ARTICLES

ASSESSING THE RETAIL BANK INTEREST RATE PASS-THROUGH IN THE EURO AREA AT TIMES OF FINANCIAL FRAGMENTATION

Despite an accommodative monetary policy stance, bank lending conditions have remained heterogeneous in an environment of persistent sovereign debt tensions, fragile economic activity, weak capital positions and high levels of uncertainty. Consequently, very low policy interest rates have not been passed through to bank lending rates to the same extent as observed in the past in several countries where the effects of such an accommodative monetary policy stance would be particularly welcome.

Furthermore, standard pass-through models (i.e. models where policy interest rates and market interest rates are considered the most important determinants of retail bank lending rates) are ill-equipped to explain the increasing levels of heterogeneity in bank lending rates during the crisis because they do not include risk factors and sovereign debt spreads among the explanatory variables. Against this background, this article provides new empirical evidence on the interest rate pass-through in the four largest euro area economies based on newly developed pass-through models that account for the impact of sovereign tensions and risk factors affecting interest rate-setting behaviour. This evidence is based on harmonised MFI interest rate statistics from 2003. Simulations based on these models confirm that risk factors and sovereign debt spreads have had a strong impact on bank lending rates in Italy and Spain in recent years.

As a response to increasing fragmentation, the ECB has introduced several standard and non-standard measures. These measures have gone a long way towards alleviating financial tensions in the euro area. However, in order to ensure the adequate transmission of monetary policy to financing conditions in euro area countries, it is essential that the fragmentation of euro area credit markets is reduced further and the resilience of banks strengthened where needed.[1]

1 INTRODUCTION

The financial and sovereign debt crisis affected all segments of the financial system and had a particularly strong impact on the banking sector. A well-functioning banking sector is needed in order to guarantee the effectiveness of the monetary policy transmission mechanism, especially in the euro area, where banks play a predominant role in providing external finance for the non-financial private sector.

Bank lending conditions have remained heterogeneous in an environment of persistent sovereign debt tensions, fragile economic activity, vulnerable banks and high levels of uncertainty in some countries. Consequently, very low policy interest rates have not been passed through to bank lending rates in several countries where the effects of such an accommodative monetary policy stance would be particularly welcome. The ECB has responded forcefully to the monetary policy implications of fragmentation by introducing several standard and non-standard measures. These measures have gone a long way towards alleviating financial tensions, but fragmentation in the euro area banking sector and stress in sovereign debt markets remain elevated.

Against this background, the article analyses the bank lending rate pass-through in the euro area in a context of high financial fragmentation. The article is organised as follows. Section 2 presents detailed MFI interest rate statistics to describe developments in interest rates on loans to non-financial corporations, including small and medium-sized enterprises (SMEs), and households in

1 The article is based on information available up to 19 June 2013.

the euro area. Section 3 discusses the potential determinants of bank lending rates and the impact of financial market tensions on fragmentation in bank lending rates across countries in the euro area. The main contribution of the section is to provide new empirical evidence on the interest rate pass-through in the four largest euro area economies. Finally, Section 4 concludes.

2 CROSS-COUNTRY HETEROGENEITY IN BANK LENDING RATES IN THE EURO AREA

In order to assess the effectiveness of the monetary policy pass-through across the euro area countries, it is necessary to use an accurate and comparable measure of the borrowing costs for firms and households in those countries. This section explains how detailed MFI interest rate statistics are used to compute an indicator of the cost of borrowing for non-financial corporations that takes into account the financial structure of firms. This new measure enhances cross-country comparability, which until now has been limited owing to the differing impact of overdrafts on short-term lending rates. The indicator is then used to describe developments in interest rates on loans to non-financial corporations in the four largest euro area economies. The section also describes developments in the cost of borrowing for households for house purchase and in the cost of funds for SMEs.

DEVELOPING AN INDICATOR OF THE COST OF BORROWING FOR EURO AREA NON-FINANCIAL CORPORATIONS

To accurately assess borrowing costs for non-financial corporations, it is important to consider the overall financing structure of firms. In this respect, MFI interest rate statistics on short-term loans to non-financial corporations, which capture bank lending rates on loans with a rate fixation period of up to one year, only offer a partial view of firms' financing costs in some countries. This is because those statistics do not include interest rates on overdrafts, which are a major source of finance for firms in some large euro area economies (e.g. Italy). Consequently, when interest rates on overdrafts (which are generally higher than other short-term bank lending rates) are taken into account, the estimated borrowing costs are higher. An indicator of the cost of borrowing for non-financial corporations in the euro area that includes data on overdrafts is presented in Box 1. The indicator is a weighted average of bank lending rates on loans with a rate fixation period of up to one year and rates on overdrafts, using outstanding amounts as a weighting scheme.

Box 1

DEVELOPING COST-OF-BORROWING INDICATORS FOR THE EURO AREA

The financial crisis has led to an increasing use of country-specific bank lending rate information in the regular assessment of euro area economic conditions and in the analysis of the bank lending rate channel of the monetary policy transmission mechanism. However, current practices in the use, forecasting and reporting of lending rates vary substantially across countries, compromising the accurate assessment of cost-of-borrowing developments in the euro area. For example, the ECB's official publications usually report MFI interest rates applied to new business volumes. Sometimes MFI interest rates are re-weighted using outstanding amounts to compute composite lending rates for countries and for the euro area as a whole.[1] This box details the calculation

1 See, for example, "*Differences in MFI interest rates across euro area countries*", ECB, September 2006, and "The use of harmonised MFI interest rate statistics", *Monthly Bulletin*, ECB, Frankfurt am Main, July 2005.

of cost-of-borrowing indicators based on a common methodology for aggregating lending rates across countries.

A new indicator of the cost of borrowing in the euro area

The construction of the new cost-of-borrowing indicators is based on MFI interest rate statistics, which are considered the most relevant source of information for bank lending rates in the euro area.[2] Four basic categories of lending rates per country are used in the calculations: short-term and long-term lending rates both to non-financial corporations and to households for house purchase. Long-term lending rates to non-financial corporations and short and long-term rates on loans to households for house purchase are obtained directly from the MFI interest rate statistics. The compilation of short-term lending rates to non-financial corporations, by contrast, needs to account for two additional technical factors: the importance of overdrafts as a main source of financing for firms in some large euro area economies (e.g. Italy) and the computation of an estimate of the share of long-term loans issued at floating rates,[3] which are akin to short-term loans. In particular, interest rates on short-term loans to non-financial corporations are aggregated on the basis of interest rates on overdrafts and bank lending rates on loans with a rate fixation period of less than one year, as follows:

$$CLI_{ST}^{NFC} = BLR_{overdraft}^{NFC} \frac{Overdrafts^{NFC}}{Totloans_{ST}^{NFC}} + BLR_{ST}^{NFC} \left[\frac{(Outloans_{ST}^{NFC} - Overdrafts^{NFC}) + \alpha(Outloans_{LT}^{NFC})}{Totloans_{ST}^{NFC}} \right]$$

Where:

- CLI_{ST}^{NFC} is the short-term lending rate to non-financial corporations, which accounts for overdrafts;
- $BLR_{overdraft}^{NFC}$ is the bank lending rate on overdrafts to non-financial corporations;
- BLR_{ST}^{NFC} is the bank lending rate on loans to non-financial corporations with an interest rate fixation period of up to one year;
- $Overdrafts^{NFC}$ is the volume of overdrafts held by non-financial corporations;
- $Outloans_{ST}^{NFC}$ is the volume of outstanding short-term loans to non-financial corporations (of up to one year), including overdrafts;
- $Outloans_{LT}^{NFC}$ is the volume of outstanding long-term loans to non-financial corporations (of more than one year);
- $\alpha = \left(\frac{1}{12}\right) \sum_{i=0}^{11} \left(\frac{Outloans_{LT,flrate}^{NFC}}{Outloans_{LT}^{NFC}} \right)_{t-i}$, where $Outloans_{LT,florate}^{NFC}$ is the volume of outstanding long-term loans issued at floating rates;[4]

2 MFI interest rates are regularly aggregated on the basis of monthly new business volumes and start in 2003.
3 Data on overdrafts refer to outstanding amounts from the MFI balance sheet database.
4 Data on the volume of outstanding long-term loans at floating rates has only been available since June 2010 on a quarterly basis. Hence, the volume is assumed to remain constant in each month within the quarter. Moreover, when data are not available at the end (owing to publication lags) and at the beginning of the sample (between January 2003 and May 2010), the latest and the first observed value are applied respectively.

• $Totloans_{ST}^{NFC}$ is the total outstanding amount of short-term loans to non-financial corporations ($Totloans_{ST}^{NFC} = Outloans_{ST}^{NFC} + \alpha(Outloans_{LT}^{NFC})$).

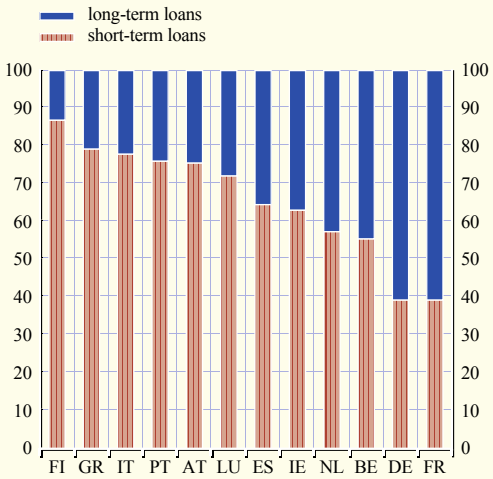
Weighting scheme and compilation of composite indicators

Two weighting schemes can be used to aggregate composite lending rates at the national and the euro area level: one based on volumes of outstanding amounts and the other based on a smoothed measure of new business volumes. Weights based on outstanding amounts capture the financing structure of the economy more accurately. However, methodological differences affect the comparability of the two databases (MFI balance sheet data are based on maturity while MFI interest rate data are based on interest rate fixation periods). Hence, aggregating MFI interest rates on the basis of outstanding amounts only provides an estimate of the cost of borrowing for non-financial corporations (see Chart A). At the same time, while an aggregation based on new business volumes provides a better measure of the impact of the marginal cost of a new loan on the overall financing cost structure, it introduces a bias towards short-term maturity lending (see Chart B) and may be highly volatile on a monthly basis. In turn, this volatility makes it difficult to extract the genuine underlying dynamics in retail lending rates. In order to filter out excessive monthly volatility, a weighting scheme based on the 24-month moving averages of new business volumes has been applied.

At the country level, four composite lending rates by maturity and sector were constructed: total short-term and long-term lending rates, and total lending rates to non-financial corporations and households for house purchase. As an example, Chart C shows the comparison between the cost-of-borrowing indicator for total loans to non-financial corporations based on the smoothed new business volume weights and the corresponding indicator aggregated with outstanding amounts.

Chart A Share of short-term MFI loans to NFCs over total MFI loans to NFCs based on outstanding amounts

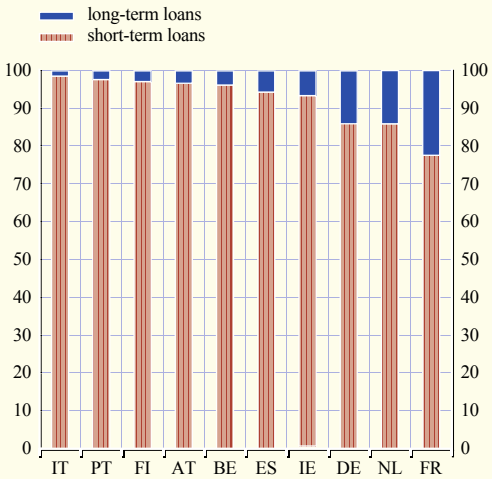
(percentages; April 2013)



Source: ECB.
Notes: Short-term loans are those with a maturity of up to one year, plus overdrafts and those long-term loans issued at a floating rate. NFCs stands for non-financial corporations.

Chart B Share of short-term MFI loans to NFCs over total MFI loans to NFCs based on new business volumes

(percentages; April 2013)



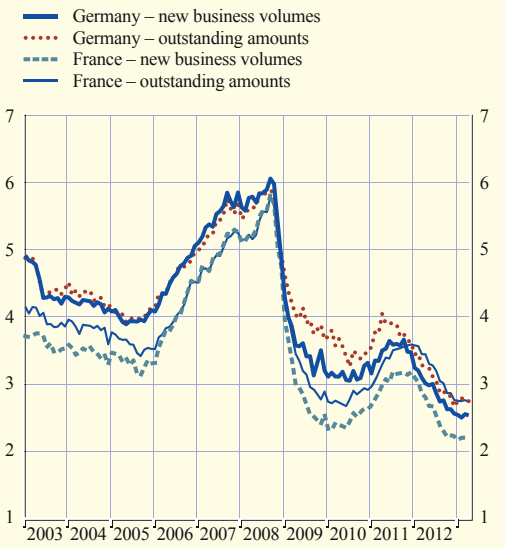
Source: ECB.
Notes: Short-term loans are those with a maturity of up to one year, plus overdrafts and those long-term loans issued at a floating rate. NFCs stands for non-financial corporations.

The latter tends to be more sensitive to variations in long-term interest rates than the former, as the share of long-term loans based on outstanding amounts is higher than that based on new business volumes (see Charts A and B). This greater sensitivity is evident in the periods where lending rates aggregated on the basis of outstanding amounts are higher than those aggregated on the basis of new business volumes.

At the euro area level, eight composite lending rates by maturity and sector were constructed: short-term and long-term lending rates to non-financial corporations and to households for house purchase, total short-term and long-term lending rates, and total lending rates to non-financial corporations and households for house purchase. These composite lending rates also make it possible to compute a total-cost-of-borrowing indicator for the euro area.

Chart C Comparison between cost-of-borrowing indicator for total loans to NFCs aggregated with new business volumes versus outstanding amounts

(percentages per annum)



Source: ECB.

The ECB started the regular compilation of the new harmonised indicators in December 2012 and expects to make them available to external users via the Statistical Data Warehouse by the end of 2013.

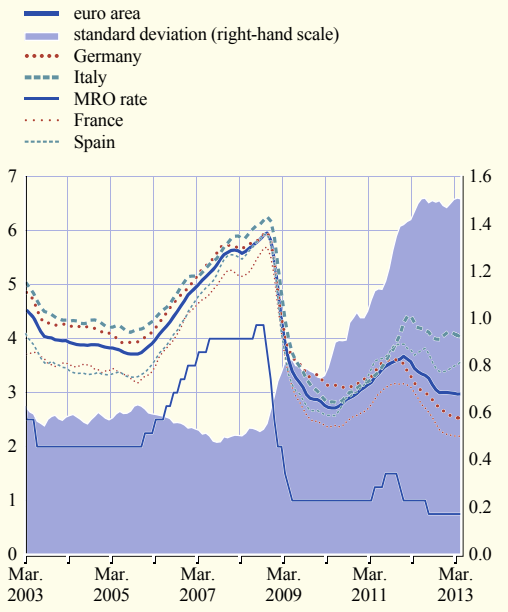
CHANGES IN BANK LENDING RATES TO NON-FINANCIAL CORPORATIONS AND HOUSEHOLDS

Charts 1 and 2 show composite indicators, i.e. weighted averages of short and long-term lending rates, of the cost of borrowing for non-financial corporations and households in the euro area respectively. The charts show that the cost of bank borrowing for non-financial corporations and households has exhibited different dynamics over time since the start of the financial crisis and particularly since the intensification of sovereign debt concerns. In the early stages of the financial crisis in late 2008 and in 2009, bank lending rates to non-financial corporations broadly tracked the ECB's main refinancing rate in the four largest euro area economies (see Chart 1). Thereafter, following the intensification of sovereign debt tensions in 2010 and in response to the increase in policy interest rates in early 2011, bank interest rates on loans to non-financial corporations started to rise more rapidly in Spain and Italy than in France and Germany. While the cuts made to policy interest rates since late 2011 have translated broadly into lower interest rates on loans to non-financial corporations in France and Germany, the pass-through has been much more sluggish in the case of Spain and Italy, where interest rates remain at a higher level than that recorded in the other two large euro area economies.

In the case of loans to households for house purchase, bank lending rates in Spain and Italy reacted particularly strongly to the cuts in policy interest rates made in late 2008 and in 2009 (see Chart 2). This reflects the higher share of mortgage loans with a short-term interest rate fixation period in these two countries than in other large economies in the euro area. After the start of the sovereign debt crisis in early 2010, however, interest rates in these two countries increased more sharply than

Chart 1 Composite indicator of the cost of borrowing for non-financial corporations

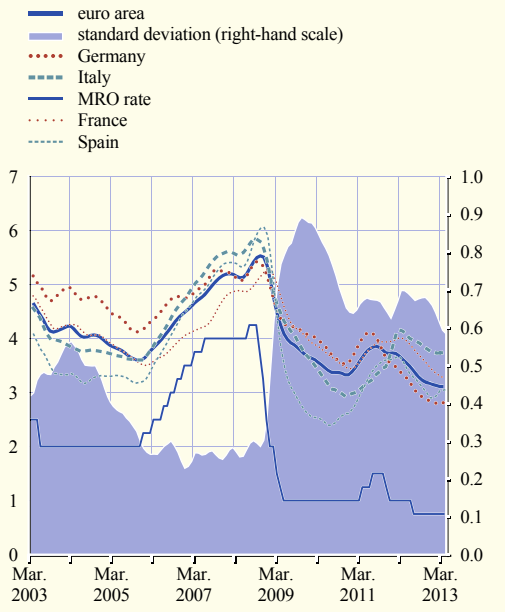
(percentages per annum; three-month moving averages; March 2003 to April 2013)



Source: ECB.
Notes: See Box 1 for a detailed description of the construction of the indicator. The standard deviation is computed for a fixed composition of 12 euro area countries.

Chart 2 Composite indicator of the cost of borrowing for households for house purchase

(percentages per annum; three-month moving averages; March 2003 to April 2013)



Source: ECB.
Notes: See Box 1 for a detailed description of the construction of the indicator. The standard deviation is computed for a fixed composition of 12 euro area countries.

in Germany and France. Following the policy rate cuts implemented since late 2011, mortgage interest rates have contracted across countries, as expected. Nevertheless, mortgage rates in Italy and Spain remain above the levels observed in 2010 in spite of monetary policy rates having reached record low levels.

The heterogeneous developments in the composite indicator of the cost of borrowing for non-financial corporations and households are reflected in measures of dispersion of lending rates across countries (see Charts 1 and 2). In particular, the dispersion of composite lending rates to non-financial corporations and households increased significantly in the early stages of the crisis in late 2008 and in 2009. In the case of non-financial corporations, dispersion stabilised somewhat in 2010, only to start rising again in 2011. More recently, indicators of dispersion for non-financial corporations have pointed to a stabilisation in the course of 2012 and early 2013. In the case of the composite lending rate to households, dispersion has declined substantially from the peak reached in 2009 and 2010, but remains elevated.

HETEROGENEITIES IN BANK LENDING RATES FOR SMALL AND MEDIUM-SIZED ENTERPRISES

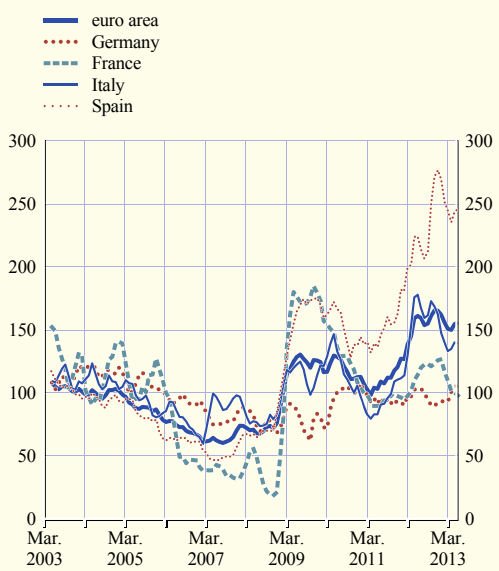
The spread between lending rates on small and large loans to non-financial corporations has also been heterogeneous across countries since the start of the financial crisis. On the basis of the assumption that loans to SMEs are generally smaller than loans to large corporations, a breakdown of lending rates into those applied to small loans and those applied to large loans permits a more detailed

analysis of the borrowing costs of SMEs.[2] A long data series on MFI interest rates distinguishing between lending rates on loans of up to €1 million and those on loans of over €1 million is available in the ECB's Statistical Data Warehouse.[3] Chart 3 shows that the spread between lending rates on these two types of loan is positive for all the countries considered.[4] It also shows that during the crisis, in late 2008 and in 2009, bank financing conditions for SMEs deteriorated sharply in the four largest euro area countries, but particularly in Spain and France. The situation improved across countries during 2010, but has deteriorated again since 2011. The spread reached record high levels in 2012 in Spain and Italy, although it has declined somewhat since the autumn of that year.

The €1 million ceiling used to define small loans may be too high as a proxy for lending to SMEs. Consequently, since June 2010 the ECB has collected more refined data on bank interest rates applied to small loans. The category of loans of up to €1 million is broken down into two sub-categories: loans of up to €0.25 million and loans of over €0.25 million and up to €1 million. This additional breakdown affords a more precise measure of the borrowing costs of SMEs (see Box 2 for a description of improvements in the collection of MFI interest rates over time). As in the case of

Chart 3 Spread between lending rates on small and large loans

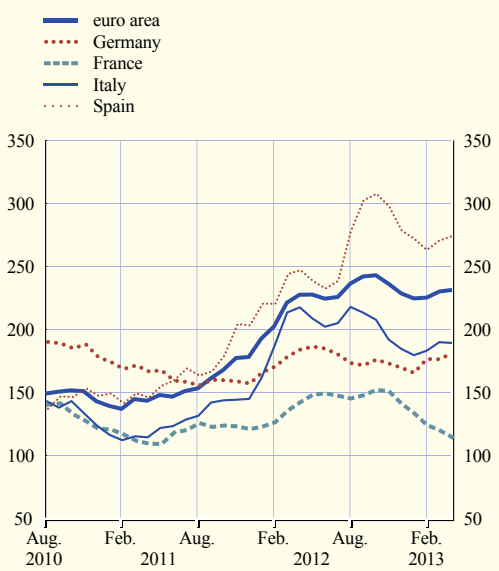
(basis points; three-month moving averages; March 2003 to April 2013)



Source: ECB.
Note: Small loans are loans of up to €1 million, while large loans are loans of above €1 million.

Chart 4 Spread between lending rates on very small and large loans

(basis points; three-month moving averages; August 2010 to April 2013)



Source: ECB.
Note: Very small loans are loans of up to €0.25 million, while large loans are loans of above €1 million.

2 The size of a loan may also be related, to some extent, to its purpose (e.g. inventory financing, working capital, long-term investment) and duration.
3 These data can be downloaded from the Statistical Data Warehouse at http://sdw.ecb.europa.eu/browse.do?node=9484266
4 It is more difficult and more expensive for SMEs and young firms to access external finance owing to their higher transaction costs, weaker bargaining power, higher business risk and low ratio of collateral to liabilities. See Berger, A. N. and Udell, G. F., "Small Business and Debt Finance", *Handbook of Entrepreneurship Research*, Kluwer Academic Publishers, 2005, pp. 299-328; Rauh, J.D., "Investment and Financing Constraints: Evidence from the Funding of Corporate Pension Plans", *Journal of Finance*, Vol. 61, 2006, pp. 33-71; and Fee, C. E., Hadlock, C.J. and Pierce, J.R., "Investment, Financing Constraints, and Internal Capital Markets: Evidence from the Advertising Expenditures of Multinational Firms", *Review of Financial Studies*, Vol. 22, 2009, pp. 2362-92.

the spread between lending rates on loans of up to €1 million and those on loans of over €1 million, the spread between interest rates on very small loans and those on large loans shown in Chart 4 has increased since the summer of 2011, particularly in the case of Spain and Italy. In Germany and France, the spread has also increased since the beginning of 2012, although to a much lesser extent. The spread between bank lending rates for very small loans and those for large loans currently stands above its long-term average.

Box 2

IMPROVEMENTS IN THE COLLECTION OF MFI INTEREST RATE STATISTICS

Monetary and financial statistics must be accurate, timely and reliable in order to enable the effective implementation of monetary policy. Financial innovation calls for a continuous effort to improve the statistical framework of the Eurosystem. In this context, harmonised MFI interest rate statistics have been produced since January 2003 and were further improved in June 2010.[1] This box describes developments in the collection of MFI interest rate statistics since their introduction in 2003.

The use of interest rate statistics in monetary policy analysis

Monitoring developments in interest rates across countries is of pivotal importance for monetary policy decision-making. First, these developments are key for analysing the mechanism through which monetary policy is transmitted to the real economy, given the predominant role of the banking sector in providing financing to the non-financial private sector.[2] Second, they provide information on the degree of integration in the euro area retail banking market.[3] Third, they help to monitor structural developments in the banking system by providing insights into how banks set their margins and how the latter react to external developments, and, fourth, they complement the monetary aggregate statistics by providing information on prices (interest rates).

The introduction of MIR statistics in 2003

In January 2003 the Eurosystem started compiling harmonised statistics on euro-denominated lending and deposits of domestic credit institutions (the largest component of MFIs) vis-à-vis households and non-financial corporations resident in the euro area. Retail interest rate statistics collected previously were not harmonised, which hampered comparison across countries. The new framework introduced in 2003 addressed these drawbacks and therefore represented an important step towards better describing the retail banking system across euro area countries.

1 Regulation ECB/2008/32.
2 See, for instance, Section 4 of the article entitled "Assessing the financing conditions for the euro area private sector during the sovereign debt crisis", *Monthly Bulletin*, ECB, Frankfurt am Main, August 2012.
3 See, for instance, the box entitled "Cross-country heterogeneity in MFI interest rates on loans to non-financial corporations in the euro area", *Monthly Bulletin*, ECB, Frankfurt am Main, November 2012.

The enhancements introduced in 2010

In the light of a changing macroeconomic environment, and as part of the efforts to further improve the quality, reliability and accuracy of interest rate statistics, a number of enhancements were introduced in June 2010.[4] These were:

1. A more detailed breakdown of bank interest rates applied to small loans to non-financial corporations. The threshold of the category of small loans (defined as up to and including €1 million) was considered too high to identify loans granted to SMEs. Therefore two sub-categories have been introduced which capture loans of up to €0.25 million and loans of over €0.25 million and up to €1 million.

2. Separate information on interest rates on guaranteed and collateralised loans. These statistics are of interest when studying the dynamics behind banks' behaviour in setting interest rates.

3. Information on the original maturity of new loans. The new statistics distinguish business volumes within the category of new loans to non-financial corporations with an initial rate fixation period of up to one year and with an original maturity of up to one year from those with an original maturity of over one year.

4. Identification of interest rates on loans to sole proprietors within the household sector. The new statistics bring clarity into the household sector by identifying and separating these micro-firms, which are often run by one person only.

5. A harmonised method of compiling rates on overdrafts and revolving loans, separately from credit card debt.

4 For a more detailed description of all the changes introduced in 2010, see the article entitled "Keeping the ECB's monetary and financial statistics fit for use", *Monthly Bulletin*, ECB, Frankfurt am Main, August 2011.

3 THE RETAIL BANK INTEREST RATE PASS-THROUGH AT TIMES OF FINANCIAL FRAGMENTATION

The previous section showed that heterogeneity in bank lending rates has increased since the financial crisis started in 2008, suggesting that the effectiveness of monetary policy has been hindered by financial fragmentation. A number of factors seem to be at play which explain cross-country divergences in MFI lending rates. Structural factors affecting lending rates include the fact that financial market structures differ across countries. Lending rates tend to be lower in economies where bank competition is stronger and alternative, market-based sources of finance are available through more developed financial sectors. The observed heterogeneity in MFI lending rates may also reflect product heterogeneity, which may be difficult to classify in homogeneous categories in MFI interest rate statistics. Moreover, it may also reflect country-specific institutional factors, such as fiscal and regulatory frameworks, enforcement procedures and collateral practices. Other factors affecting divergence in lending rates might reflect the amplifying effects of increasing credit risk and bank risk aversion in an environment of weak economic growth, potential capital constraints on the part of banks and the impact of bank funding fragmentation. The following sections will focus on those factors which may have a bearing on bank lending rates over and above the traditional pass-through of policy interest rates and which can help explain divergences in lending behaviour

during the financial and sovereign debt crisis. Structural differences in bank lending rate-setting behaviour have been extensively analysed in previous ECB publications.[5]

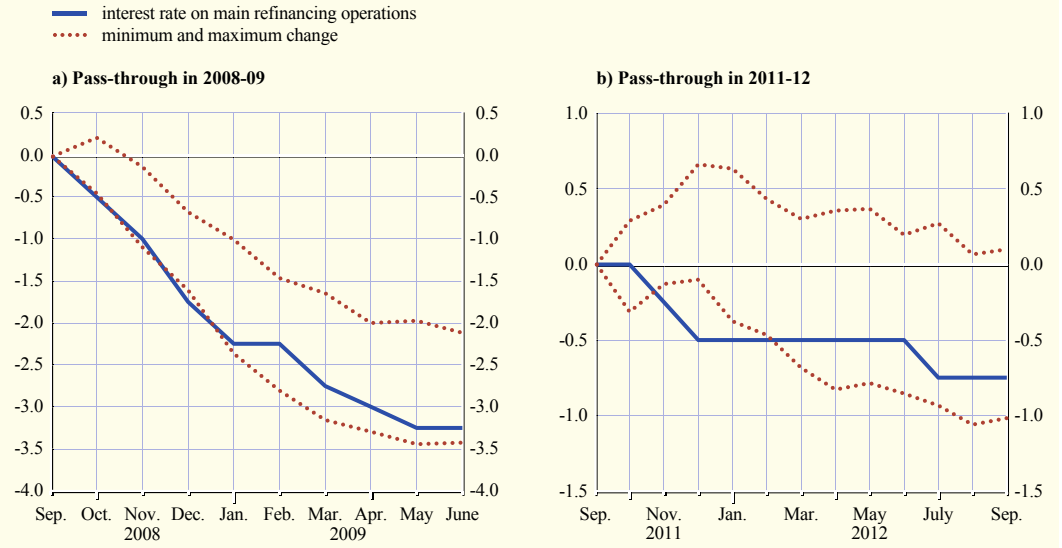
THE BREAKDOWN OF STANDARD PASS-THROUGH RELATIONSHIPS

Standard pass-through models consider policy interest rates and market interest rates to be the most direct determinants of retail bank lending rates. Such models are ill-equipped, however, to explain the increasing levels of heterogeneity in bank lending rates which have been observed during the crisis.[6] Chart 5 (left-hand panel) shows that the composite indicator of the cost of borrowing for non-financial corporations responded rapidly and relatively homogeneously across countries to the 325 basis point cut in key ECB interest rates implemented between October 2008 and May 2009. By contrast, following the 75 basis point cut implemented between November 2011 and July 2012, bank lending rates to non-financial corporations have not responded in the same way across euro area countries. As shown in Chart 5 (right-hand panel), the lower bound of the range of changes in the cost of borrowing for non-financial corporations declined, broadly in line with the change in the policy rate during this period. However, the upper bound of changes increased despite lower key ECB interest rates. This observation points to a weakening in the pass-through of monetary policy in some euro area countries, suggesting that the stance of monetary policy is not being transmitted appropriately across countries.

Model-based evidence tends to confirm that standard pass-through models are ill-equipped to explain increasing levels of heterogeneity in bank lending rates across euro area countries during the crisis.

Chart 5 Cumulated changes in the ECB's interest rate on main refinancing operations and in the composite indicator of the cost of borrowing for non-financial corporations

(changes in percentage points; September 2008 to June 2009) (changes in percentage points; September 2011 to September 2012)



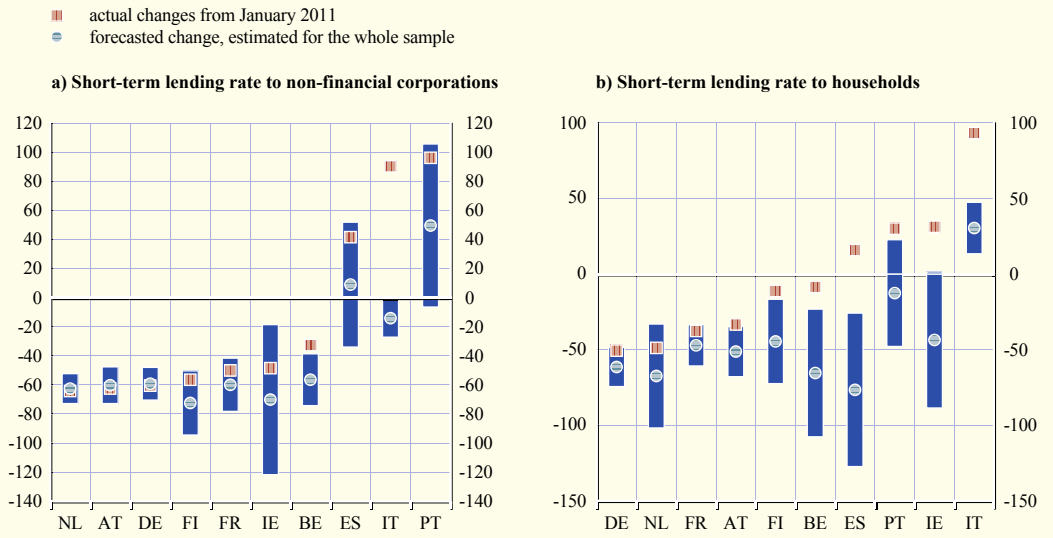
Source: ECB.
Note: See Box 1 for a detailed description of the construction of the indicator.

5 For an analysis of heterogeneities in mortgage interest rates in the euro area, see Kok Sørensen, C. and Lichtenberger, J-D., "Mortgage interest rate dispersion in the euro area", *Working Paper Series*, No 733, ECB, Frankfurt am Main, February 2007. See also "Differences in MFI interest rates across euro area countries", ECB, Frankfurt am Main, September 2006, and "The use of harmonised MFI interest rate statistics", *Monthly Bulletin*, ECB, Frankfurt am Main, July 2005, for a statistical approach to differences in interest rates in the euro area.

6 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 6 Forecasted and actual changes in short-term lending rates between 2011 and 2013

(changes in basis points from January 2011 to April 2013)



Source: ECB.
Notes: The changes were obtained using a simple pass-through model. The bars show the average 95% confidence interval over the forecast period for a model estimated over the full sample. See Box 3 for more details on the models. Countries are ordered from the lowest to the highest actual change in lending rates.

Chart 6 shows actual and projected changes in short-term lending rates for non-financial corporations and households between January 2011 (when the sovereign debt crisis intensified) and April 2013 using standard pass-through models. The estimation sample covers the period from January 2003, when data on harmonised MFI lending rates started to be collected, to April 2013 (see Box 3 for details regarding the econometric models used in the estimations). The chart shows that actual changes in short-term lending rates are systematically higher than those projected by the standard pass-through models, thus highlighting the potential presence of omitted variables in those models.

The next sub-section explores several factors that may help explain this breakdown in traditional pass-through relationships.

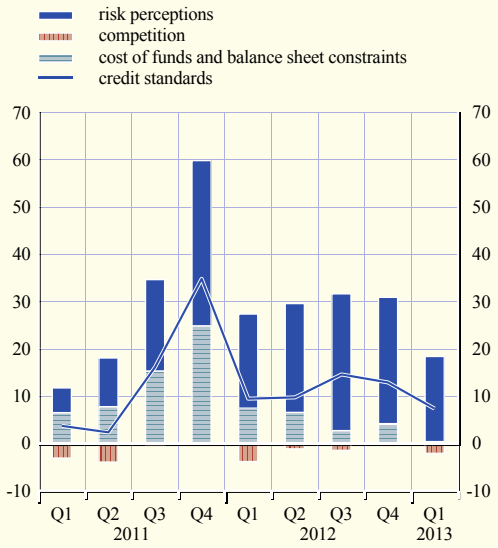
FACTORS AFFECTING THE MONETARY POLICY TRANSMISSION MECHANISM AT TIMES OF FINANCIAL FRAGMENTATION

The analysis of the monetary policy transmission mechanism has typically been based on the assumption that there is a low and stable level of risk, that financial institutions are well capitalised and that there is no fragmentation in bank funding conditions. As such, policy rates and market interest rates were traditionally considered the most direct determinants of retail bank lending rates. For this reason, the literature has focused on how fast and how extensively changes in policy interest rates are passed through to bank lending rates. Other factors such as credit risk, the quality and quantity of bank capital, and access to bank funding were assumed to be less volatile and hence to have less influence on bank lending rates.[7] However, the financial crisis and the euro area sovereign debt crisis have brought to the fore the importance of credit risk and risk perceptions, low levels and poor quality of bank capital and fragmentation in bank funding conditions for bank lending rates and bank lending

7 Although such factors could still explain differences in the pass-through across countries; see Gropp, R., Kok Sørensen, C. and Lichtenberger, J-D, "The dynamics of bank spreads and financial structure", *Working Paper Series*, No 714, ECB, Frankfurt am Main, January 2007.

Chart 7 Factors contributing to a tightening of credit standards for loans to non-financial corporations

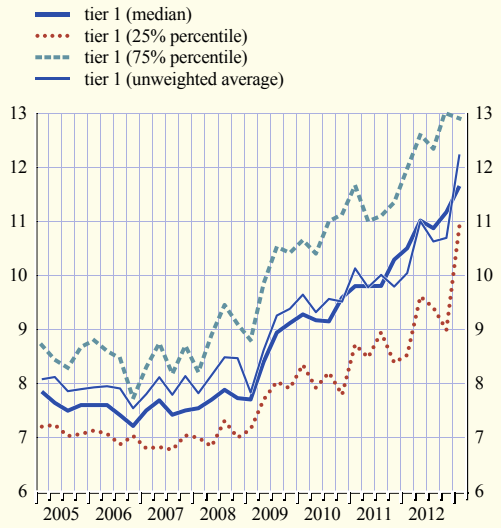
(average net percentages per category)



Source: Eurosystem bank lending survey.
Notes: Cost of funds and balance sheet constraints are calculated as the unweighted average of "capital position", "access to market funding" and "liquidity position"; risk perception as the unweighted average of "expectations regarding general economic activity" and "industry-specific risk"; competition as "bank competition", "non-bank competition" and "competition by market financing".

Chart 8 Tier 1 capital ratio for euro area listed banks

(percentages)



Source: ECB calculations based on Thomson Reuters.
Note: The latest observation is for the first quarter of 2013.

policies more generally. In this respect, evidence from the bank lending survey shows that banks' risk perceptions and the cost of funds and balance sheet constraints have had a strong impact on the credit standards applied to non-financial corporations in the euro area (see Chart 7).

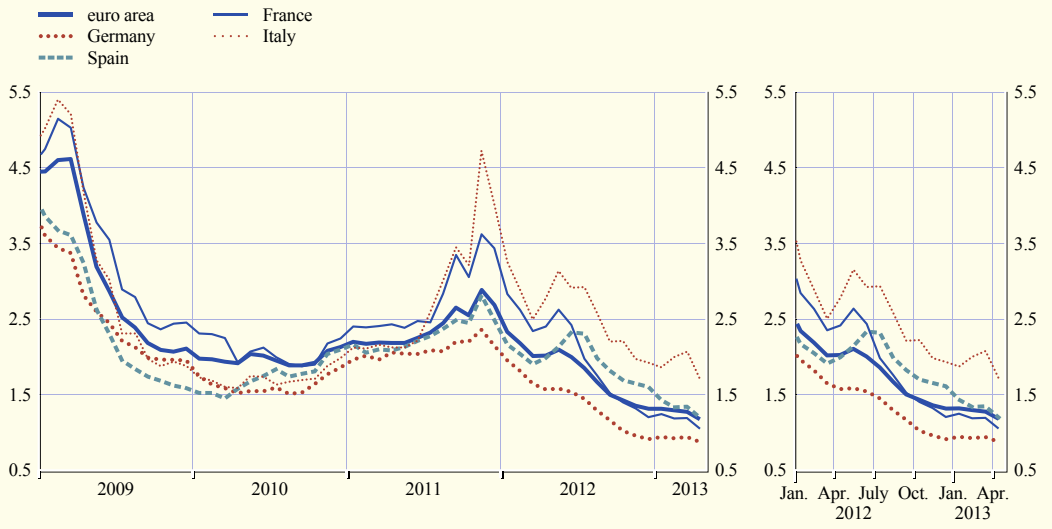
In several countries, bank capital has been depleted during the crisis as a result of valuation losses on securities holdings and, more significantly, loan losses. As a result of tensions in sovereign bond markets and the resulting funding difficulties for banks, the ability of banks to provide credit has been seriously hampered in many countries. Euro area banks have made good progress in strengthening their resilience to adverse economic developments since late 2009. The increase in banks' capital ratios, partly in response to regulatory and market pressures forcing them to hold higher discretionary buffers, resulted mainly from substantial capital-raising efforts by banks and from large injections of capital by euro area governments (see Chart 8). More recently, the progress also reflects the adjustment to the forthcoming CRD IV capital requirements, which are more stringent and rely on a stricter definition of capital.[8]

Fragmentation in banks' funding conditions arising from sovereign debt tensions is another factor explaining the divergence in MFI lending rates and bank lending policies. In setting the remuneration on their deposits and the return on bonds issued in the market, banks "compete" at

8 In addition to the capital raised by banks in private markets, since 2007 many euro area banks have also received capital injections in various forms from their governments. For example, direct capital injected by governments between 2007 and mid-2013 is estimated at around €270 billion. Furthermore, implicit state aid with capital implications for banks has also been provided in the context of asset protection schemes and asset transfers to asset management companies.

Chart 9 Composite bank cost of debt financing

(composite cost of deposit and non-secured market debt funding; annual percentages)



Sources: ECB, Merrill Lynch Global Index and ECB calculations.
Notes: Deposit rates (for both retail and institutional investors) and cost of market-based debt financing, weighted using outstanding amounts taken from MFI balance sheet statistics. An extreme value relating to the collapse of Lehman Brothers in September 2008 has been smoothed out.

the retail level with high yields on bonds and Treasury bills issued by the government. In countries where such yields have increased or have not declined at the same pace and to the same extent as policy rates, this association contributes to increases in banks' funding costs, which may be passed through to bank lending rates.[9] Banks' funding costs increased substantially in the early stages of the financial crisis in 2008 and in 2009, as well as during the sovereign debt crisis in 2011 and the first half of 2012. During the latter period, the increases were particularly high in countries with distressed sovereigns. However, with the announcement of Outright Monetary Transactions (OMTs) in the third quarter of 2012, the gradual normalisation in the funding costs of some governments contributed to a lowering of the cost of bank funding and improved access to funding (see Chart 9). At the same time, evidence from the bank lending survey shows that banks' access to retail and wholesale funding improved across all funding categories and that the impact of the sovereign tensions on their funding has lessened since the second half of 2012 (see Chart 10).

As a result of these developments, banks have been able to reduce their dependence on the Eurosystem. Nonetheless, the funding situation of banks is still significantly heterogeneous across countries.

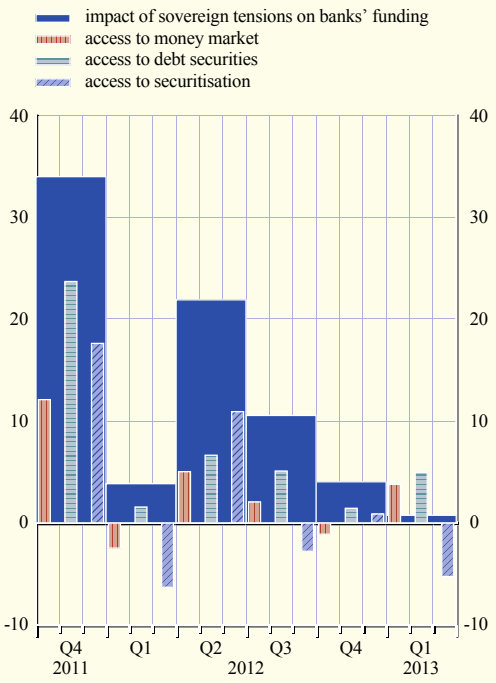
Divergence in lending rates might also be influenced by the amplifying effects of increasing credit risk and bank risk aversion in an environment of weak economic growth. Protracted periods of weak economic conditions and continued uncertainty regarding the duration of the sovereign debt crisis have weighed on the profitability and the financial buffers of non-financial corporations. When

9 Moreover, secured lending among banks in the interbank market is usually conducted using sovereign debt as collateral. Tensions in sovereign debt markets therefore reduce the collateral base of banks and thus their access to liquidity. See the box entitled "Monetary policy measures decided by the Governing Council on 6 September 2012", *Monthly Bulletin*, ECB, Frankfurt am Main, September 2012. See also the article entitled "Assessing the financing conditions of the euro area private sector during the sovereign debt crisis", *Monthly Bulletin*, ECB, Frankfurt am Main, August 2012.

economic activity is weak, the probability that a firm will go bankrupt increases and the debt-servicing capacity of non-financial corporations is impaired. Moreover, the high level of unemployment in some countries makes it risky for the financial sector to lend to households, especially via long-term mortgage contracts. As a result of the higher risk they bear, banks will tend to charge higher lending rates and tighten credit conditions for borrowers, particularly in those countries where economic conditions are weaker.[10] Evidence from the bank lending survey suggests that the effects of the cost of funds and balance sheet constraints have recently eased substantially by comparison with mid-2012, while risk perceptions are now the main factor contributing to tighter credit conditions on loans to non-financial corporations (see Chart 7).

Chart 10 Impact of sovereign debt tensions on funding and access to specific funding markets

(net percentages)



Sources: Eurosystem bank lending survey and ECB.
Notes: Positive/negative figures refer to deterioration/improvement in access to funding.

NEW EMPIRICAL EVIDENCE ON RETAIL BANK INTEREST RATE PASS-THROUGH

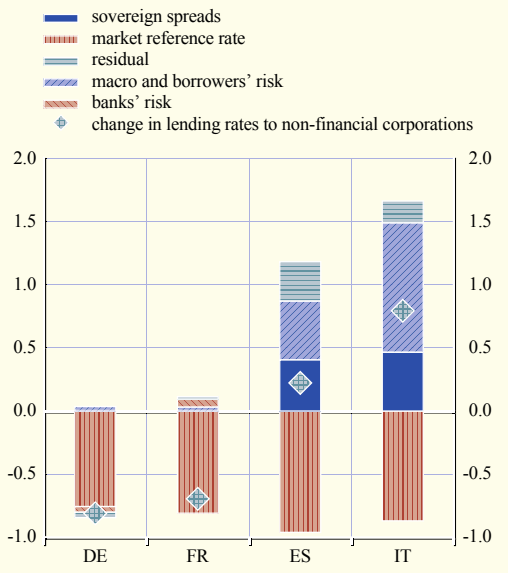
The previous section highlighted the importance of risk factors, bank capital and fragmentation in banks' funding conditions owing to tensions in government bond markets as potential drivers of bank lending rates during the financial crisis. This section provides new empirical evidence on pass-through models that assess the degree of impairment in the monetary policy transmission mechanism in the four largest euro area economies arising from tensions in sovereign debt markets and risk factors (see Box 3 for details regarding the econometric models used in the estimations). In particular, they make it possible to differentiate between the various factors affecting lending rates to non-financial corporations and households for house purchase.

Charts 11 and 12 show the actual change in lending rates to non-financial corporations and households between March 2011 and April 2013 in the four largest euro area economies and the estimated contribution of market reference rates, risk factors (related to banks and borrowers) and sovereign debt spreads. It can be seen that the fall in the composite lending rates to non-financial corporations and households has proceeded in line with historical regularities in France and Germany. This means that downward adjustments in market reference rates have translated into a concomitant reduction in bank lending rates. In the case of Spain and Italy, the fall in market reference rates associated with the drop in policy interest rates over the same time period has also contributed negatively to retail bank lending rates, as expected. However, sovereign market tensions and a deteriorating macroeconomic environment have put upward pressure on composite lending rates to non-financial corporations and households in Spain and Italy.

10 The April 2013 bank lending survey showed that banks' perceptions of high macroeconomic uncertainty and the creditworthiness of borrowers have continued to gain importance, relative to other credit supply factors, as factors explaining developments in the credit standards applied to loans to both households and non-financial corporations.

Chart 11 Breakdown of changes in lending rates to non-financial corporations by explanatory factors

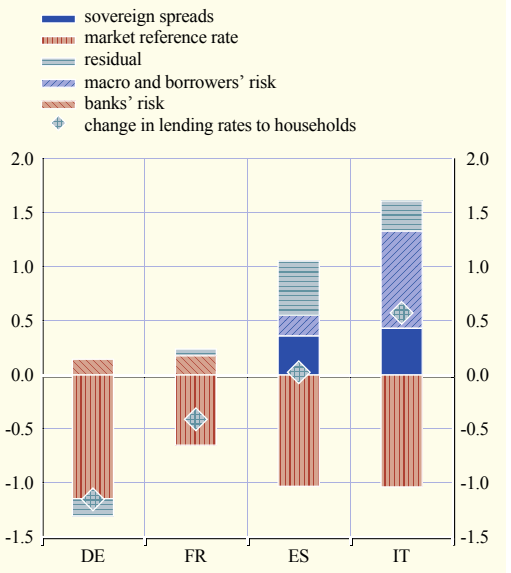
(percentages per annum; March 2011-April 2013)



Source: ECB calculations.
Notes: The chart shows the change in lending rates to non-financial corporations and the contribution of each explanatory variable between March 2011 and April 2013. Composite lending rates for non-financial corporations are compiled from short and long-term rates using a weighting scheme based on smoothed new business volumes. See Box 3 for more details on the models. Countries are ordered from the lowest to the highest change in lending rates.

Chart 12 Breakdown of changes in lending rates to households by explanatory factors

(percentages per annum; March 2011– April 2013)



Source: ECB calculations.
Notes: The chart shows the change in lending rates to households and the contribution of each explanatory variable between March 2011 and April 2013. Composite lending rates for households are compiled from short and long-term rates using a weighting scheme based on smoothed new business volumes. See Box 3 for more details on the models. Countries are ordered from the lowest to the highest change in lending rates.

Box 3

MODELLING THE INTEREST RATE PASS-THROUGH ACROSS EURO AREA COUNTRIES

The divergence observed in bank lending rates since the outbreak of the financial crisis in 2008 and their sluggish response, in some countries, to the policy interest rate reductions to levels close to zero reflect in part asynchronous business cycles and differing perceptions of credit risk across countries over the last few years. Country-specific lending rates not only exhibit a different speed of adjustment to changes in the corresponding market interest rates, they are also affected by different market interest rates and different risk factors.

Standard pass-through models assume the absence of any explanatory variables in the lending rate adjustment mechanism other than market interest rates. This is a simple error correction framework with the following structure:

$$\Delta br_t = \sum_{k=0}^{K} \delta_k \Delta r_{t-k} + \sum_{m=1}^{M} \lambda_k \Delta br_{t-m} + \alpha(br_{t-1} - \beta r_{t-1} - \mu) + u_t \quad (1)$$

where br_t denotes the bank lending rate and r_t is the reference market interest rate, i.e. the rate at which banks can raise funds in the interbank money market. Coefficient α represents the speed

of adjustment to the long-term equilibrium, while coefficient β captures the long-run elasticity of bank lending rates to market reference rates. The coefficients regarding the lags of the first difference of market reference rates capture the short-run pass-through. Finally, Δ represents the first difference operator.[1]

The standard model can be extended to accommodate the impact of other factors affecting the pricing of bank products. In particular, reflecting tensions in sovereign bond markets, models can also be estimated including the spread of sovereign bond yields with respect to a risk-free rate as a factor of risk (denoted by s_t):[2]

$$\Delta br_t = \sum_{k=0}^{K} \delta_k \Delta r_{t-k} + \sum_{j=1}^{J} \lambda_k \Delta br_{t-j} + \sum_{n=1}^{N} \omega_s \Delta s_{t-n} + \alpha(br_{t-1} - \beta r_{t-1} - \beta_s s_{t-1} - \mu) + u_t \quad (2)$$

Different financial and banking structures among euro area countries might result in different risk factors affecting the demand and supply side of the lending process, which should be considered when modelling lending rates. Proxies for supply-side risk factors are banks' expected default frequencies, the capital-to-asset ratio and the liquidity-to-asset ratio. Demand-side risk indicators include the probabilities of default of non-financial corporations and households, approximated by non-financial corporations' expected default frequencies, employment expectations and unemployment rates, and the cost of equity for financial companies and banks.[3] However, the introduction of more than two risk factors on top of sovereign bond yields into a lending rate model might exhaust degrees of freedom, considering the relatively short time span of lending rate statistics. Hence, risk factors are included in econometric models one at a time and the final model is selected on the basis of econometric diagnosis criteria (see below). Equation (2) can then be extended to accommodate the possible impact of time-varying risk factors in a model as follows:

$$\Delta br_t = \sum_{k=0}^{K} \delta_k \Delta r_{t-k} + \sum_{j=1}^{J} \lambda_k \Delta br_{t-j} + \sum_{n=1}^{N} \gamma_k \Delta k_{t-n} + \sum_{m=1}^{M} \sigma_k \Delta p_{t-m} + \sum_{n=1}^{N} \omega_s \Delta s_{t-n} + \alpha(br_{t-1} - \beta r_{t-1} - \beta_2 k_{t-1} - \beta_3 p_{t-1} - \beta_s s_{t-1} - \mu) + u_t \quad (3)$$

where k_t and p_t denote the demand and supply-side risk factors of the lending process.

Moreover, rather than an individual market rate, the market reference rate could itself be a composite time series constructed from several market rates. In this respect, principal component analysis can be used to construct a composite time series out of a long dataset of market rates of different maturities (yield curve). When applying such methodology, it is found that about 70% of the variation in interest rates of different maturities in a yield curve is explained by the first principal component and more than 95% of the variation by the first three principal components.[4] The previous model is thus extended to include the first two principal components of the euro area swap curve (denoted by f_{1t} and f_{2t}) instead of the individual market reference rate:

$$\Delta br_t = \sum_{k=0}^{K} \delta_k \Delta f_{1,t-k} + \sum_{m=0}^{M} \phi_k \Delta f_{2,t-m} + \sum_{j=1}^{J} \lambda_k \Delta br_{t-j} + \sum_{n=1}^{N} \gamma_k \Delta k_{t-n} + \sum_{m=1}^{M} \sigma_k \Delta p_{t-m} + \sum_{n=1}^{N} \omega_s \Delta s_{t-n} + \alpha(br_{t-1} - \beta f_{1,t-1} - \beta_2 f_{2,t-1} - \beta_3 k_{t-1} - \beta_4 p_{t-1} - \beta_s s_{t-1} \mu) + u_t \quad (4)$$

1 For a review of the academic literature, 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.
2 The spread between sovereign bond yields and a risk-free rate captures country-specific sovereign debt tensions, as well as flight-to-quality effects and liquidity premia.
3 Some of the risk factors are available at the country level, while others are only available at the euro area level.
4 The first three principal components of a panel of interest rates of different maturities in a yield curve capture the "level", "slope" and "curvature" of the yield curve. See Litterman, R. and Scheinkman, J., "Common Factors Affecting Bond Returns", *The Journal of Fixed Income*, Vol. 1, 1991, pp. 54-61.

The selection of risk factors and market reference rates, as well as the lag structure in the model, is performed on the basis of econometric diagnosis criteria, including in-sample fit and out-of-sample performance, stability of coefficients in the co-integrating vector, significance of coefficients, the sign of sensitivities to risk in the long-term equilibrium pass-through and impulse responses. Regarding the specific benchmark rates, the three-month and 12-month EURIBOR are used for short-term loans and the market rates of higher maturities (from the 12-month EURIBOR up to ten-year yields) for long-term loans. Finally, to disentangle the impact of policy rates or euro area "risk-free" interest rates of higher maturities from the impact of the country-specific sovereign tensions, only the euro area swap or EURIBOR (and not the country-specific sovereign yields) are used as market reference rates.

4 CONCLUSIONS

The divergence in lending rates observed since the outbreak of the financial crisis in 2008 and their sluggish response in some countries to the policy interest rate reductions to levels close to zero reflect in part asynchronous business cycles and differing perceptions of credit risk across countries over the last few years. At the same time, the effectiveness of monetary policy has been hindered by financial fragmentation, as the monetary stimulus introduced since late 2011 has hardly influenced broad credit conditions in large parts of the euro area. The ECB has sought to resist downside risks to price stability in a context of increasing fragmentation by introducing several standard and non-standard measures, including reductions in the key ECB interest rates, a broadening of the Eurosystem's collateral framework, two three-year longer-term refinancing operations, a reduction in reserve requirements and the announcement of OMTs. As a result, tensions in sovereign debt markets and bank funding constraints have abated and the risk of a disorderly bank deleveraging process has been contained. In order to ensure the adequate transmission of monetary policy to financing conditions in euro area countries, it is essential that the fragmentation of euro area credit markets is reduced further and the resilience of banks strengthened where needed. In this respect, it is essential that countries act simultaneously on various policy fronts, in particular with regard to public finances and structural reforms to boost economic activity and financial stability.[11]

11 See the article entitled "Heterogeneity in euro area financial conditions and policy implications", *Monthly Bulletin*, ECB, Frankfurt am Main, August 2012.