Article
Recent developments in the composition and cost of bank funding in the euro area

Changes in the composition and cost of bank funding have important implications for the provision of credit and, consequently, for economic output and inflation. Banks' funding costs are affected by monetary policy, but the transmission of policy depends on many factors, including the strength of banks' balance sheets and the macroeconomic environment. Therefore, developments in bank funding can be different across euro area banks and countries. This article gives an overview of recent developments in the composition and cost of bank funding, including capital, and shows that they varied across the euro area over the period of the financial crisis, which had an impact on the transmission of monetary policy. The interaction between monetary policy measures (both standard and non-standard) and banks' funding conditions is also discussed.

1 Introduction

During the financial crisis, a large degree of heterogeneity in the cost of bank credit was linked to a divergence in funding conditions across euro area banks. Understanding banks' funding conditions is vital for the analysis of credit provision to the real economy and, consequently, of output and inflation, particularly in the light of the fact that funding cost dynamics diverged from monetary policy rates during the crisis.[1] In general, banks seek funding from retail and wholesale sources. Retail funding, i.e. deposits from the private sector, is generally the dominant source of funding, and deposits from the non-financial private sector tend to be less volatile than wholesale funding sources, particularly when protected by deposit guarantee schemes. However, the importance of such sources for a bank's overall funding depends on institutional features such as the bank's size or business model. For small euro area banks, in particular, retail deposits account for a considerably larger share of overall funding than wholesale sources.[2] Wholesale funding includes interbank liabilities, which are used for short-term liquidity management, and the issuance of debt securities. Finally, banks also have access to central bank liquidity and raise capital, normally in the form of equity.

1 For a discussion, see Illes, A., Lombardi, M.J. and Mizen, P., "Why did bank lending rates diverge from policy rates after the financial crisis?", *BIS Working Papers*, No 486, February 2015.

2 See "Report on financial structures", ECB, October 2015.

A well-functioning banking sector is essential for the effective transmission of monetary policy. This applies in particular to the euro area, where banks play a dominant role in providing external financing to the non-financial private sector. The outbreak of the financial and sovereign debt crisis in 2010 affected all segments of the financial system, especially the banking sector, which hampered the transmission of the ECB's monetary policy measures to bank funding and, ultimately, to bank lending conditions. Moreover, bank funding conditions were heterogeneous across euro area countries in an environment of sluggish economic activity, high sovereign debt and concerns about weak banks. While differences in funding costs are to be expected, high levels of uncertainty led to excessive risk premia in some jurisdictions and there were periods when banks' access to wholesale and, to a lesser extent, retail funding was severely hampered. At the same time, the ECB's non-standard monetary policy measures (such as the policy of full allotment of the liquidity demanded by banks at a fixed rate and the two three-year longer-term refinancing operations (LTROs) in late 2011 and early 2012) acted as a strong backstop and prevented a disorderly and forced deleveraging that would have had a considerable negative impact on the overall economy. Since then, steps towards banking union, the ECB's credit easing package announced in mid-2014, and the expanded asset purchase programme (APP) announced in early 2015 have led to a significant improvement in bank funding conditions, which have become more homogeneous across countries. This has helped to weaken the bank-sovereign nexus, thereby considerably reducing impairments in the transmission mechanism.

The funding and capital structures of banks are of interest for a number of reasons. The determinants of banks' funding and capital structures are distinct from those of non-financial corporations.[3] Banks are subject to capital regulation because of the significant effect they can have on financial stability and economic growth: given that they are largely funded by deposits, a significant share of which are covered by guarantee schemes, banks are required to hold minimum amounts of capital to absorb losses and mitigate moral hazard concerns.[4] While this implies that the relative cost of equity and debt funding is not the main determinant of banks' capital structures, it does not mean that their cost is irrelevant. In fact, the cost of capital is an important factor in banks' portfolio allocation decisions, including lending activity. Recent developments in the European supervisory, regulatory and resolution framework – including macroprudential capital buffers, total loss-absorbing capacity (TLAC) requirements and the Bank Recovery and Resolution Directive (BRRD) – help to rectify incentives that are misaligned because of the expectation of public support (the too-big-to-fail problem). The effect of these measures on banks' cost of funding is a priori unclear, as the direct effect of a reduction in implicit public sector support is at least partially offset by decreased risk-taking by banks. While the transition to the revised regulatory framework may constrain lending in the short term, it is expected to increase economic welfare in the medium to long term, as the negative externalities associated with systemic crises are contained.[5]

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3 See Berger, A., Herring, R. and Szego, G., "The role of capital in financial institutions", *Journal of Banking and Finance*, Vol. 19, Issues 3-4, June 1995, pp. 393-430.

4 See Gropp, R. and Heider, F., "The Determinants of Bank Capital Structure", *Review of Finance*, Vol. 14, 2010, pp. 587-622.

5 See the speech by ECB Vice-President Vítor Constâncio, "Financial regulation and the global recovery", at the Annual Hyman P. Minsky Conference, Washington D.C., 16 April 2015.

This article is structured as follows: Section 2 presents the main developments in the composition of banks' funding and capital structures and discusses the monetary policy measures that have had an impact on funding quantities, Section 3 discusses developments in the cost of funding and capital and the impact of certain monetary policy measures on these costs, and Section 4 concludes.

2 The composition of funding and the impact of monetary policy

The structure of banks' funding and capital is integral to the overall stability and cost of funding. During the crisis, there were changes not only in banks' overall funding levels, but also in the structure of their funding. This section discusses some of the main changes in euro area banks' funding over the past decade and compares developments in vulnerable and less vulnerable countries.[6] Banks are defined here as credit institutions and other monetary financial institutions (MFIs) that are resident in the euro area. The impact of monetary policy measures on funding quantities and composition is also discussed.

The composition of euro area banks' funding has fluctuated over the past decade, reflecting changes in economic conditions, uncertainty and the monetary policy response to the crisis. Banks' overall funding grew in line with the expansion in their assets until the escalation of the financial crisis following the collapse of Lehman Brothers and the resulting increase in uncertainty in interbank markets. Chart 1 shows annual flows in the main liabilities of MFIs, including capital. Funding flows increased steadily from 2005 until the end of 2007, particularly via wholesale funding sources, which include external (non-euro area) liabilities, interbank funding and shorter-term debt securities and tend to be more volatile than retail deposit funding. While growth in these wholesale funding sources facilitated the fast expansion of banks' balance sheets in the years leading up to the crisis, the outflows and swift withdrawals observed at the start of the crisis made a significant contribution to bank funding pressures and a reduction in liquidity. Increased reliance on these funding sources is likely to have introduced a pro-cyclical bias in financial intermediation.[7]

Deposits from resident non-MFIs, and deposits from the non-financial private sector in particular, are the most stable and single largest component of funding for euro area banks. While the composition of these deposits varies across countries and bank types, they are the predominant source of funding for banks in both vulnerable and less vulnerable countries.[8] Retail deposits tend to be a more

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6 Throughout this article, the term "vulnerable countries" refers to countries more directly affected by the crisis, namely Ireland, Greece, Spain, Italy, Cyprus, Portugal and Slovenia, while the term "less vulnerable countries" refers to the remaining euro area countries.

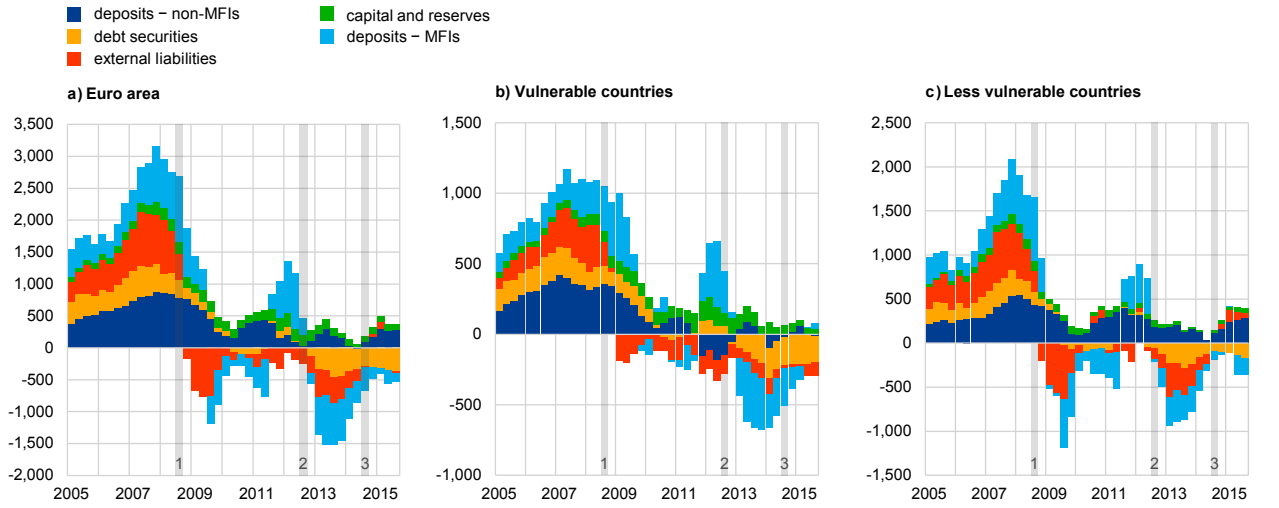
7 For a discussion, see Shin, H.S. and Shin, K., "Procyclicality and Monetary Aggregates", *NBER Working Papers*, No 16836, February 2011.

8 Non-MFI deposits include deposits from households, non-financial corporations, general government, insurance corporations, pension funds and other financial institutions.

Chart 1

Developments in funding of MFIs other than the Eurosystem

(EUR billions; annual flows by quarter)



Sources: ECB and ECB calculations.
Notes: The chart highlights three periods: 1. the collapse of Lehman Brothers, 2. the announcement of OMTs, and 3. the introduction of the credit easing package. The analysis is based on aggregate MFI data: deposits from other MFIs include operations between banks belonging to the same economic group. The components constitute MFIs' main liabilities and exclude money market fund shares/units and remaining liabilities, which are composed mostly of derivatives. Data are annual flows starting in the first quarter of 2005 and ending in the third quarter of 2015. Deposits of MFIs include both interbank funding and funding from the Eurosystem.

stable source of funding than wholesale sources:[9] since the liquidity services banks provide to depositors can incur transaction and switching costs, retail deposits are less susceptible to unanticipated withdrawals.[10] Moreover, as withdrawals are based on individual liquidity needs they tend to be more predictable, on the basis of the law of large numbers. In addition, deposits are generally insured up to a limit and are less subject to adverse shocks related to uncertainty.

As the financial crisis intensified with the collapse of Lehman Brothers, deposit flows fell, but remained robust relative to the other, more volatile sources of funding in both vulnerable and less vulnerable countries.

Since changes in deposit levels are associated with changes in income and general economic conditions, the reduction in flows reflected, at least in part, the deterioration in the macroeconomic environment across the euro area.[11] As the sovereign debt and financial market stress intensified, deposit outflows became more pronounced in vulnerable countries, driven largely by a repatriation of funds by non-domestic depositors (both from other euro area countries and from outside the euro area). After reaching a peak in mid-2012, deposit outflows from vulnerable countries subsided and fragmentation in funding across the euro area receded. This can be explained largely by the ECB's announcement of Outright Monetary Transactions (OMTs) and the decision taken at the June 2012 euro area summit by

9 For a discussion on the stable nature of retail deposits relative to wholesale funding, see Huang, R. and Ratnovski, L., "The dark side of bank wholesale funding", *Working Paper Series*, No 1223, ECB, July 2010.

10 See Song, F. and Thakor, A., "Relationship Banking, Fragility, and the Asset-Liability Matching Problem", *Review of Financial Studies*, Vol. 20(6), 2007, pp. 2129-2177.

11 See Cohen, B. and Kaufman, G., "Factors Determining Bank Deposit Growth by State: An Empirical Analysis", *Journal of Finance*, Vol. 20, Issue 1, 1965, pp. 59-70.

European leaders to deepen European integration in accordance with the long-term objective of creating a banking, fiscal and political union, as well as the decision to launch the Single Supervisory Mechanism (SSM).[12] While deposit flows in vulnerable countries recovered following these announcements, they remained weak relative to pre-crisis levels and then began to decline in an environment of low inflation and subdued income growth. Following the introduction by the ECB of further credit easing measures in the middle of 2014 and the announcement of the expanded APP at the beginning of 2015, deposit flows improved in an environment of increased central bank liquidity.

The sources of wholesale market funding that had increased in the years preceding the collapse of Lehman Brothers decreased rapidly at the start of the crisis, with debt securities issuance and interbank activity in particular slumping (see Chart 1). In vulnerable countries, as interbank funding deteriorated, banks continued to issue securities. A proportion of these were covered by government guarantees, whose aim was to support bank funding over this period.[13] However, issuance diminished as uncertainty and fears regarding the solvency of sovereigns increased. While market risks receded in the middle of 2012, there was a second stage of negative net issuance of debt securities by banks at this time, partly reflecting the correction of excessive leverage of the financial and non-financial sectors, as well as a move towards a more comprehensive regulatory and supervisory framework. Moreover, debt securities funding was replaced by Eurosystem liquidity because the cost of the latter was more favourable. Overall deposit flows from MFIs, which include interbank and Eurosystem funding, decreased as the financial crisis intensified (see Chart 1). Crucially, however, the composition of the deposits changed as more volatile interbank liquidity was partially replaced by central bank liquidity (see Chart 2). Interbank liquidity grew in the years before the financial crisis, reflecting increased international interlinkages among banks as cross-border lending increased over time. With the collapse of Lehman Brothers, the use of interbank deposits as a short-term liquidity tool decreased in line with a need to deleverage and amid general uncertainty about the creditworthiness of counterparties.[14]

The financial market stress not only resulted in a shift towards Eurosystem liquidity and away from interbank liquidity, particularly in vulnerable countries (see Chart 2), there was also a change in the composition of the Eurosystem liquidity, largely owing to the monetary policy response to the crisis.[15] At the start of the crisis the ECB switched to a fixed rate full allotment tender procedure

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12 See the presentation by ECB Vice-President Vítor Constâncio, "Fragmentation and rebalancing in the euro area", Joint European Commission-ECB Conference on Financial Integration, Brussels, 25 April 2013.

13 See the box entitled "The funding of euro area MFIs through the issuance of debt securities", *Monthly Bulletin*, ECB, August 2010, the article entitled "Monetary analysis in an environment of financial turmoil", *Monthly Bulletin*, ECB, November 2009 and the box entitled "How are government measures to support the financial system reflected on the balance sheets of euro area credit institutions?", *Monthly Bulletin*, ECB, April 2009.

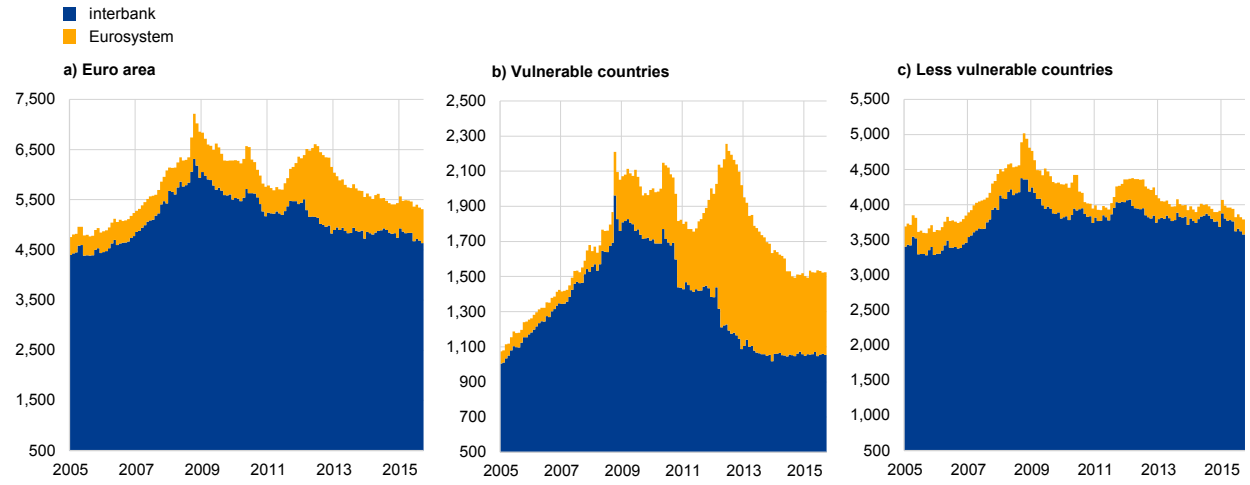
14 For a structural model of the money market, where informational asymmetries and concerns about the solvency of specific banks can lead to the breakdown of interbank trading, see Heider, F., Hoerova, M. and Holthausen, C., "Liquidity hoarding and interbank market spreads: the role of counterparty risk", *Working Paper Series*, No 1126, ECB, December 2009.

15 For details, see Eser, F., Amaro, M., Iacobelli, S. and Rubens, M., "The use of the Eurosystem's monetary policy instruments and operational framework since 2009", *Occasional Paper Series*, No 135, ECB, August 2012.

Chart 2

Breakdown of MFI deposits at MFIs other than the Eurosystem

(EUR billions; monthly outstanding amounts)



Source: ECB.
Note: The series for the Eurosystem comprises its lending to euro area credit institutions related to monetary policy operations denominated in euro and other claims on euro area credit institutions denominated in euro.

whereby, as long as banks had adequate collateral, their liquidity demands were fully satisfied at a rate determined by the Governing Council, which provided certainty and stability to the banking sector.[16] Moreover, the maturity of the liquidity was extended by means of LTROs.[17] As the sovereign debt tensions intensified and concerns about bank solvency increased, the ECB announced two three-year LTROs, the first of which took place at the end of 2011 and the second at the start of 2012. The share of outstanding Eurosystem liquidity in banks' funding increased substantially following these operations, reaching its highest level around the middle of 2012. There is evidence that these operations bolstered the supply of bank credit and, consequently, output and inflation over the crisis.[18] As part of a credit easing package introduced in June 2014, the ECB also announced a series of targeted LTROs (TLTROs), providing liquidity with a maturity of up to four years and linked to banks' lending volumes, in order to enhance the functioning of the monetary policy transmission mechanism by supporting the provision of credit to the real economy.[19] The weighted average maturity of bank borrowing from the Eurosystem increased from around 130 days before the first TLTRO was conducted to around 800 days after the settlement of the fifth TLTRO in September 2015.[20] In

16 See Giannone, D., Lenza, M., Pill, H. and Reichlin, L., "Non-standard monetary policy measures and monetary developments," *Working Paper Series*, No 1290, ECB, January 2011, and Lenza, M., Pill, H. and Reichlin, L., "Monetary policy in exceptional times", *Economic Policy*, Vol. 25, Issue 62, 2010, pp. 295-339.

17 For details, see Eser, F., Carmona Amaro, M., Iacobelli, S. and Rubens, M., "The use of the Eurosystem's monetary policy instruments and operational framework since 2009", *Occasional Paper Series*, No 135, ECB, August 2012.

18 See Darracq-Pariès, M. and De Santis, R., "A non-standard monetary policy shock: the ECB's 3-Year LTROs and the shift in credit supply", *Working Paper Series*, No 1508, ECB, January 2013.

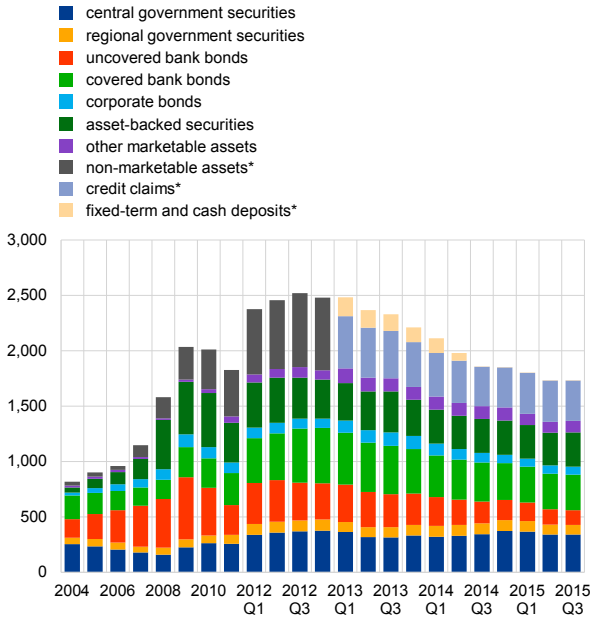
19 See the press release on further details of the targeted longer-term refinancing operations published by the ECB on 3 July 2014.

20 This illustrative calculation assumes that all TLTROs are repaid on their final maturity date in September 2018 and are not subject to voluntary or mandatory early repayment.

Chart 3

Use of collateral

(EUR billions after valuation and haircuts)



Source: ECB.
Notes: Averages of month-end data over each period.
* Since the first quarter of 2013 the category "non-marketable assets" has been split into two categories: "fixed-term and cash deposits" and "credit claims".

the July 2015 euro area bank lending survey, banks reported that the TLTROs had improved and were likely to further improve their liquidity position, market financing conditions and profitability, and that they had been and would be used as a substitute for other funding sources, mainly other Eurosystem liquidity operations, maturing debt and interbank lending.[21] The Eurosystem also changed the collateral framework during the crisis, mainly by expanding the list of assets eligible as collateral in monetary policy operations and by lowering the rating required on assets.[22] These changes were essential for the functioning of the banking system, particularly when stress in sovereign markets led to rating downgrades. They ensured that solvent banks could still access liquidity, in order to prevent an escalation of the crisis.[23] During the crisis, banks used their highest quality collateral for direct repo transactions in the wholesale markets, while non-marketable collateral was increasingly posted with the Eurosystem (see Chart 3).

During the crisis, in addition to the decline in the overall level of interbank liquidity, there was a change in its composition, reflecting perceptions of increased counterparty risk. There was a considerable move from unsecured to secured lending, particularly from 2008 onwards (see Chart 4), as well as a substantial adjustment in activity towards domestic counterparties and away from counterparties from other euro area countries.[24] Concerns about counterparty creditworthiness resulted in increased use of central counterparties, which facilitate clearing and settlement in money markets by acting as the direct counterparty for both lender and borrower, thereby assuming the risk of the borrower defaulting.[25]

External liabilities increased substantially in the years preceding the crisis and facilitated the growth in banks' balance sheets. However, in the wake of the Lehman Brothers collapse there was a swift contraction in external liabilities, partly owing to asymmetric information and a sudden rise in risk aversion among

21 See https://www.ecb.europa.eu/stats/pdf/blssurvey_201507.pdf

22 For details on the changes in the collateral framework, see the article entitled "The Eurosystem collateral framework throughout the crisis", *Monthly Bulletin*, ECB, July 2013.

23 See Wolff, G., "Eurosystem collateral policy and framework: Was it unduly changed?" *Bruegel Policy Contribution*, Issue 14, November 2014.

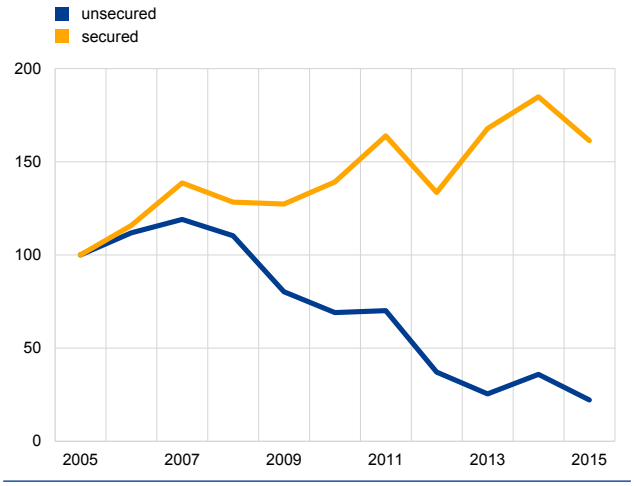
24 For detailed developments in euro area money markets, see "Euro money market survey", ECB, September 2015.

25 For more information on interbank funding via central counterparties, see the article entitled "The interplay of financial intermediaries and its impact on monetary analysis", *Monthly Bulletin*, ECB, January 2012, and the box entitled "The adjustment of monetary statistics for repurchase agreement transactions with central counterparties", *Monthly Bulletin*, ECB, September 2012.

Chart 4

Euro area money market volumes

(annual indices, 2005=100)



Source: ECB.

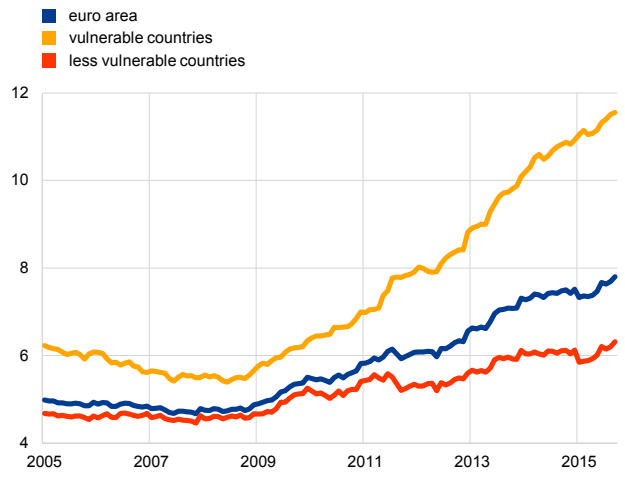
international investors.[26] The growth in external liabilities in the lead-up to the crisis stemmed from deposits of non-euro area residents and holdings by non-residents of shorter-term debt securities issued by euro area banks, and largely reflected the expansion of cross-border interbank liquidity (see Chart 1). This facilitated the growth in banks' balance sheets, as deep and liquid cross-border financial markets eased quantitative constraints on their liquidity management. However, at the outbreak of the crisis, cross-border funding was withdrawn quickly, which increased banks' exposure to adverse global funding pressures.[27] For vulnerable countries, external liability flows have remained broadly negative since the onset of the crisis. For less vulnerable countries, annual flows have increased recently, and have been generally positive since the ECB's announcement of additional monetary policy easing measures in the middle of 2014.

The adverse changes in prices and credit losses associated with the crisis led to impairments in banks' capital positions, which, in conjunction with funding pressures, often necessitated deleveraging and changes in banks' liabilities, such as increased capital issuance. Chart 5 shows that capital as a percentage of total assets was relatively stable in the pre-crisis period. The subsequent increase in the ratio was particularly pronounced for banks in vulnerable countries, where levels of assets decreased and levels of capital increased in response not only to regulatory requirements but also to pressure from markets to hold larger discretionary buffers against losses. Over this period, in addition to the capital raised in private sector markets, a substantial amount of capital was also obtained through government capital injections.[28] The Capital Requirements Directive and Regulation (CRD IV/CRR), which came into force in January 2014, increased both the quality and the amount of capital that banks must hold for prudential purposes. In addition, new European legislation has set the stage for the creation of a banking union and addressed gaps in the capital framework that were highlighted by the crisis.

Chart 5

Capital and reserves of euro area MFIs other than the Eurosystem

(percentages of total assets)



Source: ECB.
Note: Total assets, capital and reserves were derived via notional stocks in order to avoid reclassifications, revaluations and changes in the composition of the euro area impacting on this measure.

[26] See Forster, K., Vasardani, M. and Ca' Zorzi, M., "Euro area cross-border financial flows and the global financial crisis", *Occasional Paper Series*, No 126, ECB, July 2011.

[27] See the article entitled "The supply of money – bank behaviour and the implications for monetary analysis", *Monthly Bulletin*, ECB, October 2011.

[28] For an overview of government measures to support the banking system, see the article entitled "The fiscal impact of financial support during the crisis", *Economic Bulletin*, ECB, Issue 6, 2015.

Table

Structure of main liabilities of euro area MFIs other than the Eurosystem

(percentages of main liabilities)

	Euro area		Vulnerable countries		Less vulnerable countries	
	Jan. 2005	Sep. 2015	Jan. 2005	Sep. 2015	Jan. 2005	Sep. 2015
Deposits – non-MFIs	35	43	39	47	34	42
Debt securities	18	14	15	12	20	15
Capital	6	9	8	13	6	8
External liabilities	15	13	16	10	15	15
Interbank liabilities	23	17	20	13	24	19
Eurosystem liabilities	2	3	1	6	2	1
Total (EUR trillions)	19.2	26.8	5	8.1	14.3	18.8

Source: ECB.
Notes: The main liabilities consist of total liabilities excluding remaining liabilities, and shares/units issued by money market funds. Remaining liabilities consist of volatile components that are separate from the core activities of banks, including in particular (negatively-valued) financial derivatives, for which there are some variations in accounting and statistical treatment over the period under review and across jurisdictions.

Over the past decade the funding structure of euro area banks has been altered by changes in market risk, the economic environment and monetary policy measures: there is now a greater reliance on more stable funding relative to volatile funding.[29] The table shows that MFIs' increased reliance on deposit funding and decreased reliance on debt securities and external liabilities is common to both vulnerable and less vulnerable countries. The table also shows the breakdown in MFI deposits between interbank and Eurosystem liquidity, illustrating the fact that while the decrease in interbank liquidity has been a general phenomenon across the euro area, it has been greatest in vulnerable countries. Reliance on central bank liquidity grew between January 2005 and September 2015 in vulnerable countries, in contrast to the situation in less vulnerable countries. The nature of interbank liquidity has also changed from unsecured to secured (see Chart 4), and there has been a reduction in the reliance on cross-border activities, including with non-euro area counterparties (reflected in the reduced relevance of external liabilities). Vulnerable countries in particular now have a substantially larger share of capital in total funding. While this measure of capital differs from the regulatory measure, its increase follows a general improvement in solvency and leverage ratios.[30] Overall, these changes indicate a move towards a business model with a greater reliance on more stable funding sources.[31]

The structure of banks' balance sheets and funding will continue to be affected by the economic and policy environment, and in particular by the expanded APP, which will inject further liquidity into the banking system. The expanded APP, which comprises two private sector asset purchase programmes (the asset-backed securities purchase programme (ABSPP) and the third covered bond purchase programme (CBPP3)) and the public sector purchase programme (PSPP), aims to ease financing conditions and bring the path of inflation back in line with price stability.[32] The APP has had a substantial impact on banks' balance sheets: as the Eurosystem pays for the assets it purchases by supplying reserves, purchases are always settled through banks regardless of who the ultimate seller is. In terms of funding, increases in reserves following the introduction of the expanded

29 For a more detailed overview of bank funding trends in the euro area following the crisis, see Van Rixtel, A. and Gasperini, G., "Financial crises and bank funding: recent experience in the euro area", *BIS Working Papers*, No 406, March 2013.

30 The statistical definition of capital and reserves includes equity capital; non-distributed benefits or funds; and specific and general provisions against loans, securities and other types of assets (the recording of which may follow national accounting rules). See "Manual on MFI balance sheet statistics", ECB, April 2012.

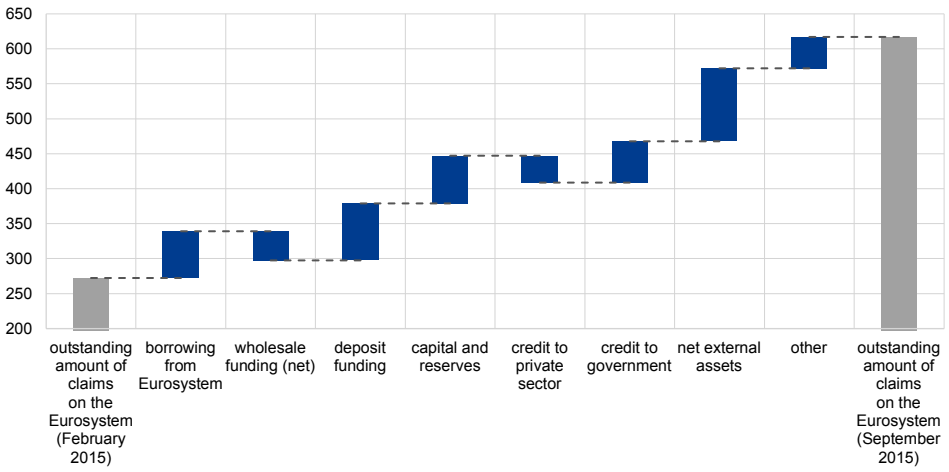
31 See "Report on financial structures", ECB, October 2015.

32 Purchases under the expanded APP amount to €60 billion per month and are intended to run until the end of March 2017, or beyond, if necessary, and in any case until the Governing Council sees a sustained adjustment in the path of inflation that is consistent with its aim of achieving inflation rates below, but close to, 2% over the medium term. For more details, see https://www.ecb.europa.eu/mopo/implement/omt/html/index.en.html.

Chart 6

Movements in the balance sheet of MFIs other than the Eurosystem that correspond to the change in reserve holdings between end-February and end-September 2015

(EUR billions; non-seasonally adjusted)



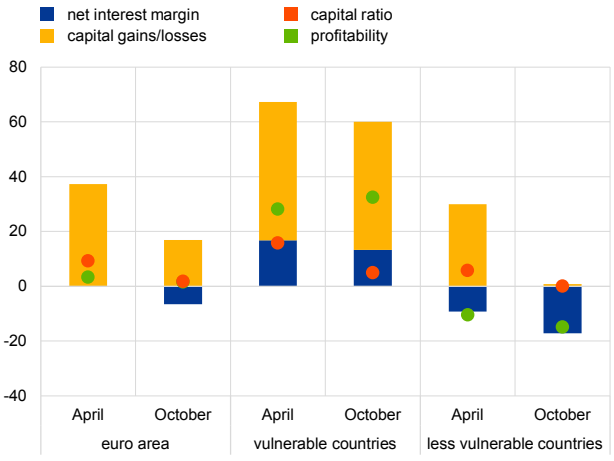
Sources: ECB and ECB calculations.
Notes: Increases in net asset positions reduce claims on the Eurosystem; increases in net liability positions increase claims on the Eurosystem. "Wholesale funding (net)" refers to issuance of debt securities net of holdings of MFI debt securities, and borrowing from MFIs other than the Eurosystem net of deposits with MFIs other than the Eurosystem.

APP have so far been reflected largely in increases in deposits (see Chart 6), which partly reflect banks' intermediation of bond sales to the Eurosystem by euro area non-banks. The sizeable decline in net external assets reflects the intermediation of sales by non-euro area residents. Credit to governments has declined, which, at least partly, reflects sales of securities to the Eurosystem from banks' own portfolios and contributes to the increase in reserves. Chart 6 also shows an increase in credit to the private sector, part of which will have contributed to the above-mentioned increase in deposits.

Chart 7

Impact of the APP on euro area banks' profitability and capital position, as reported in the April and October 2015 bank lending surveys

(net percentages of respondents)



Source: ECB.
Notes: Impact over the past six months. The net percentages are defined as the difference between the sum of the percentages of banks responding "increased/improved considerably" and "increased/improved somewhat" and the sum of the percentages of banks responding "decreased/deteriorated somewhat" and "decreased/deteriorated considerably" to the corresponding question in the April and October 2015 bank lending surveys. The results shown are calculated as a percentage of the number of banks that did not reply "not applicable".

According to the April and October 2015 bank lending surveys, the contribution of the APP to euro area banks' profitability and solvency positions has been positive overall, even though the effects are varied and differ across countries (see Chart 7). Although the APP has led to capital gains associated with the valuation of securities held by banks, its effect on net interest income is a priori unclear. On the one hand, the compression of yields and the flattening of the yield curve have led to lower interest income. This is likely to translate into lower unit margins, since liabilities tend to have shorter maturities than assets and are less responsive to decreasing interest rates, particularly when they are at very low levels. Furthermore, the APP generates excess liquidity which, if deposited with the Eurosystem, is remunerated at a negative rate. On the other hand, these effects are at least partly

offset by the increased intermediation activity and credit quality stemming from the programme's positive impact on output. The APP has made a modest contribution to bank profitability in the euro area as a whole, but its impact has been positive for vulnerable countries in particular. For the euro area aggregate, the estimated negative effects on net interest income have so far been outweighed by the positive effects from capital gains and improved credit quality against the background of the APP's positive impact on economic activity. The effect on the capital ratio has also been positive, although the effects have diminished since the initial announcement and implementation of the programme.

3 The cost of funding and the effects of monetary policy

As the financial crisis escalated, stress in financial markets caused the cost of funding for many euro area banks to increase. Uncertainty regarding the health of certain banking markets led not only to outflows, but also to increases in risk premia on the funds available to banks. Wholesale funding sources became either unavailable or prohibitively expensive for many banks in vulnerable countries, leading to an increase in recourse to central bank operations, as outlined in Section 2. The observed market fragmentation reflected high uncertainty and risk aversion and was at times greater than would be expected given the actual underlying risks. Since the degree of dispersion in lending rates and heterogeneity in the transmission of monetary policy were salient features of the crisis, this section uses data at both the country and the bank level to explore movements in the level and dispersion of the different funding elements over time. These data contain detailed information on quantities of deposits held by the non-financial private sector, debt securities issued by banks and capital, as well as prices of deposits and securities and an estimate of the cost of equity.

The cost of deposits across euro area countries can vary for a number of reasons, such as differences in maturity or market structure and variation in credit risk and in institutional factors, including regulation and taxation.[33] Despite these differences, the transmission of monetary policy must be smooth across euro area countries and banks in the long run. Uncertainty and stress in the financial markets during the crisis meant that credit risk concerns fuelled financial market fragmentation and hindered transmission as dispersion in pricing behaviour across banks increased in relation to the perceived interaction with sovereign credit risk in their country of residence.[34]

Developments in deposit rates have broadly followed monetary policy rates, albeit with an incomplete pass-through. As the interest rate on the ECB's main refinancing operations (MROs) was cut from 4.25% at the end of September 2008 to 1.00% in May 2009, deposit rates in the euro area also fell, although to a lesser

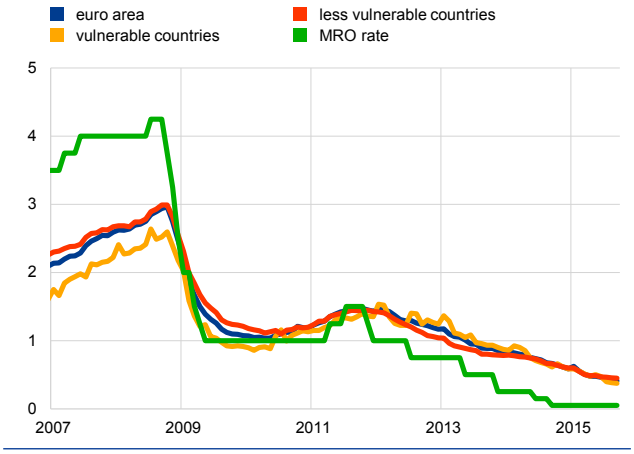
[33] See "Differences in MFI interest rates across euro area countries", ECB, September 2006.

[34] See Darracq-Pariès, M., Moccero, D., Krylova, E. and Marchini, C., "The retail bank interest rate pass-through: the case of the euro area during the financial and sovereign debt crisis", *Occasional Paper Series*, No 155, ECB, August 2014.

Chart 8

Composite euro area bank deposit rates for the non-financial private sector

(percentages per annum)



Source: ECB.
Note: Composite rates are computed as averages of new business rates for different maturities, weighted by outstanding amounts.

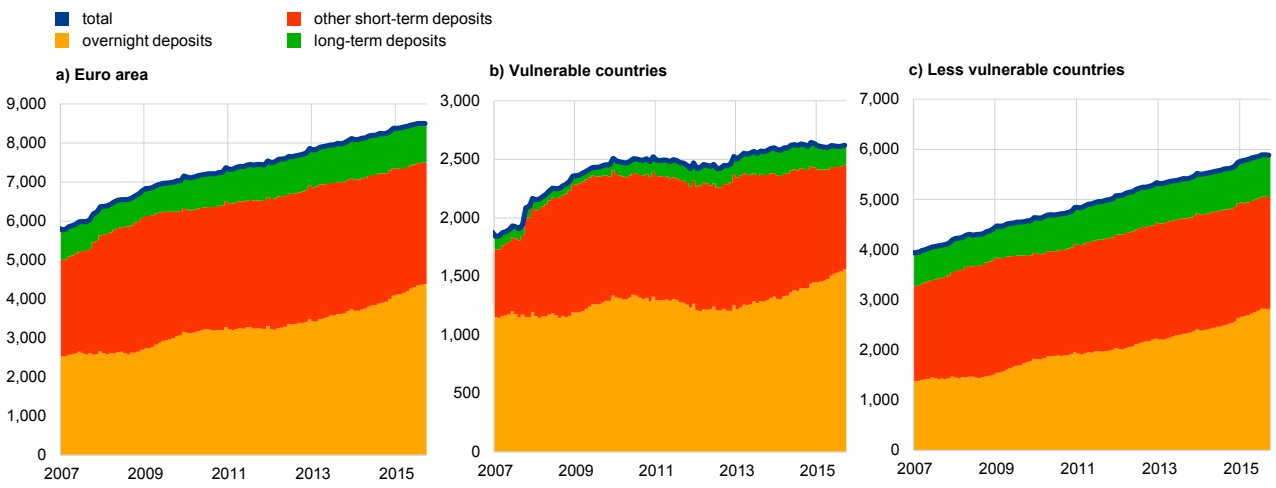
extent (see Chart 8). In October 2008 they stood at around 2.95%, and reached a trough of around 1.0% at the beginning of 2010. From the middle of 2010, deposit rates started increasing gradually and, following two policy rate increases in the middle of 2011, stood at around 1.45% at the end of 2011. Monetary policy then resumed an easing cycle, whereby the MRO rate was cut incrementally from 1.50% in November 2011 to 0.05% in September 2014. Deposit rates fell over this period, and the average composite rate currently stands at around 0.4%. Moreover, the dispersion of deposit rates has narrowed somewhat, as they are close to the zero lower bound, particularly for shorter maturities. However, the number of banks with negative deposit rates for any segment remains small (see Chart 10).

Before the crisis deposit rates were lower overall in vulnerable countries than in less vulnerable countries. This is largely explained by the difference in the maturity of the deposits (see Chart 9). Particularly in vulnerable countries, overnight deposits made up a significant share of bank deposits from the non-financial sector. Since the crisis, the share of overnight deposits has increased in both vulnerable and less vulnerable countries against the background of lower interest rates. However, the increase in the weight of overnight deposits started later in vulnerable countries, against a background of hampered access to wholesale funding markets. The share of long-term deposits has declined somewhat in the euro area as a whole, driven by developments in less vulnerable countries, but it remains considerably higher than in vulnerable countries.

Chart 9

Breakdown of non-financial private sector deposits by maturity

(EUR billions)

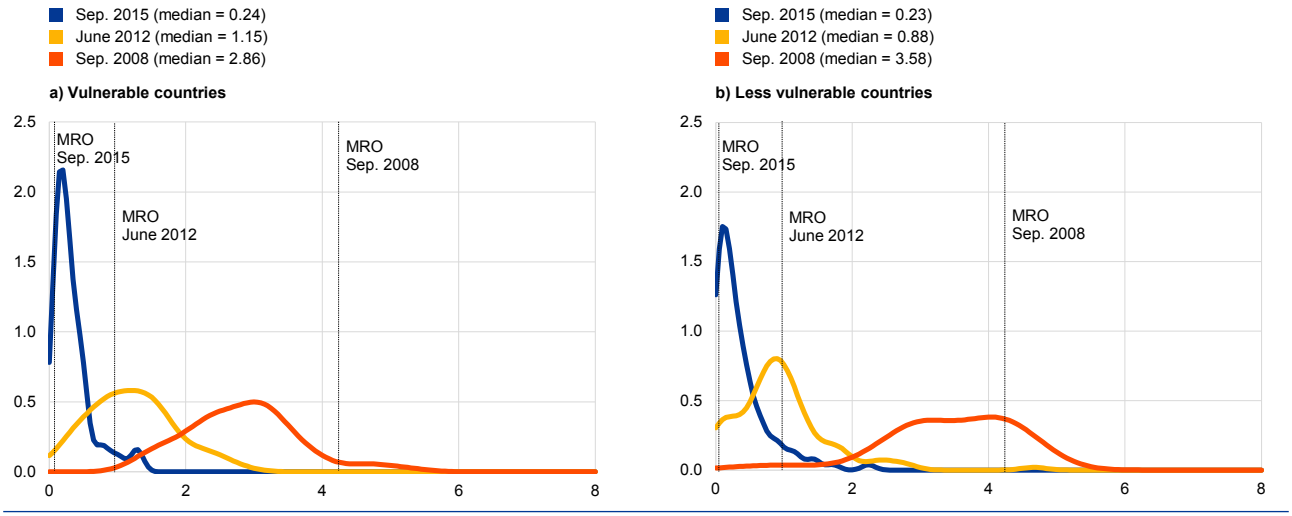


Source: ECB.

Chart 10

Distribution of euro area bank deposit rates for the non-financial private sector

(percentages per annum)



Sources: iBoxx and ECB.

Notes: Composite rates are computed as averages of new business rates for different maturities, weighted by outstanding amounts. The chart shows the density approximation of the distribution of deposit rates obtained from a sample of MFIs in vulnerable and less vulnerable countries.

Deposit rates in vulnerable countries did not fully follow policy rate declines at the height of the crisis. The median deposit rate for banks in vulnerable countries fell from 2.86% in September 2008, when policy rates were cut, to around 1.15% in mid-2012 (see Chart 10). In less vulnerable countries, the median deposit interest rate fell further (from 3.58% to 0.88%). In vulnerable countries, deposit outflows and banks' need to attract more stable funding may have stemmed the decrease in rates.[35] Since the OMT announcement in the middle of 2012, deposit outflows linked to concerns about the health of sovereigns and banks have receded. Deposit rates have fallen and the dispersion in pricing across banks in vulnerable countries has also declined notably, particularly following the announcement of further credit easing by the ECB in mid-2014 and the expanded APP in early 2015. Deposit rates are increasingly clustered at zero as the effect of monetary easing keeps funding costs low. Nonetheless, banks have proved reluctant to set negative deposit rates. This is likely to reflect commercial policies, since retail depositors are likely to be less averse to an increase in commissions than to a negative deposit rate. It may also reflect the gradual pass-through of past cuts in monetary policy rates to deposit rates and the recent re-pricing in wholesale markets.

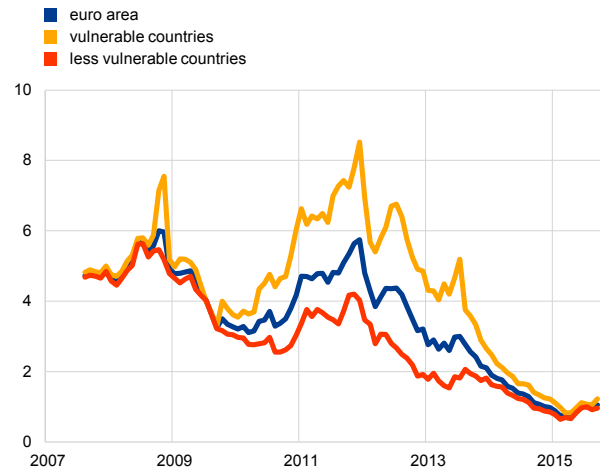
Banks' access to market funding deteriorated during the crisis, with funding flows diminishing and the cost of issuing debt securities increasing substantially. Around the time of the turmoil related to the sub-prime mortgage crisis in the United States and the collapse of Lehman Brothers there was a general increase in market funding costs in the euro area (see Chart 11). While this increase was more significant in vulnerable countries, it was driven by a small number of large banks that were particularly affected by the collapse of Lehman Brothers. When the sovereign debt crisis broke out in early 2010, the level and dispersion of

[35] See the box entitled "The impact of the financial crisis on banks' deposit margins", *Financial Stability Review*, ECB, June 2011.

Chart 11

Yields on bonds issued by euro area banks

(percentages per annum)



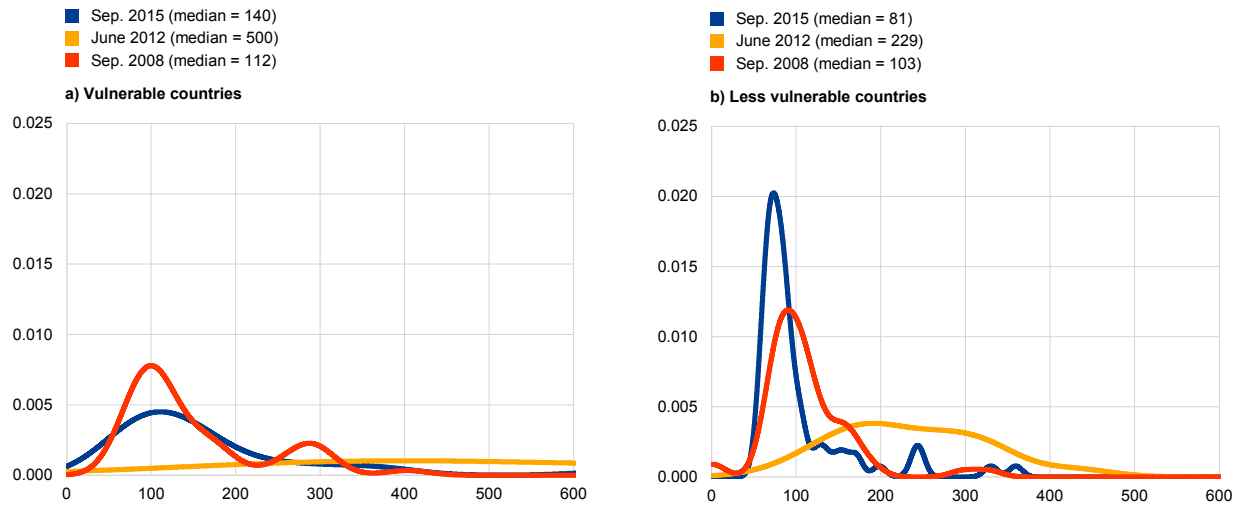
Sources: iBoxx and ECB.
Note: Bank bond yields are averaged by outstanding amount of securities issued.

market funding costs increased in vulnerable countries, while banks in less vulnerable countries were more insulated from the turmoil. By the middle of 2011, as the sovereign debt crisis intensified, market funding costs for banks in both vulnerable and less vulnerable countries had increased, although the gap between them also widened.[36] While the introduction at the end of 2011 and in early 2012 of the LTROs with a three-year maturity acted as a strong backstop to prevent forced deleveraging of banks and helped subdue market funding costs, these remained high overall until the OMT announcement in mid-2012. Bond yields have since fallen across both vulnerable and less vulnerable countries. Market funding costs declined further for most euro area banks as a result of the expanded APP, at least until the re-pricing in financial markets observed in April 2015. Developments in credit default swap (CDS) spreads, which abstract from differences in the type and maturity of the debt securities issued by banks, were broadly in line with bank bond yields. Distributions of five-year CDS spreads show that the sovereign debt crisis led to a significant increase in the dispersion of the perceived credit risk of banks, most notably in vulnerable countries (see Chart 12). The ECB's monetary policy actions since the second half of 2012 and the strengthening of the European supervisory, regulatory and resolution framework have led to a decline in the stress in financial

Chart 12

Distribution of five-year bank CDS spreads

(basis points)



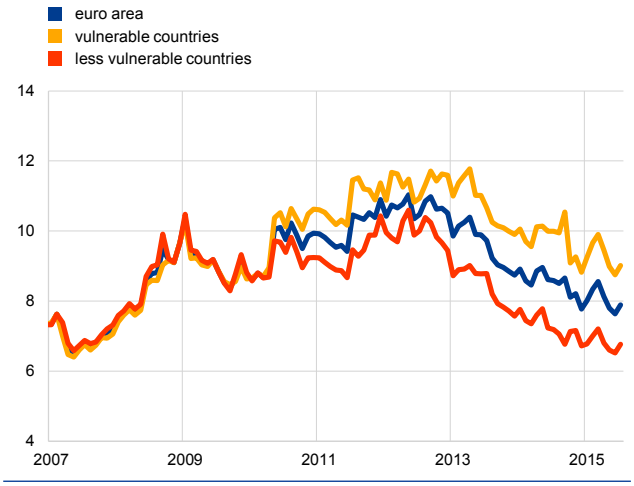
Sources: Datastream and ECB.
Note: The chart shows the density approximation of the distribution of five-year CDS spreads obtained from a sample of MFIs in vulnerable and less vulnerable countries.

[36] See Babihuga, R. and Spaltro, M., "Bank Funding Costs for International Banks", *IMF Working Papers,* No 14/71, April 2014.

Chart 13

Cost of euro area bank equity

(percentages per annum)



Sources: Bloomberg, Thomson Reuters Datastream, Consensus Economics and ECB calculations.

markets and a decrease in the dispersion of the perceived risk of euro area banks, as well as in their wholesale market funding costs. Nonetheless, renewed tensions in Greece have led to an increase in CDS spreads for some banks since early 2015.

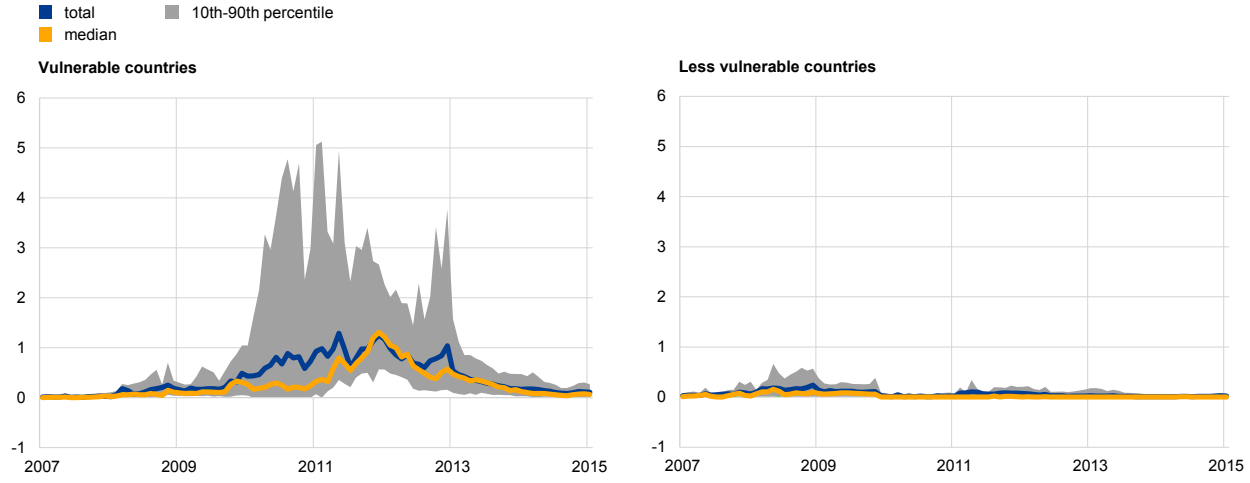
The cost of equity for euro area banks rose sharply during the financial crisis (see Chart 13). This was triggered by the sub-prime mortgage crisis in the United States. A gap between the expected return paid by banks in vulnerable and less vulnerable countries started to open up after the outbreak of the euro area sovereign crisis in 2010. Until the summer of 2007 euro area banks had been able to raise equity at an expected rate of return of approximately 7%. Between the beginning of the US subprime crisis and the collapse of Lehman Brothers, their cost of equity rose to almost 10%. It continued to increase until the second half of 2012, when it reached a level well above 10%. Eventually, the introduction of the three-year LTROs and the OMT announcement began to moderate risk aversion in financial markets. At the same time, risk-free rates decreased and banks undertook a steady process of deleveraging that resulted in a reduction of their market risk. As a result, even though the equity premium has remained a few percentage points higher than before the crisis, lower risk-free rates and lower balance sheet risks have brought the cost of bank equity back down to levels close to those prevailing before the crisis (see Box 1 for details of the cost of equity estimation). However, the gap between banks' equity funding costs in vulnerable and less vulnerable countries has not closed and has reached spreads of approximately 2 percentage points.

Overall, Eurosystem support played a major role during the crisis in mitigating distortions related to dysfunctional funding markets by providing abundant liquidity at low interest rates and minimising the pro-cyclical contraction in lending to the non-financial private sector. Chart 14 provides a simple illustration of the direct impact of Eurosystem liquidity on banks' funding costs. Against the background of the ECB's forward guidance and fixed rate full allotment policy, banks were able to use liquidity provided by the central bank for refinancing in place of wholesale market debt in a context of adverse market conditions. This effect can be illustrated by assuming that in the absence of Eurosystem liquidity banks would have issued debt securities at the cost implied by the secondary market, leading to a higher weighted average cost of debt funding. This measure shows considerable dispersion across banks and particularly high cost relief for banks located in vulnerable countries. For banks in less vulnerable countries, the cost relief provided by Eurosystem liquidity was smaller, even though it increased for a minority of banks following the collapse of Lehman Brothers, and then more modestly at the peak of the sovereign debt crisis. This indicator is likely to underestimate the actual impact of Eurosystem liquidity, since it abstracts from the relief from quantitative constraints

Chart 14

Interaction between Eurosystem liquidity and banks' average cost of debt financing

(percentages per annum)



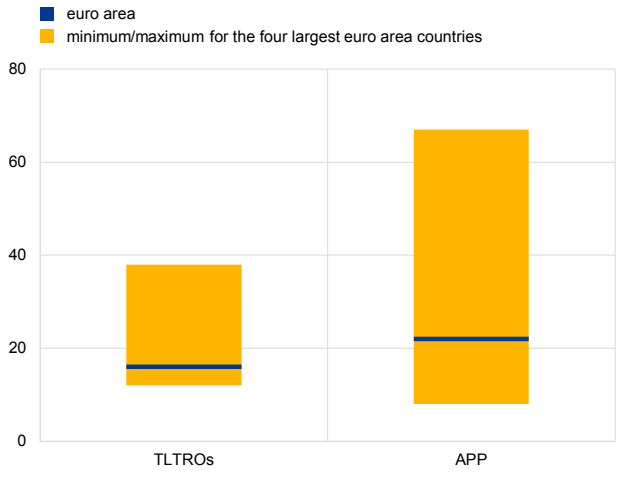
Sources: iBoxx, ECB and ECB calculations.
Note: The shaded area shows the distribution between the 10th and 90th percentiles. The indicator is calculated by attributing the cost of debt securities to the share of Eurosystem liquidity in banks' funding structures. On this basis, a hypothetical weighted average cost of debt funding is obtained and compared with that which was actually observed. The components of debt funding considered are deposits of the non-financial private sector, debt securities and Eurosystem liquidity.

and from the positive effect of the operations on the price of other funding sources due to improved market sentiment. On the other hand, it could also be the case that relatively profitable opportunities emerged, given the access to liquidity at a very low cost, which would mean that if the liquidity had not been available, banks would have simply forgone those opportunities and not issued debt.

Chart 15

Estimated impact of the TLTROs and APP on bank bond yields

(basis points)



Source: ECB calculations.

All three main transmission channels of the APP and the TLTROs – the direct pass-through, portfolio rebalancing and signalling channels – have an impact on bank funding costs and, ultimately, output and inflation.[37] There are a number of ways to estimate the direct and indirect impact of the APP and the TLTROs on banks' funding conditions, one of which is using controlled event studies. Such studies suggest that the combined effects of the non-standard monetary policy measures implemented since June 2014 have significantly lowered yields in a broad set of financial market segments, with the effects generally increasing with maturity and riskiness (see Chart 15).[38]

[37] For a more detailed discussion of the different channels, see Borio, C. and Disyatat, P., "Unconventional monetary policies: an appraisal", *BIS Working Papers*, No 292, November 2009.

[38] See Altavilla, C., Carboni, G. and Motto, R., "Asset purchase programmes and financial markets: lessons from the euro area", *Working Paper Series*, No 1864, ECB, November 2015.

4 Conclusions

Changes in the composition and cost of bank funding and capital have important implications for credit provision and, consequently, for output and inflation. Banks' funding costs are affected by monetary policy, but the transmission of monetary policy depends on many factors, including the strength of banks' balance sheets and the macroeconomic environment.

Over the crisis, funding conditions fluctuated greatly, owing to changes in the economic environment, financial and sovereign market tensions and the monetary policy response to these developments. Bank funding structures changed considerably, in part reflecting the need to increase the weight of capital in the overall funding mix and reduce the overreliance on wholesale funding that was observed in the run-up to the crisis. The ECB's standard and non-standard monetary policy measures provided considerable support to the economy over the different phases of the crisis. The Governing Council decreased the interest rate on refinancing operations and increased the quantity and maturity of liquidity provided to banks, which helped prevent disorderly deleveraging and mitigate the stress in funding markets. Steps towards a banking union and a more comprehensive regulatory environment have also encouraged a move towards a more sustainable and resilient funding structure. More recently, as the banking system has stabilised, policies have been introduced to address below-target inflation. The credit easing package introduced in the middle of 2014 and the APP provide additional liquidity and reduce funding costs, supporting banks' intermediation capacity and, ultimately, output and inflation.

While monetary policy measures have helped to reduce the heterogeneity in euro area funding conditions (particularly for deposits and bonds, leading to improved policy transmission), there remain differences across countries, as seen in the cost of equity. The differences in the cost of equity across countries reflect remaining differences in perceived risk, as well as underlying differences in strength of banks' balance sheets and expected profitability. Many of the problems for banks are related to structural issues that are outside the realm of monetary policy and require action from the private sector or governments to ensure a sustained recovery.

Current monetary policy measures and a changing regulatory environment will continue to affect the composition and cost of bank funding. Steps towards banking union and important regulatory initiatives at the global and European level will strengthen banks, which will have a considerable impact on their funding structure. While the adjustment to this new environment may carry costs in the short term, the reduction in the risk of further systemic crises will lead to a more stable banking system and robust transmission mechanism.

Box 1
Estimation of the cost of equity

This box outlines the approach used to estimate the cost of equity (COE) of euro area banks. Estimates are based on an application of the capital asset pricing model (CAPM). This approach can be applied to a portfolio of the largest listed euro area banks.

The COE is the rate of return that shareholders expect to earn (in equilibrium) on a stake in the equity of a bank or a portfolio of banks. The value of an investment should amount to the expected sum of all its future cash flows, discounted at a rate that compensates for the investment risk: this discount rate is defined as the COE of that investment.[39] As the COE is unobservable, it must be inferred from prices and expected cash flows using a theoretical model.

There are two methods of estimating banks' COE: a direct and an indirect one.[40] Direct estimates invert the discounted cash flow formula to compute the COE, given the market price of equity and the (survey-based) market expectations of banks' future cash flows. As the market price must (in equilibrium) coincide with the discounted sum of all expected future cash flows, the valuation formula can be solved for the discount rate that prices the banks' equity. This is also called the implied equity premium approach. Indirect estimates, on the other hand, first infer an implied COE for the whole stock market and then project it onto banks' COE with an economic model. As with direct estimates, the first step is calculated using the implied equity premium approach, while the CAPM operationalises the second stage. The difference between the expected return on the stock market and the risk-free rate is known as the market equity premium, a measure of the market price of risk that is used to price all assets under the CAPM.

The methodology used in this box relies on the indirect method and is based on two elements: an estimate of the market equity premium and its projection onto banks' COE obtained using the CAPM. The CAPM is a general equilibrium model that imposes tight restrictions on the cross section of expected returns. It predicts that the expected excess return on asset over the risk-free rate $(E[R_i] - R_{rf})$ is linear in β_i for any i:

$$(E[R_i] - R_{rf}) = \beta_i (E[R_m] - R_{rf})$$

where $(E[R_m] - R_{rf})$ is the equity premium (market price of risk) and $\beta_i = [cov(R_i,R_m)/var(R_m)]$ measures the contribution of asset i to the risk of the market portfolio (quantity of risk). Given the market price of risk, the quantity of risk β_i is sufficient to price asset i.

The reference market portfolio here is the euro area stock market. This is approximated by the Euro STOXX portfolio, a broad yet liquid subset of the STOXX Europe 600 portfolio. Returns on

[39] More generally, the COE can be defined for a single project or a portfolio – a firm (portfolio of projects), a sector (portfolio of firms) or the whole stock market (portfolio of all firms).

[40] This box does not explicitly consider surveys in which financial sector participants only report their estimated COE and/or historical averages of realised excess returns as a proxy for the COE. The former are excluded as they are crude numbers which do not lend themselves to economic interpretation, and the latter are excluded as they are generated by a naive model.

the portfolio of 33 Euro STOXX banks are aggregated using daily market capitalisation as weights. These banks account for roughly 85% of the total assets and total market capitalisation of all listed euro area banks.[41]

The quantity of risk carried by bank shares (i.e. banks' beta) is estimated using standard linear regression techniques.[42] Returns of each portfolio are regressed on the returns of the market index. The reference market index for all securities is the Euro STOXX index because the euro area is a well-integrated financial market with low cross-border transaction costs and a single currency. In order to document the development of the industry's COE over time, the analysis concentrates on spot estimates of beta, obtained with rolling regressions of daily data over short windows (one year).[43] Euro area banks' beta was fairly stable (between 1.0 and 1.2) until the first half of 2007. Following the outbreak of the financial crisis, it increased constantly until it reached 1.7 in the second half of 2012. After this peak, there was a sharp decline, back to pre-crisis levels.

The equity premium is estimated using the market price of equity and analysts' expectations of future dividends. Implied premia are forward-looking measures, calculated using a variant of the discounted cash flow model (DCFM). Assuming a constant dividend pay-out ratio, which implies an equal growth rate of earnings and dividends, the DCFM reduces to the dividend discount model (DDM). In its simplest form, the DDM posits that the value of equity is determined by the flow of dividends that it yields to investors, discounted at a rate that accounts for a term premium and an equity risk premium.[44] The basic, constant growth DDM can be represented as follows:

$$P_t = E_t \sum_{k=0}^{\infty} \frac{D_{t+k}}{\rho_{t+k}}$$

where D_{t+k} is the level of dividends in period t + k and p_{t+k} is the discount rate from t to t + k, defined as the sum of the risk-free rate and the equity premium:

$$P_{t+k} = 1 + R^{rf}_{t+k} + EP_t$$

Assuming that dividends grow at a constant rate g , the two equations imply that

$$EP_t = \frac{D_t}{\rho_t}(1 + g) - (R^{rf}_t - g)$$

41 For reasons of data quality and availability, the countries defined in this article as vulnerable and less vulnerable are represented in this box by the following countries: Spain and Italy for vulnerable countries and Belgium, Germany, France and Austria for less vulnerable countries.

42 As in Fama, E.F. and MacBeth, J.D., "Risk, Return, and Equilibrium: Empirical Tests", *Journal of Political Economy*, Vol. 81, No 3, 1973, pp. 607-636.

43 For the sake of robustness, the estimates are compared with those obtained from five-year rolling windows of monthly data. The difference is not statistically significant, except for the recent period. The departure of the two measures from one another in the last period is a sign of the ongoing deleveraging of European banks.

44 See Gordon, M. J., "Dividends, Earnings, and Stock Prices", *Review of Economics and Statistics*, Vol. 41, No 2, 1959, pp. 99-105.

The equity premium is estimated using a variation of the DDM known as the H-model. [45] Dividends are expected to grow at an abnormal rate for g_a (an average of) H years and gradually decelerate/accelerate to a normal growth rate g_{ss} in the long run. The expected growth rate is assumed to decline linearly from an initial rate g_a to the long-term (constant) rate g_{ss}:

$$EP_t = \frac{D_t}{\rho_t}(1 + g_a) + H * (g_a - g_{ss}) - (R_t^{rf} - g_{ss})$$

The long-term expected growth rate g_{ss}, is obtained from the forecast survey of Consensus Economics, as the long-term real GDP growth forecast (beyond five years ahead). Long-term real interest rates are yields to maturity on ten-year inflation-linked sovereign bonds. Dividend yields D_t/P_t and abnormal growth rate forecasts g_a are obtained from the Institutional Brokers Estimate System (I/B/E/S) database. This database measures a weighted (by market capitalisation) average of the median forecast of the annual growth rate of earnings for individual firms included in the Euro STOXX index over a five-year period.

[45] As in Fuller, R.J. and Hsia, C.-C., "A Simplified Common Stock Valuation Model", *Financial Analysts Journal*, Vol. 40, No 5, 1984, pp. 49-56.