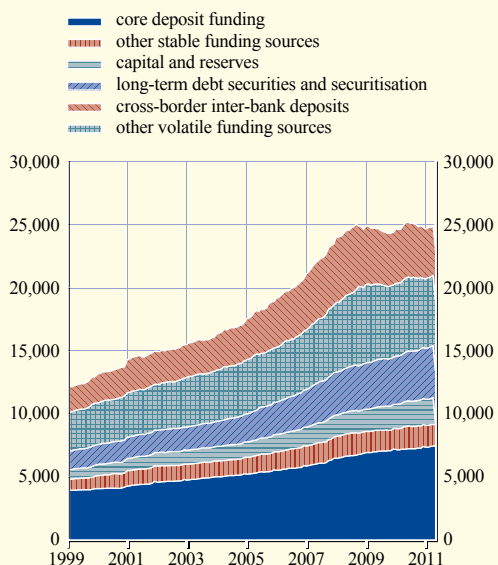
Euro area credit institutions gradually increased the size of their balance sheets between 1999 and September 2008, leading to a doubling of the main liabilities recognised. Since late 2008 balance sheet size has stagnated at around that level (see Chart 2). An important element for assessing the funding situation is the counterpart sector holding the claims. A deposit can have very different funding implications for the bank, depending on whether it is held by a household or by an investment fund owing to the different likelihood that it will be rolled over. It is thus important to distinguish between stable and volatile funding sources. Stable funding sources provide around half of the funding needed by banks, consisting mainly of the deposit holdings of the non-financial private sector and longer-term debt securities held by non-MFIs (see Section 3.1). Volatile funding sources comprise mainly short-term debt securities and short-term deposits provided by financial intermediaries. Cross-border deposits obtained from other banks have been an important component in this respect. Overall, deposits are the main liability of credit institutions in the

18 See, for instance, Berry, S. et al., “Interpreting movements in broad money”, *Bank of England Quarterly Bulletin*, Q3 2007, p. 378.

19 See Tobin, J. “A general equilibrium approach to monetary theory”, *Journal of Money, Credit and Banking*, Vol. 1, No 1, 1969, pp. 15-29; Meltzer, A., “Monetary, credit (and other) transmission processes: a monetarist perspective”, *Journal of Economic Perspectives*, Vol. 9, No 4, 1995, pp. 49-72.

Chart 2 Structure of euro area credit institutions' main liabilities

(EUR billion; not adjusted for seasonal and calendar effects)



Source: ECB.

Notes: Core deposit funding comprises deposits of households and non-financial corporations. Funding from other stable funding sources consists of longer-term deposits of insurance corporations and pension funds, deposits redeemable at notice of more than three months held by other non-monetary financial intermediaries, all deposits of general government excluding central government and all deposits by non-bank non-euro area residents. Funding from other volatile funding sources consists of short-term deposits of insurance corporations and pension funds, all deposits of other non-monetary financial intermediaries not related to securitisation, all deposits of central government and MFI debt securities with an initial maturity of up to one year. Long-term debt securities and securitisation comprise MFI debt securities with an initial maturity of more than one year and deposits of other non-monetary financial intermediaries with an agreed maturity of more than one year.

euro area, with a small remaining part financed through debt securities issuance and capital and reserves. The euro area perspective, however, masks considerable heterogeneity across member countries, which reflects, inter alia, the structure and concentration of the banking sector, as well as accounting practices and the regulatory environment.

3.1 SECURITISATION AND DEBT SECURITIES ISSUANCE

Banks can manage the maturity mismatch between assets and liabilities by issuing debt securities that are congruent in terms of maturity with the lending activity. A key difference

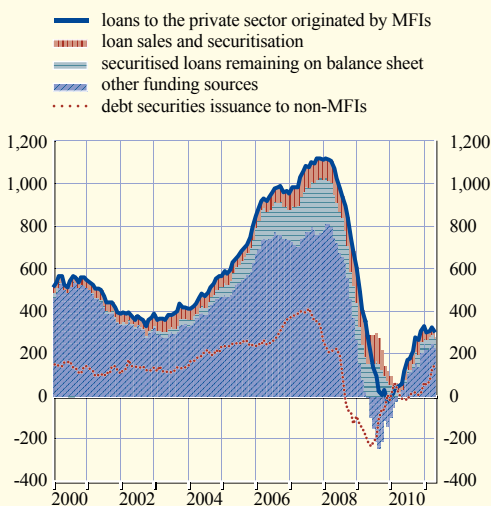
between market-based funding and traditional deposit funding is that, in the first case, the bank has to pay a higher risk premium to investors than on traditional deposit funding, as the latter are to some extent insured by governments. A further important difference is that under normal market conditions market funding can be fine-tuned to needs, while deposit funding adjusts more sluggishly. In the past two decades, the rapid growth in the assets managed by institutional investors has meant that banks have been able to rely on a large pool of market funds that could be tapped with complex products. This contributed to the expansion of securitisation and the covered bond market.

From a monetary analysis perspective, three elements are important. First, monetary analysis is interested in the interplay of money and credit, which typically fluctuate closely together. Market-based funding may dilute this relationship, both temporarily and more durably. Second, through securitisation, the loans on credit institutions' balance sheets, which were traditionally illiquid, have now become available to investors outside of the banking sector. Securitisation, if adequately performed, exhibits large economies of scale, in part, because banks use automated credit scoring models – a technology with a low ratio of variable costs to fixed costs – to evaluate loan applications before packaging the loans and selling them. It also provides an additional global funding source, as it makes the loan book tradable and thus lifts the quantitative restrictions implied by the size of the domestic deposit base. Third, a greater reliance on market-based funding compared with deposit-based funding implies that banks with hard-to-value loan books are likely to face elevated and variable costs of funding. Financial market perceptions may have an increased impact on the ability and incentives to grant credit, as banks are likely to be more sensitive to investors' perceptions and overall financial market conditions.²⁰

²⁰ Gambacorta, L. and Marques-Ibanez, D. "The bank lending channel: lessons from the crisis", *Working Paper Series*, No 1335, ECB, Frankfurt am Main, 2011.

Chart 3 Market-based funding of MFI loans to the private sector

(annual flows in EUR billion; not adjusted for seasonal and calendar effects)



Source: ECB.

Note: Securitised loans remaining on balance sheet are proxied by deposits with agreed maturity of over one year held by the sector of non-monetary financial intermediaries excluding insurance corporations and pension funds.

Chart 3 shows the annual flow of loans originated by MFIs to the euro area private sector, as well as different measures of market-based funding. Loan sales and securitisation activities are inherently linked to the lending business. From 1999 loan sales and securitisation played a growing role in the funding of credit growth until the financial crisis resulted in a closure of the market. Credit institutions have continued to securitise assets in order to create collateral for use in Eurosystem refinancing operations, leading to “retained securitisation”. In addition, loan sales to “bad bank” schemes have been a second element since 2010.²¹ Chart 3 identifies the share of loans derecognised from the MFI balance sheet through sale or securitisation, as well as the securitised loans that, owing to the accounting treatment, remain on balance sheet, but effectively have been funded through security issuance by financial vehicle corporations. Finally, the chart shows the volume of debt security issuance with a maturity of more than one year. The issuance is likely to have contributed to the funding of the entire

balance sheet, not only loans. Market-based funding played a supportive role in the period of strong credit growth, providing incremental funding to banks in a flexible manner. However, Chart 3 also shows that a large share of euro area loan growth has been funded from other sources such as deposits. Thus, a large part of the loan growth in the euro area is still based on the traditional “originate-and-hold” model of banking, underlining the importance of the money and credit nexus for gauging the effect of banking on the macroeconomy.

3.2 INTERNATIONALISATION OF INTERBANK FUNDING

The internationalisation of interbank funding during the past decade has had a profound impact on banks’ management of their liabilities. From a monetary analysis perspective, this development needs to be factored in, as the access to deep and liquid international markets is likely to alleviate the funding risks faced by the banks. It should therefore facilitate the provision of money and credit to the economy.²² Understanding the funding models of banks and the interlinkages both within and across banks operating internationally is important in order to assess the impact of global liquidity conditions for euro area money and credit growth. In this respect, monetary analysis may be instrumental in understanding these effects.

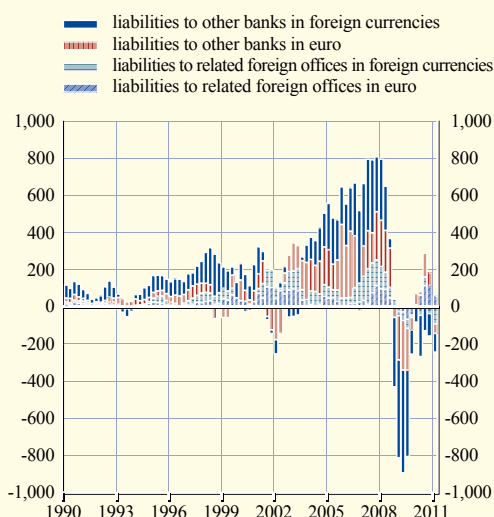
Chart 4 illustrates the expansion of cross-border interbank funding by banks headquartered in a euro area country along two dimensions: distinguishing the funds obtained from affiliates located outside the home country and the denomination of the liabilities. The chart shows that cross-border borrowing by banks increased only gradually until 2001, with the predominant share denominated in foreign currencies. Throughout this period foreign offices belonging to the same banking group played a marginal

21 See the box entitled “Revisiting the impact of asset transfers to ‘bad banks’ on MFI credit to the euro area private sector”, *Monthly Bulletin*, ECB, Frankfurt am Main, January 2011.

22 See the article entitled “The external dimension of monetary analysis”, *Monthly Bulletin*, ECB, Frankfurt am Main, August 2008.

Chart 4 Cross-border interbank funding of euro area banks

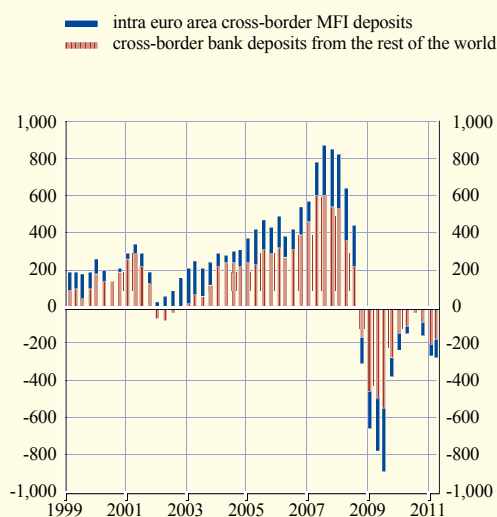
(annual flows in EUR billion)



Source: BIS.
Note: BIS banking data by nationality are available for banks headquartered in Belgium, Germany, Ireland, Spain, France, Italy, Luxembourg, the Netherlands and Austria.

Chart 5 Deposits of euro area MFIs received from other MFIs and banks resident in the rest of the world

(annual flows in EUR billion; not adjusted for seasonal and calendar effects)



Source: ECB.

role in attracting funds. Starting in 2003 cross-border deposit-taking increased substantially in an environment of growing global liquidity. This was accompanied by a more significant role for these foreign offices, as well as by a larger share of euro-denominated deposits.

Both of these developments changed the options open to banks in their funding decisions. The growing international outreach of euro area banks contributed to the development of internal capital markets to move liquid funds between domestic and foreign offices on the basis of the relative needs. The availability of such markets to large banks, on the one hand, insulates the lending activity from local funding conditions and, on the other hand, transmits local liquidity shocks to other parts of the bank. In addition, euro area financial integration increased the availability of deposits denominated in euro from outside the home country. Euro area banks facing strong credit demand were thus able to fund their balance sheet expansion in euro, without having to manage exchange rate risks.

Chart 4 and Chart 5 also show the increased role of international funding, illustrated by the large share of cross-border deposits funded from foreign non-related entities. These deposits that were collected from banks in the rest of the world were mainly denominated in foreign currencies. In part, these funds were then reinvested in foreign assets, but overall euro area banks enjoyed deposit inflows between 2004 and 2008. This period of strong internationalisation of bank funding coincided with strong money and credit growth in the euro area. With the collapse of Lehman Brothers, euro area banks suffered significant outflows of cross-border interbank deposits, mainly as non-affiliated depositors withdrew.

The internationalisation of bank funding affected the supply of money in the euro area, over and beyond the amount of net interbank funding received, predominantly by facilitating the intermediation process. Indeed, in the period up to 2008, access to deep and liquid cross-border financial markets reduced banks' funding risks

and thereby eased the strains on banks' liquidity management, such as quantitative constraints in refinancing strong domestic credit growth. Subsequently, with the outbreak of the financial crisis, the withdrawal of cross-border funding is likely to have contributed to the transmission of global funding pressures to the euro area and to a perception of reduced liquidity.

3.3 MONETARY SERVICES OF EURO AREA MONETARY INSTRUMENTS

From a monetary analysis perspective, the core deposits provided by euro area households and non-financial corporations are of particular importance as they account for a third of banks' main liabilities in the aggregate balance sheet. The bulk of these deposits can be withdrawn at relatively short notice. However, in practice, these deposits are held on a fairly continuous basis, thus providing a reliable source of funding to the banks. In exchange, depositors receive compensation for holding these instruments in the form of interest rate remuneration and monetary services. The monetary services compensate the depositors for the interest they forego by holding liquid deposits rather than higher yielding but less liquid assets.

During the period of strong credit growth between 2004 and 2008, a strong increase in M3 deposits was observed, driven mainly by short-term deposits with agreed maturity. At the same time, overnight deposits contributed positively to the expansion of bank liabilities, despite the fact that the opportunity cost of holding these deposits increased considerably during this period. This implies that the monetary services consumed by the holders of deposits increased during this period as shown in Chart 6, which presents a proxy measure of the monetary services relative to real GDP obtained by the euro area money-holding sector from holding liquid monetary instruments.²³ The strong increase in this measure of monetary services between 2005 and 2009 suggests that, during this period, economic agents attached a high

Chart 6 Monetary services relative to real GDP



Source: ECB estimates.

Notes: Liquidity services are computed as a weighted average of the difference between the remuneration on each monetary instrument and the yield on a benchmark asset deemed to provide no liquidity services. The weights are relative shares of monetary instruments in M3.

value to these services. It is not clear whether this reflects a stronger preference for these services or whether improvements to the deposit instrument contributed to this higher valuation. Admittedly, this proxy assumes that the interest rate differential only captures the monetary services and is not tainted by other factors, such as imperfect competition in the banking sector.

The availability of a large deposit base implies that banks were able to fund their lending at attractive rates. At the same time, it may have contributed to insulating the pass-through of market rates to bank lending rates (see Box 3 on “Banks’ intermediation margin and funding conditions”) during the period of strong credit growth until the start of the financial tensions, thereby contributing to the stronger supply of money to the economy.

²³ Liquidity services are computed as a weighted average of the difference between the remuneration on each monetary instrument and the yield on a benchmark asset deemed to provide no liquidity services. The weights are relative shares of monetary instruments in M3. For details, see Papademos, L. and Stark, J. (eds.), *Enhancing Monetary Analysis*, Chapter 3, Annex 4, ECB, Frankfurt am Main, 2010.

Box 3

BANKS' INTERMEDIATION MARGIN AND FUNDING CONDITIONS

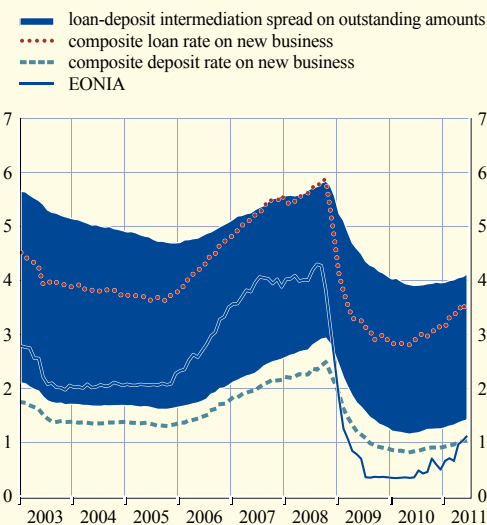
The structure and conditions of banks' funding sources are major determinants of the financial intermediation spread, which in turn constitutes a substantial part of banks' profits. In the euro area, core deposits by households and non-financial corporations are a primary source of banks' stable funding. Therefore, the developments in deposit markets and their impact on retail loan and deposit interest rate margins are key elements for monitoring and analysing euro area banks' overall financial intermediation margin. This box provides a brief overview of developments in euro area banks' loan and deposit margins in view of changes in the banking sector's funding situation.

More generally, banks' interest rate-setting behaviour, as captured by the spread between interest rates on deposits and loans, can be expected to depend on the degree of competition (or bank market power) and on factors related to the cost of intermediation, such as interest rate risk, credit risk, the banks' degree of risk aversion, unit operating costs, banks' capital and liquidity positions and their product diversification.¹ Nonetheless, the most direct determinants of retail bank lending and deposit rates for households and firms are policy (and hence market) interest rates (see Chart A). This reflects the typical empirical finding that deposit rates tend to react rather sluggishly to changes in market rates and hence that the difference between market rates and deposit rates generally moves in parallel with the short-term interest rate. Notably in the period before the collapse of Lehman Brothers, the short-term money market rates were safely above the composite deposit rate, a configuration that was reversed during the financial crisis

1 For a more thorough description of the bank interest rate pass-through, see the article entitled "Recent developments in the retail bank interest rate pass-through in the euro area", *Monthly Bulletin*, ECB, Frankfurt am Main, August 2009.

Chart A Loan-deposit spread and EONIA

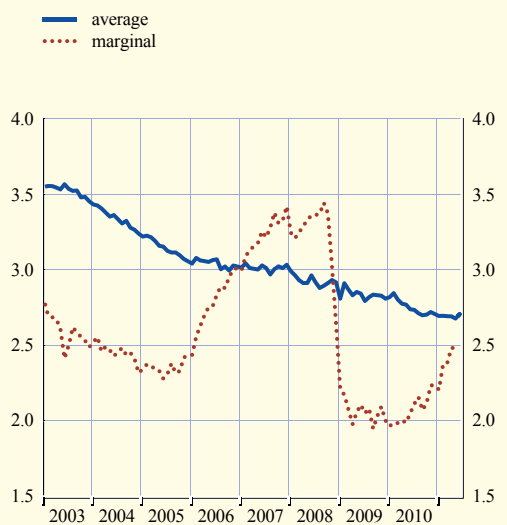
(percentages per annum; percentage points)



Sources: ECB and ECB calculations.

Chart B Loan-deposit intermediation spread: average and marginal

(percentage points)



Sources: ECB and ECB calculations.

until recently. Bank rates have declined less than money market rates. Monetary conditions in general, and availability of funding from customers more specifically, are likely to affect the pricing of bank retail interest rates.

Chart A illustrates the two measures of the loan-deposit spread, a marginal intermediation spread as the difference between composite rates on new business and an average intermediation spread based on outstanding amounts. The first measure can be considered a proxy for the conditions offered to bank customers, while the second measure is related to banks' overall net interest income and profitability. The fact that the marginal intermediation spread is generally below the average intermediation spread suggests that the cost of intermediation through banks is declining over time. This is reflected in Chart B, which shows a slow decline in the average intermediation spread since 2003, in part resulting from the lower marginal spreads feeding into the average intermediation spreads as business is gradually rolled over. Indeed, the composite lending rate on new business seems to have declined more than the composite deposit rate, thereby driving the compression of the average intermediation spread.

4 CONCLUSIONS

This article has argued that the behaviour of banks has considerable implications for the macroeconomy. The examination of money and credit developments for the purposes of monetary analysis provides information on the functioning of banks' intermediation activity. It helps the timely identification of the propagation of changes in bank behaviour through the business cycle onto longer-term economic trends. In this respect, innovations in technology and operational management are likely to be of a lasting nature. However, the changes to banks' behaviour that result may evolve over time, which makes it difficult to assess the relative importance of the short-term versus the more persistent effects on the economy. In addition, agents' expectations with regard to the changes in banks' intermediation activities, which evolve over time, are essential in this respect as well. Nonetheless, banks intermediation behaviour, as well as its perception by households and firms, needs to be taken into account in formulating monetary policy.

The examples described in the article illustrate how the changes in bank funding behaviour contributed to the period of strong credit growth between 2004 and 2008. The financial crisis and the regulatory response to it are likely to trigger further changes in banking, as is already

evident in the new international regulatory framework for banks (Basel III). For instance, the implementation of the Liquidity Coverage Ratio and the Net Stable Funding Ratio is likely to induce adjustments in how maturity transformation is conducted and priced. In the future, the real-time identification of the effects of these developments on the supply of money will be an important contribution of the monetary analysis to the assessment of the appropriate monetary policy stance.