FINANCIAL STABILITY REVIEW

DECEMBER 2011

EUROPEAN CENTRAL BANK

EUROSYSTEM
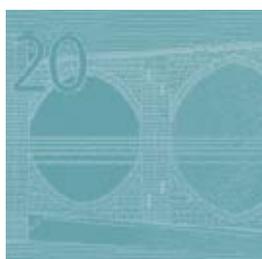
In 2011 all ECB
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feature a motif
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PREFACE

Financial stability can be defined as a condition in which the financial system – which comprises financial intermediaries, markets and market infrastructures – is capable of withstanding shocks and the unravelling of financial imbalances. This mitigates the likelihood of disruptions in the financial intermediation process that are severe enough to significantly impair the allocation of savings to profitable investment opportunities. Understood this way, the safeguarding of financial stability requires identifying the main sources of risk and vulnerability. Such sources include inefficiencies in the allocation of financial resources from savers to investors and the mispricing or mismanagement of financial risks. The identification of risks and vulnerabilities is necessary because the monitoring of financial stability must be forward-looking: inefficiencies in the allocation of capital or shortcomings in the pricing and management of risk can, if they lay the foundations for vulnerabilities, compromise future financial system stability and therefore economic stability. This Review assesses the stability of the euro area financial system both with regard to the role it plays in facilitating economic processes and with respect to its ability to prevent adverse shocks from having inordinately disruptive impacts.

The purpose of publishing this Review is to promote awareness in the financial industry and among the public at large of issues that are relevant for safeguarding the stability of the euro area financial system. By providing an overview of sources of risk and vulnerability for financial stability, the Review also seeks to play a role in preventing financial crises.

The analysis contained in this Review was prepared with the close involvement of the Financial Stability Committee (FSC). The FSC assists the decision-making bodies of the European Central Bank (ECB) in the fulfilment of the ECB's tasks in the field of financial stability.

I OVERVIEW

Risks to euro area financial stability increased considerably in the second half of 2011, as the sovereign risk crisis and its interplay with the banking sector worsened in an environment of weakening macroeconomic growth prospects. Indeed, several key risks identified in the June 2011 Financial Stability Review (FSR) materialised after its finalisation. Most notably, contagion effects in larger euro area sovereigns gathered strength amid rising headwinds from the interplay between the vulnerability of public finances and the financial sector. Euro area bank funding pressures, while contained by timely central bank action, increased markedly in specific market segments, particularly for unsecured term funding and US dollar funding.

While several catalysts were at play in prompting the materialisation of these key risks, a combination of weakening macroeconomic growth prospects and the unprecedented loss of confidence in sovereign signatures were key factors, crystallising in downgrades, both within and outside the euro area, by major credit rating agencies. Positive market responses to European measures aimed at stemming the crisis appear to have been short-lived – indeed, a bumpy ratification process appears to have contributed to additional market uncertainties. At the same time, downward revisions to the outlook for macroeconomic growth contributed to a lower shock-absorption capacity of euro area financial institutions. This environment implied a significant increase in funding costs and also created challenges for selected sovereign and bank issuers in accessing bond markets. Ultimately, the transmission of tensions among sovereigns, across banks and between the two intensified to take on systemic crisis proportions not witnessed since the collapse of Lehman Brothers three years ago.

Amid these rising tensions, a package of measures to restore confidence and address the current tensions in financial markets was agreed by the European Council and euro area Heads of State or Government on 9 December. A swift and effective implementation of all key elements – a new fiscal compact and the strengthening of stabilisation tools for the euro area, including a more effective European Financial Stability Facility (EFSF), the bringing-forward of the implementation of the European Stability Mechanism (ESM) and a solution for the unique challenges faced in Greece – is pivotal in making a decisive contribution to curtailing the cycle of risk intensification in the euro area that characterised the latter half of 2011. In addition, measures were taken for a durable strengthening of the capital of European banks, while also addressing their funding needs, with the ECB deciding on additional enhanced credit support measures to strengthen bank lending and liquidity in the euro area money market on 8 December.

MAIN RISKS TO EURO AREA FINANCIAL STABILITY

Mirroring the magnitude of the crisis, vulnerabilities and sources of risk have sprung widely from the euro area macro-financial environment. While remaining uneven across both economic sectors and countries, the breadth of vulnerabilities continues to relate predominantly to the unusual amount of balance sheet adjustment necessary after the widespread credit expansion that presaged the global financial crisis. This applies most acutely to the government sector – with worsening public finances a feature shared by virtually all advanced economies. The non-financial private sector also faces some challenges, notably from an ongoing macroeconomic slowdown, but with aggregate euro area balance sheet positions that make it relatively more robust to weather such forces. In parallel, financial markets exhibited heightened volatility and, on occasion, even extreme turbulences, with sharp adjustments characterising the latter half of 2011. In this environment, financial stability in the euro area has faced strong headwinds. In particular, four related and intertwined risks are key at present (see the table below).

Four key risks to euro area financial stability
1. Contagion and negative feedback between the vulnerability of public finances, the financial sector and economic growth
2. Funding strains in the euro area banking sector
3. Weakening macroeconomic activity, credit risks for banks and second-round effects through a reduced credit availability in the economy
4. Imbalances of key global economies and the risk of a sharp global economic slowdown

The *first key risk*, arguably the most important, concerns the potential for a further intensification of contagion and the negative feedback between the vulnerability of public finances, the financial sector and economic growth. Sovereign and banking sector stress has intensified throughout the euro area since the middle of 2011, becoming broad in geographic scope and including some of the largest member countries. A central aggravating factor appears to have been the further deterioration in the outlook for economic growth. The vulnerability to further contagion remains highest for those countries that are perceived to exhibit a combination of vulnerable fiscal positions, weak macro-financial conditions, and the potential for further significant losses in the banking sector. Despite several national initiatives aimed at improving fiscal fundamentals, as well as the announcement or adoption of supranational initiatives to stem stress, contagion effects have spread widely across euro area sovereigns and banks. The possibility that more euro area sovereigns will, as a consequence, face difficulties in refinancing their debt remains among the most pressing risks to euro area financial stability. A swift and complete implementation of the measures announced by the European Council and euro area Heads of State or Government on 9 December would mitigate this risk considerably.

A further materialisation of this risk may nonetheless be triggered by several potential factors. Perhaps most importantly, any emergence of protracted domestic political uncertainties in vulnerable countries, combined with fiscal consolidation lagging behind EU recommendations and programme plans, would further undermine confidence in the adjustment process. Other factors may also increase market participants' reluctance to invest in European assets – of which four are noteworthy. A first trigger could relate to negative news on euro area banks' profitability and solvency. A second would stem from any further deterioration of the credit ratings of euro area sovereigns and banks, or from the activation of higher margin calls or collateral requirements. A third trigger concerns the potential for any lingering uncertainties about details relating to private sector involvement in respect of Greek sovereign bonds when implementing the decisions taken by the Heads of State or Government. A last trigger relates to implementation risk with respect to the new fiscal compact and the effective size of the EFSF.

A *second key risk* concerns market funding strains in the euro area banking sector. This risk, which is closely intertwined with the aforementioned risk of contagion with sovereign and banking sector stresses, has been aggravated by an abrupt rise in term funding costs, together with a lower availability of funding, in several euro area countries. While unsecured medium and long-term funding markets have been closed for a number of European banks, access to collateralised term funding in euro has been secured for ECB counterparties by the full allotment procedure used by the ECB in its marginal refinancing operations, as well as by its complementary and wide-ranging longer-term refinancing operations. For the immediate future, the ECB has decided on two three-year refinancing operations with an option of early repayment after one year. The broadening of the pool of eligible collateral

available to euro area banks, as well as the lowering of reserve requirements from 2% to 1% on 8 December, has eased euro area banks' access to the central bank's secured term funding further. In order to increase the collateral available to banks, the ECB has lowered the rating threshold for certain asset-backed securities (ABSs), and has allowed national central banks, on a temporary basis, to accept certain performing credit claims (bank loans). The measures announced by the European Council should also contribute more generally to increased confidence in the banking sector, to the extent that the perception of sovereign debt sustainability has been reinforced. Lastly, despite at times severe tensions in financial and, more specifically, interbank markets, financial market infrastructures have remained resilient and have provided a solid anchor of stability. Notwithstanding these factors, the term funding needs of the euro area financial sector remain challenging, and the situation could become more difficult, particularly if headline risk and the market volatility associated with the fiscal and/or financial strains in the euro area persist. Vulnerabilities include not only sovereign financial risk and its potential for spreading further, but also wholesale funding risks from a broad-based fall in market confidence. Another important funding vulnerability stems from the heavy reliance of some large euro area banks on short-term and highly risk-sensitive US dollar funding, mainly through credit provided by money market funds in the United States, which has, however, been alleviated by the implementation of foreign exchange swap lines between major central banks. In this vein, possible triggers for bank funding risks are closely related to those for contagion and the interplay of sovereign and financial sector vulnerabilities, as well as to other factors that lead to a marked increase in country or bank-specific risk premia.

A *third key risk* concerns an increase in credit risks for banks in conjunction with the slowdown in economic activity, and possible second-round effects through reduced credit availability in the economy. Financial stability risks stemming from the euro area non-financial corporate and household sectors have increased as a result of the deterioration of economic prospects. The vulnerabilities in these sectors can pose risks for financial stability, through their strong potential to adversely affect the associated credit risks for banks. Furthermore, the risks could be exacerbated further by the possibility of an adverse feedback loop, whereby a restriction in credit availability prompts a deterioration in the economic outlook and in the quality of banks' assets that, in turn, triggers an additional tightening of credit conditions. In this respect, national supervisors need to ensure that banks' recapitalisation plans, as required by the current EU-wide recapitalisation exercise carried out by the European Banking Authority (EBA), do not lead mainly to unwelcome pro-cyclical deleveraging involving significant constraints on the flow of credit to the real economy. The authorities responsible for macro-prudential oversight should monitor any externalities that arise in considering the aggregate impact of balance sheet adjustments in individual institutions. Moreover, close supervisory scrutiny is warranted to ensure that changes to risk-weighted assets are not used as a means of circumventing a genuine need to raise both the quality and quantity of capital. All of the previously mentioned supervisory tasks will certainly prove to be challenging. The ECB's recent enhanced credit support measures ensure that liquidity issues should as such not be a cause of deleveraging pressures. The current interest rate environment has contributed to enhancing the affordability of debt servicing and has fostered the adjustment of balance sheets in relation to property markets. However, there remain vulnerabilities that are related to households' and non-financial corporations' leverage and the associated sensitivity of debt-servicing capacities to changing economic and financial conditions, as well as to a prospective need for eventual mark-downs on the value of commercial and residential property loan portfolios that would strain financial sector balance sheets. The need to monitor loan portfolios extends to exposures beyond euro area borders, notably the foreign currency loan exposures of euro area banks in non-euro area EU countries. The most relevant prospective trigger of stronger than expected deleveraging pressures would be a sharp deterioration of macro-financial conditions.

The risk that pro-cyclical deleveraging leads to a marked rationing of credit

A *fourth and last key risk* concerns the external environment for the euro area, namely the risk of an abrupt unwinding of imbalances in key global economies that could result from a sharp global economic slowdown. Specific concerns include fiscal and economic weaknesses in key advanced economies across the globe, and a sudden halt of private capital flows to emerging markets. For advanced economies, a major macro risk is that key industrialised countries experience a further slowdown of economic growth as a result of both further declines in confidence and financial market tensions. In the United States, in particular, ongoing uncertainty about the medium-term fiscal policy, as well as potential further declines in consumer and business confidence arising, in part, from sovereign stress in Europe, may lead to deteriorating growth prospects, with the associated potential spillover effects to global growth and financial stability. For some emerging economies, the key financial stability risks have shifted away from overheating and the potential for boom-bust cycles in private credit and asset prices to the risk of sudden interruptions of capital inflows and the potential for a negative spillover to, and contagion from, financial tensions in advanced economies. However, in some other countries, a rapid expansion of credit, inflationary pressures, the risk of delayed macroeconomic policy responses and concerns about the quality of banks' assets are contributing to medium-term risks related to the possibility of a hard landing of a key emerging economy or set of economies. An unfolding of either scenario would impact global and euro area financial stability through direct and indirect exposures, given strong trade, as well as financial and confidence linkages, between the euro area and other major economies. A possible trigger for a sudden stop of capital flows to emerging economies could be a sharp increase in global investors' risk aversion, while the trigger for the fiscal and economic weaknesses in key advanced economies could be a more marked global economic slowdown or a market reassessment of fiscal sustainability in any of the key advanced economies.

OTHER RISKS

While many relevant factors are captured by the four key risks to euro area financial stability highlighted above, this succinct set of risks does not, and cannot feasibly, capture all prospective sources of financial instability. A close monitoring of other developments is therefore crucial for a more complete underpinning of known risks to financial stability. Numerous initiatives at the European and international level, and their potential to shed light on risks, while also mitigating them, are noteworthy in this respect. Perhaps most importantly, considerable benefits should accrue from endeavours to improve transparency and the capacity for effective monitoring, particularly in areas where detailed or even basic information is currently lacking. Given its inherent dynamic nature, financial innovation in conjunction with structural changes in the financial system falls mainly in these areas, since notwithstanding the beneficial impacts some innovations can have on risk allocation and financial resilience, they can harbour potential for creating pockets of vulnerability. Financial innovation that has been monitored in this respect has generally focused on those developments that have altered market microstructure. Specific examples of European and/or international cross-border initiatives include work on mitigating risks inherent in exchange-traded funds and in high-frequency and algorithmic trading. At the same time, it is important that endeavours to improve the means of monitoring financial institutions cover all relevant entities and not only banks – in particular, they should include the monitoring of financial intermediation outside the traditional banking sector, often referred to as shadow banking, as well as insurance companies and pension funds.

POLICY INITIATIVES TO ADDRESS THE CRISIS AND BUILD A SAFER FINANCIAL SYSTEM

The broad-based worsening of financial stability risks has revealed a need for bold and decisive action both within and outside the euro area. The measures announced or adopted by the European Council and Heads of State or Government contain several basic elements that are key for the restoration of financial stability in the euro area – with five being noteworthy and warranting speedy and effective implementation. First and foremost, unequivocal commitments have been made at the national level to ensure fiscal discipline and accelerate structural reforms for growth and employment, commitments that require rigorous implementation. Second, a forceful assertion of the presence of a strong and credible backstop by the EFSF would make a decisive contribution to halting the downward spiral of self-fulfilling dynamics in the pernicious interplay between sovereign, banking and macroeconomic forces. Third, measures have been taken that are aimed at a durable strengthening of the capital of European banks, while also addressing their funding needs. Fourth, measures have been announced that meet the unique needs of Greece, which faces a set of challenges unlike those confronting any other euro area country. Fifth, the significant strengthening of economic and fiscal coordination and surveillance is now firmly in place, and further steps to improve fiscal discipline and deeper economic union will be sought.

A need to rapidly and effectively implement measures to combat turmoil and crisis in the EU…

Ultimately, what became painfully clear in the autumn of this year was that bank and sovereign vulnerabilities are inseparable in several countries. At the aggregate euro area level, partial solutions were no substitute for a comprehensive approach to stem contagion and the interplay between fiscal and banking sector vulnerabilities. These two factors needed to be considered in tandem – as two sides of one and the same coin. On the one hand, sovereign debt must retain or regain its benchmark low-risk status at the national level. This entails a need for vulnerable countries within the euro area (and also outside the euro area) to do more to allay concerns about their debt sustainability – as crystallised in market pricing, for instance. Within the euro area, stable and sustainable support needs to also derive from the EFSF and, eventually, the ESM, so as to limit both contagion in abnormal market conditions and risks to financial stability. Clearly, however, pan-European initiatives cannot be effective in the absence of sound and sustainable national policies, which form the necessary foundations upon which any edifice is built. This must be an underlying principle of cross-border initiatives. Discussions giving rise to concerns about the prospect of a widespread failure to honour sovereign signatures were both unproductive and destructive. On the other hand, an orderly bank recapitalisation is a very important supplementary step to help strengthen the resilience of the euro area banking system in parallel, thereby contributing to bolstering financial stability. That said, recapitalisation cannot and should not be considered independent of business models. Those banks that are prone to encountering difficulties must consider fundamental changes, in particular where profitability is overly reliant on low short-term wholesale funding costs. Supplementing these changes in practices at the bank level with the goal of fostering resilience, recapitalisation – together with facilitating access to term funding as a coordinated approach – should also contribute to strengthening the system. To assuage market fears that are at times completely unfounded, a reactive approach clearly needs to be superseded by a proactive approach to determining financial resilience that as such obviates the onset of financial strain. The recapitalisation of the banking sector that is underway in conjunction with supplementary policy measures should contribute to strengthening banks' resilience against future shocks.

… to break a malign feedback loop between sovereigns and banks

On the supervisory and regulatory front, there has been a significant strengthening of both macro- and micro-prudential supervision at the European level in 2011, the first year of existence of the European Systemic Risk Board (ESRB) and three European Supervisory Authorities, namely the European Banking Authority (EBA), the European Securities and Markets Authority (ESMA) and

Enhanced macro- and micro-prudential supervision…

the European Insurance and Occupational Pensions Authority (EIOPA). While much progress has already been made, a further strengthening could derive from an enhanced role of the new European Supervisory Authorities in coordinating effective cooperation across national entities, while retaining some scope for addressing often heterogeneous specific national conditions. This would encourage strong pan-European cooperation and initiatives, as well as a level and stable playing field within the euro area and, more generally, the EU. At the international level, bodies such as the Financial Stability Board (FSB) and the International Monetary Fund (IMF) continue to foster dialogue and action on global financial stability issues.

… supplementing several regulatory initiatives

The severity of the financial crisis demanded a strong regulatory response, which has yielded several initiatives. These regulatory initiatives at both the international and the European level should strengthen the resilience of the financial sector in the future, which will clearly have a positive impact on financial stability in the euro area. Four ongoing initiatives stand out as particularly noteworthy. First, there has been a determined move to improve the soundness of the banking system globally and within Europe. Under the aegis of the G20, much progress has been made, with important milestones being reached, in reforming financial regulations so as to address risks and vulnerabilities identified in the context of the lessons learnt from the financial crisis.

New capital and liquidity standards

A cornerstone of the regulatory reform is the Basel III framework that provides for new global capital and liquidity standards. In Europe, the revised Capital Requirements Directive (CRD IV) clearly demonstrates the commitment of the EU to the full and timely implementation of Basel III. It is nonetheless crucial to ensure that the CRD IV corresponds to the Basel III agreement in all aspects, not least because it introduces prudential requirements via a regulation, thus establishing what is typically referred to as an EU rulebook. In general, a "single rulebook" approach for financial regulation, as proposed in the CRD IV, should be supported for financial stability reasons, but it is important that adjustments can be made to some of the harmonised minima at the level of both the EU and individual Member States. However, such adjustments should be restricted to allowing only a more stringent calibration of a restrictive set of requirements, while maintaining underlying definitions, and should be subject to strict safeguards, with the ESRB playing a significant role in coordination.

Addressing "SIFIs"

Second, the financial crisis revealed a clear need for measures to address systemically important financial institutions (SIFIs). In this vein, another important step towards strengthening the resilience of the financial markets is the agreement reached on establishing a consistent and effective international framework for global systemically important banks. A timely and internationally coordinated implementation of the framework, in particular the graduated capital surcharge, is crucial. Moreover, in order to avoid regulatory arbitrage, work needs to progress on extending the regulatory net to capture non-bank SIFIs.

Crisis management and resolution

Third, important steps have been taken to strengthen the framework for crisis management and resolution. At the international level, the new standard containing key attributes of effective resolution regimes that was approved by the G20 at the Cannes Summit in November 2011 sets out the key elements that all resolution regimes should contain to enable authorities to resolve failures of SIFIs in an orderly manner without exposing the taxpayer to the risk of losses, as well as principles on cross-border cooperation. At the European level, legislative proposals of the European Commission for an EU framework for the recovery and resolution of failing financial institutions are scheduled for early next year. Ultimately, both international and EU initiatives should provide the means to facilitate the management and resolution of bank crises also at a cross-border level. These initiatives aim to ensure that resolution authorities have the appropriate tools and powers at

their disposal, provide principles for cooperation (even if the latter are mainly non-binding) and basically leave national authorities some degree of freedom. These initiatives constitute a realistic step to promote cooperation, acknowledging that a more binding framework for authorities would be difficult to implement at the current stage. At the very least, a harmonised list of powers should already increase the chance of coordinated action in the event of a failure of a cross-border financial group, although further work is necessary. In particular, especially across EU Member States, insolvency laws may need to be harmonised and robust resolution financing mechanisms should be found so as to minimise the exposure of taxpayers and avoid public burden-sharing conflicts. In this way, the EU could over the medium term gradually move towards a more integrated framework which may ultimately prevent fragmented national responses and ensure the most efficient resolution of systemic cross-border firms.

Fourth, there is a need to improve and more effectively regulate over-the-counter (OTC) derivatives markets – an area where more progress is needed. In September 2009, the G20 leaders agreed in Pittsburgh that *"all standardised OTC derivative contracts should be traded on exchanges or electronic trading platforms, where appropriate, and cleared through central counterparties by end-2012 at the latest."* Although some progress has been made, delays are evident. Few G20 members have the legislation or regulations in place for achieving the commitments to ensure central clearing, organised platform trading and reporting to trade repositories by the end of 2012. The development of international standards is still underway in some areas, and the rules needed are complex and subject to interdependencies. Frameworks are needed, first of all, for the largest OTC derivatives markets, such as those in the United States and the EU. But the development of frameworks is only the beginning of the process – firms, markets, infrastructures and authorities then need to implement those frameworks. In the EU, some progress has been made with the European Market Infrastructure Regulation (EMIR), which is aimed at fulfilling the G20 mandate on OTC derivatives. Ultimately, all relevant work in the field of OTC derivatives being undertaken at the global and the European level must be pushed forward quickly and consistently so as to avoid any divergence of different national rules that could lead to regulatory arbitrage.

Regulation of OTC derivatives markets

THIS EDITION OF THE FINANCIAL STABILITY REVIEW

Euro area and, more generally, global financial stability stands at a pivotal point where steps to improve the current situation also present an opportunity to redress failings of the pre-crisis period. Several steps at the national level within euro area countries, in addition to overdue supranational initiatives, should not only aim at attenuating current tensions, but also pave the way for a strengthening of the fundamentals underpinning Economic and Monetary Union. This FSR contains a detailed analysis of factors that play a role when considering the financial stability situation in the euro area – split into an analysis of macro-financial issues and a review of the financial system – supplemented by numerous boxes and special features on issues of current relevance.

Steps to improve not only the present situation, but also the future setting

II THE MACRO-FINANCIAL ENVIRONMENT

I MACRO RISKS

Macro risks have increased given signs of a moderating pace of economic activity in both the euro area and the global economy since the finalisation of the June 2011 Financial Stability Review (FSR). At the same time, progress in global and regional rebalancing has been limited; thus, vulnerabilities related to imbalances among key global economies are continuing to contribute to euro area financial stability risks.

1.1 A WEAKENING OF THE GLOBAL MACROECONOMIC OUTLOOK HAS INCREASED BUSINESS CYCLE RISKS

Data released since the June FSR have been suggesting a broad-based moderation in global macroeconomic activity. While the global economy continued to expand in 2011, albeit at a moderating pace, forecasting institutions have generally revised their growth projections for major economies downwards (see Chart 1.1).

Global medium-term inflationary pressures appear set to ease from currently elevated levels – with easing price pressure already to some extent apparent in the evolution of commodity prices.

Weaker than expected macroeconomic data (see Chart 1.2), uncertainty regarding fiscal consolidation plans in some advanced economies and increased tensions in financial markets have led to increased uncertainty surrounding the economic outlook and to weak business and consumer confidence.

In the **United States**, concerns related to the continued weakness in the housing market, combined with persistently high unemployment, continue to weigh on the growth outlook (see also Box 1). These signs of moderation have, however, also been seen for other large advanced economies. Economic activity in **Japan** is expected to slow in the medium term, following strong export-led growth in the third quarter that reflected in part the recovery from the combined natural and nuclear disasters

Chart 1.1 Real GDP growth and CPI inflation forecasts for 2012 for the world's largest economies

(percentage change per annum)

- real GDP (May 2011 forecast)
- real GDP (November 2011 forecast)
- CPI (May 2011 forecast)
- CPI (November 2011 forecast)
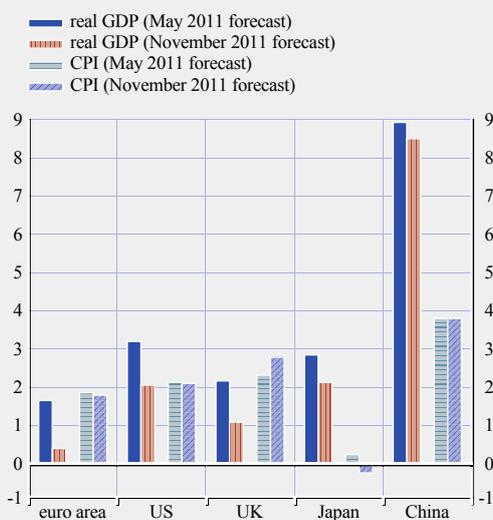
Source: Consensus forecasts.
Note: Average across all available economic forecasters for each country.

Chart 1.2 Citigroup Economic Surprise Index for the United States, Japan and the euro area

(Jan. 2008 – Nov. 2011; index; ten-day moving average)

- euro area
- United States
- Japan
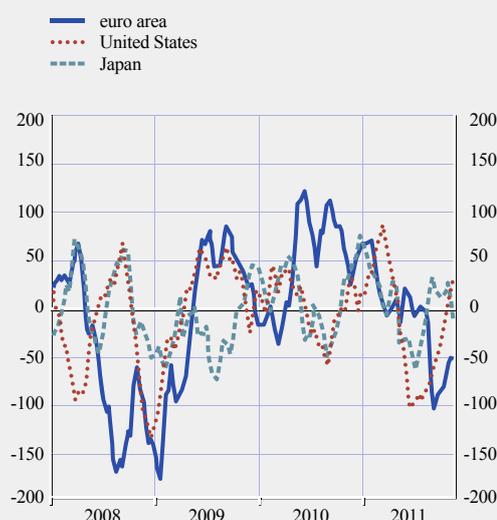
Source: Bloomberg.
Note: A positive reading of the index suggests that economic releases have on balance been more positive than consensus expectations.

earlier in 2011. Key downside risks relate to further yen appreciation and the impact from a potential slowdown of global activity. A materialisation of sustained low growth in advanced economies, combined with a further loss of confidence in the sustainability of public finances in key economies, could lead to a further intensification of financial market tensions and lower growth.

Emerging market economies (EMEs) have not been immune to the slowdown in activity in advanced economies – they have also been exhibiting signs of moderating economic growth compared with the June 2011 FSR, although the expansion remains relatively robust in most key countries. Downside risks to growth have also increased for emerging economies because of weaker external demand from advanced economies, which should, however, be offset somewhat by stronger domestic demand, fuelled by accommodative policies, easy financing conditions and robust labour markets. As pointed out in the June FSR, political risk in the Middle East and North Africa (MENA) region remains elevated and could negatively affect the euro area via weaker demand from the region or via supply disruptions in global commodities markets. Compared with the June FSR, monetary policy in EMEs appears to no longer be in a tightening cycle, with some EMEs either stabilising or lowering policy rates in response to the overall downside risks to growth.

In the **non-euro area EU countries**, the macroeconomic outlook has weakened since the June 2011 FSR, although significant differences remain across countries (see Chart 1.3). Given that exports have been the key driver of output in most non-euro area EU countries, this weaker outlook mainly reflects waning demand by trading partners. Furthermore, households and companies in the region have become more cautious, reflecting subdued labour market conditions, financial market volatility and uncertainty regarding future economic policies.

In the **United Kingdom**, the fragile state of the economy could lead to a postponement

Chart 1.3 Evolution of GDP growth projections for 2011 and 2012 in the largest non-euro area EU countries

(Jan. 2010 – Oct. 2011; percentages)

— Denmark
····· Poland
---- Sweden
— United Kingdom
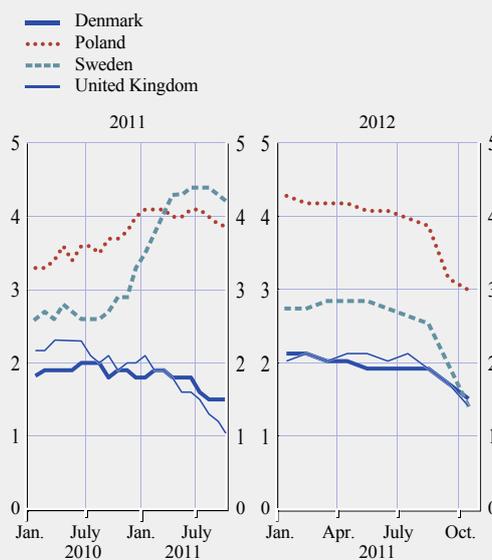
Source: Consensus Economics.

of investment and a further increase in the household saving rate, while concerns over fiscal developments in major trading partners could spill over in the form of renewed financial stress. In other non-euro area EU countries, uncertainty has increased, particularly in the economies that have close financial or trade links with countries that are currently under pressure to ensure the sustainability of their fiscal positions and to preserve the stability of their banking systems. As lending activity remains weak in almost all non-euro area EU countries, the outlook for both household and business spending will also depend on the extent to which the availability of bank credit improves.

The developments in the global economy and non-euro area EU economies have been closely correlated with signs of moderating economic activity in the **euro area**. Compared with the outlook at the time of finalisation of the June 2011 FSR, growth developments have been weaker than expected and some of the tail risks mentioned in the June FSR have actually materialised. National accounts data for euro area annual real GDP signalled falling growth

Table 1.1 Comparison of forecasts for euro area real GDP growth in 2012

(percentage change per annum)

Institution	Date of release	2012
ECB	December 2011	-0.4 – 1.0
	Change since September 2011	*(-0.8 – -1.2)*
European Commission	November 2011[1]	0.5
	Change since May 2011	*(-1.3)*
IMF	September 2011[2]	1.1
	Change since June 2011	*(-0.6)*
ECB Survey of Professional Forecasters	Q4 2011[3]	0.8
	Change since Q3 2011	*(-0.8)*
Consensus Economics	18 November 2011	0.4
	Change since October 2011	*(-0.2)*
Euro Zone Barometer	16 November 2011	0.3
	Change since October 2011	*(-0.3)*

1) European Economic Forecast – Autumn 2011. Forecasts are not working day-adjusted.
2) World Economic Outlook.
3) Survey conducted between 14 and 18 October 2011.

momentum in the second quarter (see Chart S1), also consistent with the deterioration in survey indicators over the past few months.

The slowing of euro area activity appears to reflect a combination of factors. First, euro area developments have been closely

linked to the apparent loss in global growth momentum. Second, domestic factors, such as pent-up domestic demand and a replenishing of inventories, which typically support growth during the earlier stages of a recovery, are waning. Indeed, the euro area capacity utilisation rate is returning to its long-term average. Of course, high uncertainty stemming from the sovereign debt crises in some euro area countries has also played a role, though rather through uncertainty and an associated loss in confidence than through a direct impact of financial market tensions. This latter factor, in particular, has also implied rather heterogenous impacts across countries within the euro area.

Looking ahead, leading indicators of the euro area business cycle point to an ongoing weakening (see Chart 1.4). In line with experience following past financial crises, the recovery is expected to remain muted, implying a slow narrowing of the output gap. This is reflected in a generalised downward revision in the euro area economic growth outlook across all major forecasts (see Table 1.1).

Chart 1.4 The Purchasing Managers' Index and real GDP growth for the euro area

(Jan. 1999 – Oct. 2011)

— PMI composite index (left-hand scale)
······ GDP (percentage change per annum; right-hand scale)
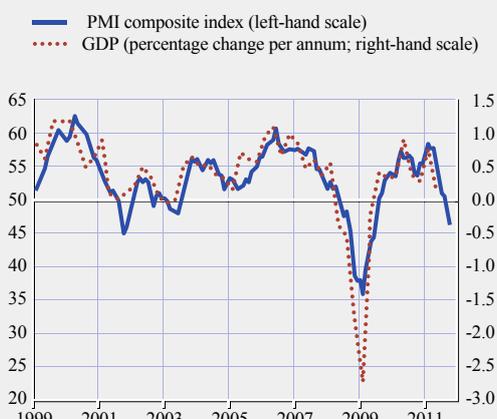
Sources: Eurostat and Markit.

Chart 1.5 Uncertainty and disagreement surrounding one-year-ahead real GDP forecasts for the euro area

(Q1 1999 – Q4 2011; percentage points)

— uncertainty (standard deviation of aggregate probability distribution)
······ disagreement (standard deviation of point forecasts)
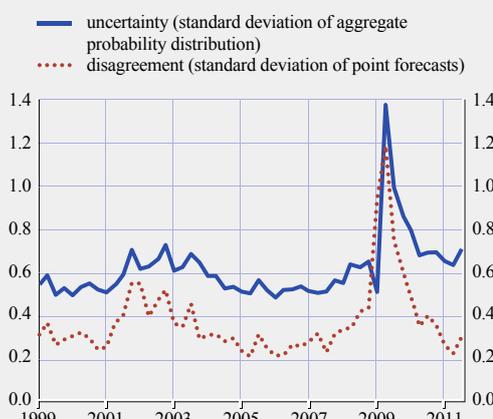
Sources: ECB Survey of Professional Forecasters and ECB calculations.
Note: The scale of the downward revision in the first quarter of 2009 resulted in outcomes of probability distributions for one-year-ahead forecasts located mainly in the lowest, open-ended intervals; thus, the value for the first quarter of 2009 is an underestimation of uncertainty for that quarter.

This growth outlook has, however, coincided also with heightened uncertainty surrounding growth expectations – though still well below historical peaks. Measures derived from the ECB Survey of Professional Forecasters (SPF) probability distributions for one-year-ahead forecasts suggest increasing disagreement among forecasters and uncertainty around individual forecasts (see Chart 1.5).

Nonetheless, the probability attached to adverse growth scenarios has increased since the finalisation of the June 2011 FSR (see Chart S2). Indeed, a key risk to euro area financial stability relates to adverse macro-financial feedback loops. In particular, intensified financial market tensions could arise from a loss of confidence in the recovery and from downgrades and write-offs of sovereign debt. These would affect the banking system through the deterioration of funding conditions for banks and balance sheet impairments. The resulting banking system adjustments in the form of higher lending margins and deleveraging processes would then constrain the provision of bank credit and ultimately weigh on investment and private consumption. Beyond this, there remains considerable heterogeneity in the economic outlook at the country level.

DOWNSIDE RISKS TO REAL ACTIVITY IN THE UNITED STATES: THE ROLE OF DISAGREEMENT IN EXPECTATIONS IN DETERMINING MACROECONOMIC VULNERABILITY

One critique of the build-up phase prior to the onset of the recession in 2008-09 was that "groupthink" amongst macroeconomic forecasters prevailed, whereby a lack of heterogeneity in beliefs led to myopia about the potential for such an event. This reflects a general phenomenon whereby an economy can become more vulnerable if people largely agree about the future course of the economy, and can become more resilient if they hold differing beliefs.[1] One explanation for this phenomenon is that the acquisition of insurance coincides largely with beliefs about economic developments. If expectations are very homogenous, this can lead to higher aggregate risk because of overly homogenous insurance schemes. On the one hand, the risks of a severe downturn may be underplayed and sow the seeds for unhedged losses. On the other hand, risks of recession may be overplayed, thereby leading to overly precautionary behaviour contributing to self-fulfilling outcomes. In either setting, when risk aversion is more homogenous, aggregate losses may be amplified. This box examines financial stability risks from disagreement in macroeconomic expectations, on the basis of a model using a disagreement metric for measuring and assessing financial stability.

Comparing aggregate consumer disagreement[2] with GDP growth for the United States shows that for the last three decades, the NBER dated recessions have been preceded by a continual rise in agreement throughout the expansion periods (see Chart A). During intermediate contraction phases, more disagreement built up. Local peaks in agreement tended to occur prior to the beginning of all five recession periods dated in the sample.

This anecdotal evidence can be substantiated with estimates from an econometric model that allows for regime switches between the three states of expansion, medium growth and recession,

1 Empirical support for the hypothesis is presented in C. Badarinza and M. Buchmann, "Macroeconomic vulnerability and disagreement in expectations", *ECB Working Paper Series*, No 1407, December 2011. In addition to the analysis with a focus on US GDP, the paper draws very similar conclusions regarding the role of regime switches in financial market volatility.
2 Disagreement is proxied by an ordinal dispersion measure computed based on shares of answers to question 17 of the Michigan Survey of Consumers. Details can be found in Badarinza and Buchmann, *op. cit*.

in conjunction with a mechanism for *probabilities* of regime switches to depend on the agreement level. Based on that model, the mean GDP growth rates have been estimated to equal 4.6% for expansion, 2.5% for medium growth, and -0.7% for recession.

The model results suggest that more disagreement renders the US economy less vulnerable, as recessions become less likely and medium positive growth becomes more sustainable. Moving from minimum to maximum disagreement levels increases the probability of switching from the medium positive growth regime to strong growth from 1% to 45%, increases the probability of medium growth prevailing from 18% to 55%, and decreases that of falling into recession from 81% to virtually nil (see Table A).

Table A Disagreement level implied transition probabilities for the medium positive growth regime

(percentages)

Quantile (disagreement)	Med (t-1) - Exp (t)	Med (t-1) - Med (t)	Med (t-1) - Rec (t)	*Sum*
1 (0.11)	0.5	18.1	81.3	*100*
50 (0.49)	13.7	83.0	3.3	*100*
99 (0.86)	45.2	54.8	0.0	*100*
53.4 (0.49 = Q2 2011 level)	13.9	83.0	3.1	*100*

Sources: Federal Reserve Bank of St. Louis database, Michigan Survey of Consumers and ECB calculations.

Model-based macroeconomic projections yield some illustrative insights into the importance of a given level of disagreement (they should not be considered official ECB projections).[3] A ten-quarter-ahead projection, with the agreement level first fixed at its end-sample value,

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3 In interpreting the projections presented in this box, the stylised nature of the underlying model should be borne in mind. In particular, no further judgement is involved. The projections should not be considered official ECB projections, since they are merely meant to illustrate the role of disagreement in shaping the outlook for real activity.

Chart A Real GDP and disagreement in the United States

(Q1 1978 – Q2 2011)

y-axis: GDP growth (percentage change per annum) (left-hand scale)
y-axis: index (right-hand scale)

NBER recessions
real GDP growth (left-hand scale)
disagreement (right-hand scale)
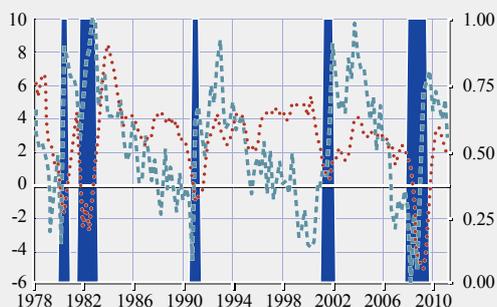
Sources: Federal Reserve Bank of St. Louis database, Michigan Survey of Consumers and ECB calculations.

Chart B US GDP growth projections conditional on different regime assumptions

(Q1 2009 – Q4 2013)

y-axis: disagreement (left-hand scale)
y-axis: GDP growth (percentage change per annum) (right-hand scale)

actual GDP growth
disagreement, including assumption (left-hand scale)
forecast conditional on recession regime
forecast conditional on strong positive growth regime
forecast conditional on medium growth regime
mean forecast
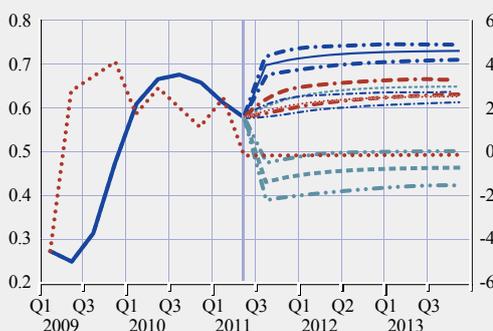
Sources: Federal Reserve Bank of St. Louis database, Michigan Survey of Consumers and ECB calculations.
Note: Dashed lines are 95% forecast error bounds.

Table B Projected GDP growth paths				

(percentages)

	Regime-conditional forecasts			Mean forecast
	Exp	Med	Rec	
2011	3.0 (2.7,3.2)	1.9 (1.8,2.1)	0.3 (-0.2,0.7)	2.1 (1.9,2.2)
2012	4.4 (3.9,4.8)	2.3 (2.0,2.6)	-0.9 (-1.8,-0.1)	2.8 (2.3,3.1)
2013	4.6 (4.1,4.9)	2.5 (2.2,2.7)	-0.8 (-1.6,0.0)	2.9 (2.5,3.3)

Sources: Federal Reserve Bank of St. Louis database, Michigan Survey of Consumers and ECB calculations.
Note: 95% forecast error bounds are shown in brackets.

Chart C US GDP growth forecasts conditional on different disagreement assumptions

(Q1 2009 – Q4 2013; percentage change per annum)

- actual GDP growth
- mean forecast under Q=99% disagreement
- mean forecast under Q=1% disagreement
- mean forecast under Q=53.4% (Q2 2011) disagreement

Sources: Federal Reserve Bank of St. Louis database, Michigan Survey of Consumers and ECB calculations.
Note: Dashed lines are 95% forecast error bounds.

was generated. For the second quarter of 2011, the inferred probabilities of remaining in expansion, medium growth or recession equalled 1.7%, 97.7% and 0.6% respectively. The one-step-ahead predicted switching probabilities from the second quarter of 2011 standpoint equal 15%, 81% and 4% for moving into expansion, medium growth or recession. Conditional on the assumption of the probability of falling into recession materialising, the resulting prediction is an annual 0.3% growth for 2011 and a drop of -0.9% for 2012 (see Table B); thereafter, the recession path quickly converges to its long-run mean of -0.7%. The overall mean projection suggests a 2.1% annual rate for 2011, 2.8% growth for 2012, and 2.9% (close to the conditional long-run mean) throughout 2013 (see Chart B).

To further illustrate the role of agreement in determining macroeconomic outcomes, two additional paths were derived, while assuming a shock hit the agreement level at the start of the horizon. The shock sizes equal +0.38 and -0.37, implying counterfactual agreement index levels of 0.86 and 0.11. The gap between the mean forecast and the paths under hypothetical low agreement is not pronounced, with a 0.3 percentage point gap along the horizon, whereas the counterfactual high agreement results in a -3.4 percentage point gap along the horizon (see Chart C).

Based on the mean projection and the uncertainty as to the future disagreement level, the model implies that risk for macroeconomic activity in the United States currently appears to be on the downside. More generally, the model results suggest that disagreement has the ability to impact transition probabilities and thereby shape the resulting growth projections. For the assessment of risks to financial stability, the analysis implies that attention should indeed be devoted to economy-wide disagreement levels and their implied transition probabilities.
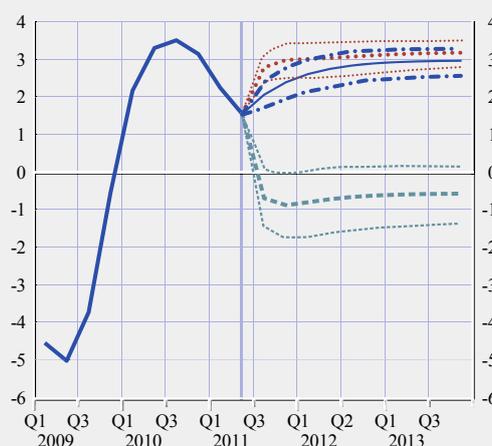
1.2 LIMITED REBALANCING IN THE EXTERNAL ENVIRONMENT

GLOBAL IMBALANCES

Since the finalisation of the June 2011 FSR, progress towards global rebalancing has been limited. Structural factors behind the global financial and current account imbalances still remain in place (see Chart 1.6), of which three are particularly noteworthy. First, fiscal deficits and high public debt in key advanced economies such as the United States have become a key vulnerability, underpinning the risk of a disorderly adjustment of external imbalances. This may be linked to higher risk premia in countries experiencing fiscal strains.

Second, the possibility of overheating in key EMEs remains a pressing concern, given the potential for sudden stops or abrupt reversals

in capital flows. In this vein, a key source of vulnerability relates to the potential for a building-up of imbalances in EMEs – with investment in China, for instance, above 45% of GDP, while private consumption, at barely 35% of GDP, has now declined to an almost two-decade low. At the same time, export growth in other emerging economies in Asia, in conjunction with limited exchange rate flexibility, has contributed to widening external surpluses in these economies. The abrupt unwinding of financial imbalances among key EMEs may pose financial stability risks to the euro area both through direct bank lending channels in euro area countries with large exposures to EMEs, as well as through direct and indirect financial exposures related to market risks (such as indirect exchange rate risk stemming from foreign currency lending to unhedged borrowers and an asset price correction).

Third, the current pattern of global exchange rate adjustment has not contributed sufficiently to global demand rebalancing – rather, it has the potential to remain a destabilising factor. Undervalued exchange rates remain a key distortion in many emerging economies with large external surpluses.

Clearly, an appropriate adjustment of policies would be beneficial to mitigate the risk of a disorderly unwinding of global imbalances. Such policies include fiscal adjustment to allay market concerns about public debt sustainability and enhanced exchange rate flexibility. These and other region-specific issues are discussed in more detail below.

REGION AND SECTOR-SPECIFIC VULNERABILITIES IN THE GLOBAL ECONOMY

In the **United States**, structural vulnerabilities remain in two areas. First, fiscal concerns have continued to predominate with Standard & Poor's having downgraded its US long-term sovereign credit rating by one notch on 5 August, while maintaining a negative outlook, and Moody's having assigned a negative outlook on 2 August (see also Box 2).

Chart 1.6 Current account balances for selected economies

(2006 – 2016; percentage of US GDP)

- other Asia
- China
- oil exporters
- Japan
- United States
- euro area
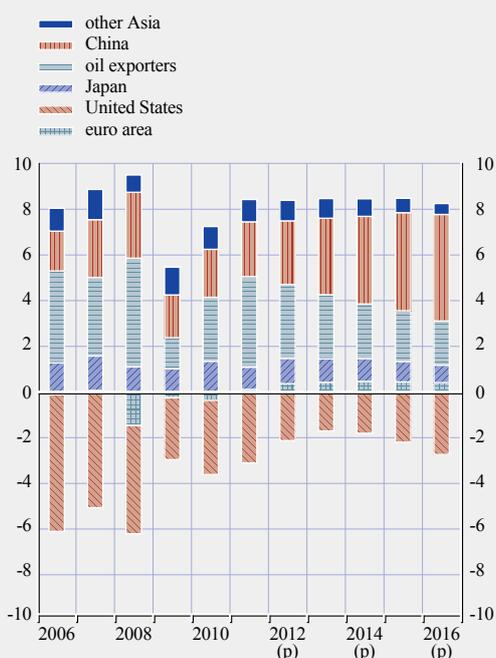
Sources: IMF, *World Economic Outlook*, October 2011, and ECB calculations.
Note: (p) denotes projections.

Moreover, heightened uncertainty about medium-term fiscal policy has increased the risk of stronger than expected fiscal consolidation, which may have adverse consequences for US growth and euro area foreign demand.

Second, continued difficulties in the household sector, in particular associated with remaining fragilities in residential property markets, combined with persistent high unemployment are weighing on growth and confidence. A sharp increase in financial market volatility as well as weak consumer and business sentiment have been observed in the United States (see Chart 1.7), not dissimilar to developments in other major advanced economies. In this environment, a potential further increase in risk aversion may impact euro area financial stability not only via abrupt financial flows but also through adverse confidence spillover effects.

Chart 1.7 US business and consumer confidence and the VIX

(Jan. 2007 – Nov. 2011)

— ISM business confidence (composite index)
⋯⋯ University of Michigan consumer sentiment
- - - VIX
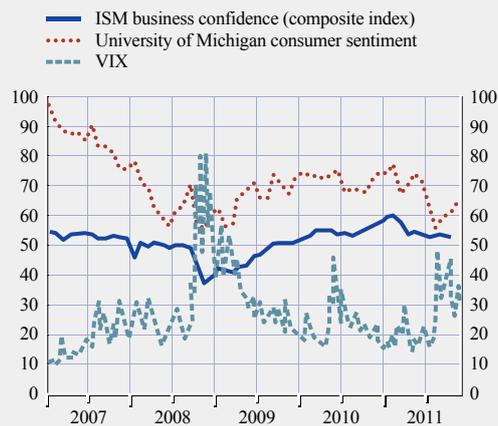
Sources: Wall Street Journal, Institute for Supply Management (ISM), Haver Analytics and University of Michigan.
Note: The VIX index measures the volatility implied by the prices of eight S&P 500 index put and call options.

Box 2

WHAT ARE THE CONSEQUENCES OF THE DOWNGRADE OF THE UNITED STATES' SOVEREIGN DEBT?

On Friday 5 August, the United States' long-term sovereign debt was downgraded from AAA to AA+ (with a negative outlook) by Standard & Poor's (S&P), one of the three global rating agencies, without a clear reaction of the bond market following this announcement: the Treasury yields did not increase (see Chart A) and market liquidity did not dry up (see Chart B). To some extent the decision by S&P was expected, as the conditions under which a downgrade would take place had been communicated on several occasions by S&P.

The impact of the downgrade is difficult to assess since many factors may have accounted for this inertia. First, it can take some time, if ever, for investors in US Treasuries to adjust their portfolios: institutional long-term investors need to find alternatives to use as a "safe-haven" asset. Second, the positive tone of the US bond market cannot be disentangled from the negative dynamics in August on

Chart A Yields on two and ten-year US government bonds

(Jan. 2011 – Nov. 2011; percentages)

— ten-year government bond yield
⋯⋯ two-year government bond yield
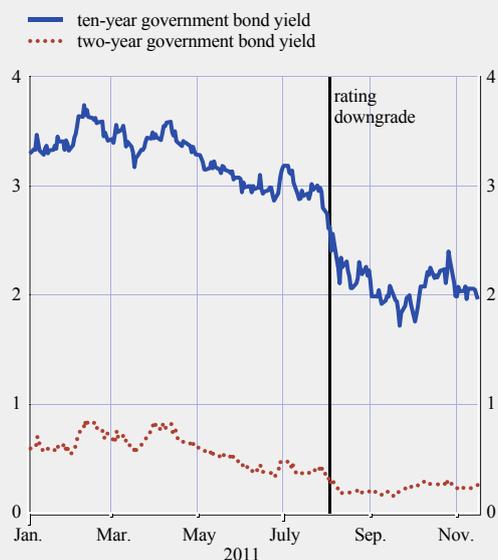
Source: Bloomberg.

Chart B Bid-ask spreads for two and ten-year US government bonds

(Jan. 2011 – Nov. 2011; monthly average of bid-ask spreads, basis points)

— ten-year bid-ask spread
····· two-year bid-ask spread

Source: Bloomberg.

Chart C Sovereign CDS curves for selected developed countries

(17 Nov. 2011; basis points)

x-axis: years

— France   — United Kingdom
····· Japan   ····· United States
--- Germany

Source: Bloomberg.

global stock markets and from the downward revision of the US economic growth forecast by most market economists. Third, the decline in long-term US yields partly reflects the sharp downward movement in the expected path of US short-term interest rates following the commitment by the Federal Reserve on 9 August to keep short-term interest rates at low levels until mid-2013.

While the US Treasury market was able to withstand the rating downgrade, developments in the sovereign credit default swap (CDS) market showed signs of market concerns. A comparison between the sovereign CDSs of major developed economies shows that the United States fares well relative to other countries (see Chart C). However, the surge of the one-year CDS before the last-minute political agreement on 31 July 2011 on the debt ceiling extension appears to suggest market concerns (see Chart D). While the increase in the premia of the short-dated US sovereign CDS was only short-lived, the premia of the

Chart D One-year and ten-year sovereign CDSs on the United States and net CDS notional

(Jan. 2011 – Nov. 2011; CDS premia in basis points and net CDS notional in USD billions)

— net notional USD CDS (USD billions, right-hand scale)
····· ten-year CDS (basis points; left-hand scale)
--- one-year CDS (basis points; left-hand scale)
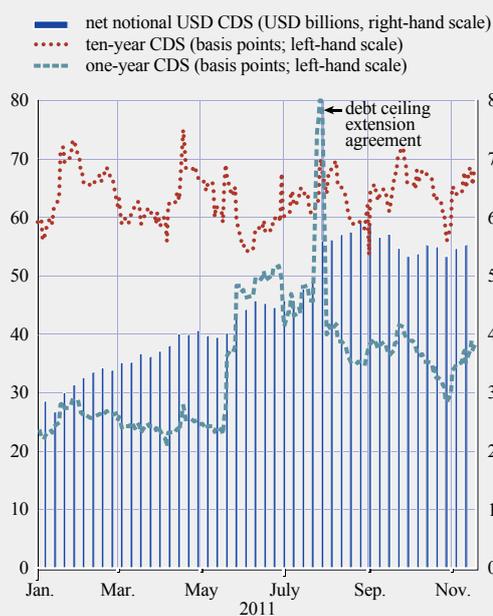
Sources: Bloomberg and Depository Trust & Clearing Corporation.

longer-dated CDS remained more stable.[1] The significant increase in the net notional amount outstanding of CDSs on the US sovereign may also reflect those concerns (see Chart D), even if this amount remains very small relative to the size of the US Treasury market.

More generally, the downgrade of US sovereign debt by S&P, which occurred as several euro area government bond markets were facing intense pressure, may have led market participants to further reconsider the notion of "risk-free" asset. Looking ahead, this may have far-reaching consequences on portfolio allocation strategies, which have long been based on the assumption that large advanced economies' sovereign debts bear little credit risk.

1 There are also other factors that could have potentially contributed to the rise in sovereign CDS premia. For instance, the deceleration of global economic growth has, to a certain degree, contributed to increases in all sovereign CDS premia, with differences across countries and maturities. The US sovereign CDSs may also have been affected by the developments in euro area sovereign risks given the interconnectedness of the two major economic areas. Finally, part of the increases in the sovereign CDSs may have also been related to a repricing of risks rather than to the perceptions that risks have generally increased.

Confidence in the fiscal sustainability of **Japan** has also declined. In this vein, Moody's cut its sovereign credit rating by one notch to Aa3 on 23 August, citing a weak growth outlook that complicates the government's ability to implement fiscal reform measures. While this action did not have a significant impact on the yields of Japanese government bonds, 95% of which are held by domestic investors, concerns about medium-term debt sustainability are reflected in rising credit default swap (CDS) spreads.

As regards the disruptions in global supply chains from the natural and nuclear disasters in Japan earlier in 2011, the impact on the euro area was overall rather limited. While selected industries, such as the automobile sector, experienced some disruptions in several countries, the overall impact on domestic production in the euro area was short-lived and of a rather small magnitude.

For **EMEs**, recent indicators suggest that large net private portfolio inflows resumed until mid-2011, while continued rapid credit expansion has remained in some key EMEs. This situation reversed itself in autumn 2011, reflecting a heightened perception of risk in EMEs more recently. Associated with this, some EME currencies depreciated during the autumn of 2011. In the recent period, bank asset quality has started to deteriorate in several EMEs during the ongoing financial crisis due to either country-specific weaknesses in the banking sector or more widespread regional vulnerabilities, such as lending in foreign currency to unhedged borrowers. Moreover, a rapid credit expansion (see Chart 1.8) and capital inflows in some countries have further contributed to the build-up of financial sector vulnerability via reduced loss-absorption capacity of the banking sector, which may increase the risk of a sudden stop in capital inflows.

Chart 1.8 Capital flows, credit growth and equity prices in key emerging economies

(Jan. 2005 – Oct. 2011)

- cumulative net portfolio inflow (USD billons; left-hand scale)
- MSCI EME equity price (index; left-hand scale)
- credit growth (percentage per annum; right-hand scale)
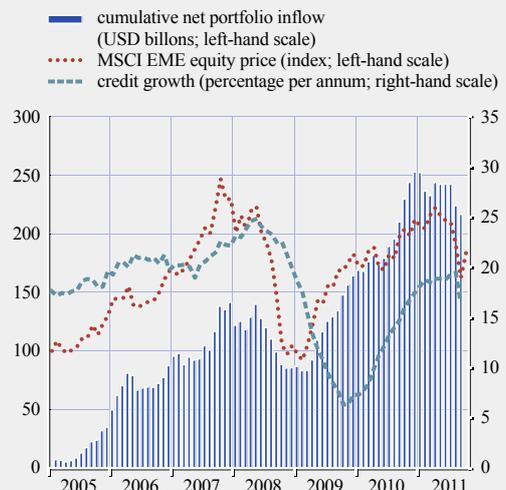
Sources: EPFR, IMF, MSCI and ECB calculations.
Notes: Credit growth is the year-on-year growth of credit to the private sector, while net portfolio inflow is the cumulated net inflows into bonds and equities for 19 key emerging economies from emerging Asia, emerging Europe and Latin America. The MSCI EME is the MSCI emerging markets index rebased to 100 on 1 January 2005.

Box 3

ASSESSING EQUITY AND PROPERTY PRICES IN SELECTED LARGE EMERGING MARKET ECONOMIES

Over the past decade, emerging markets have been growing as a share of world output. The so-called BRIC economies (Brazil, Russia, India and China), in particular, have outperformed advanced economies in terms of economic growth. The strong economic performance has, however, partly been fuelled by strong credit growth, coupled with booming asset and property prices. These developments have raised concerns that the economies could overheat, thereby presenting numerous financial stability risks associated with an unwinding of imbalances, with resulting potential for aggregate global shocks and contagion. Most relevant for the euro area could be those risks transmitted through trade, financial and – more generally – confidence channels. Making use of two selected early-warning indicators on equity and residential property markets, this box takes an aggregate view of the BRIC economies and analyses the potential for the group as a whole to be subject to costly asset price busts.

Although the box focuses on the common risks shared by the BRIC economies as a whole, it is also important to be aware of a number of country-specific financial stability risks. To mention a few, a fall in oil prices would represent an important shock for Russia given its dependence on the export of energy commodities. In Brazil non-financial corporations have rapidly increased their borrowing in foreign currency over the past years and may not be well cushioned against a strong depreciation of the domestic currency. The growth model of China is to a large extent export-driven and thus dependent on developments in advanced economies, whereas in India downside risks mainly emanate from domestic demand. One indicator which tracks the linkages between asset prices and the real economy is the so-called "equitisation ratio", which compares the stock market capitalisation of a country (or region) to its gross domestic product. This metric is a useful tool to gauge stock price developments as, in the long run, stock prices should not deviate significantly from macroeconomic performance. The linkages between stock prices and economic growth can best be seen using the insights from the so-called dividend discount formula, which tells us that a broad-based stock market index for an economy is determined by the expected future dividends of the constituents included in the index (using an appropriate discount factor that incorporates the risk-free rate and the expected risk premium). The firms' dividends are usually a direct function of their aggregated earnings capacities, which in turn are closely dependent on the overall demand in the economy. Thus, the higher growth of stock prices compared with the gross domestic product for a prolonged period may signal a potential for overvaluation in stock prices and downside risks for future stock price developments. Needless to say, stock price valuation tools are in general surrounded by large uncertainty and should thus be interpreted with some caution.

Equitisation ratios for the BRIC economies suggest that, sparked to a large extent by foreign investors, the value of the BRIC economies' stock markets has increased at a faster rate than the growth rate of total production over the past decades (see Chart A). In the late 1980s the total value of BRICs' stock markets was around 10% of GDP. The shares have steadily risen to around more than 150% in 2011, compared with around 120% on average for the G7 advanced economies. Part of the increase over the past decades can be seen as a catching-up process and the result of improved financial infrastructure in the BRIC economies. However, the current high equitisation ratios in comparison with advanced economies, which are swiftly recovering to the levels seen

Chart A Equitisation ratios for the BRIC and G7 economies

(1988 – 2010; percentage of GDP)
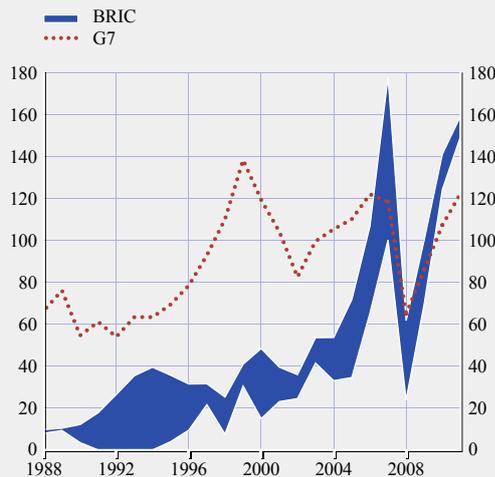
- ▬▬ BRIC
- ····· G7

Source: World Bank.
Notes: The "equitisation ratio" is computed as the stock market capitalisation expressed as a percentage of nominal GDP. For the BRIC economies the (min-max) range is shown and for the G7 economies the weighted average GDP is shown.

Chart B Private sector credit and property price growth for the BRIC economies

(2000 – 2011; percentage change per annum)

- ▬▬ credit growth
- ····· property prices
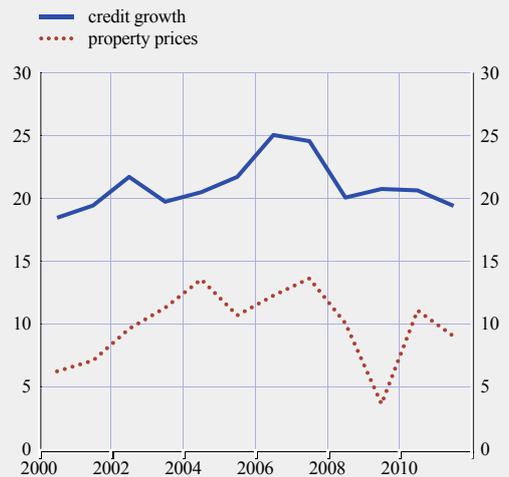
Sources: Haver Analytics and CEIC.
Note: Both credit growth and property price growth are GDP-weighted.

prior to the outbreak of the financial crisis, coupled with an expected slowdown in global economic growth, suggest that risks for stock prices in the BRIC economies are tilted to the downside.

Another potential indicator to gauge the likelihood of costly asset price booms and busts concerns strong private sector credit growth, particularly if coupled with high residential property prices (see Chart B). Having several caveats in mind,[1] growth in credit to the private sector and property prices have moved broadly in tandem at high growth rates over the past decade, which suggests that part of the increase in property prices has been fuelled by the relatively easy access to credit. Throughout the financial crisis, however, the growth rates of the two indicators have started to normalise, but are still hovering at close to double-digit levels.

While asset prices in the BRIC economies have declined in line with global developments, credit and property prices are still growing fairly rapidly and stock prices may be stretched in comparison with the economies' economic growth prospects. In the short run, if a sharp correction takes place, it could have adverse implications also for the euro area via trade, confidence and in particular asset price spillover channels. In the medium run, the main financial stability risks emanating from emerging markets in general and the BRIC economies in particular continue to be related to the levels and volatility of capital inflows and their impact on domestic credit expansion. Sound macroeconomic and macro-prudential policies, as well as a robust financial regulatory framework fostering a resilient financial system, could play a role in cooling these economies down and holding back the build-up of financial imbalances.

1 Several caveats apply regarding the property price index. First, data are not easily collected for the BRIC economies. Second, country averages of property prices for large economies may conceal important regional developments. Third, averaging the four BRIC economies into a single index fails to give due regard to country-specific fundamental supply and demand considerations driving property prices. Fourth, the property price index for the BRICs is a combination of construction indices and city price indices available for the four economies.

Triggered by renewed tensions in some euro area countries, financial conditions in **European countries outside the euro area** deteriorated during the summer of 2011. Falling stock prices as well as higher CDS and interest rate spreads suggest that global market tensions have affected the region, although the impact has differed significantly across countries. Spreads increased particularly in countries with remaining vulnerabilities, such as high public debt ratios and a poor quality of outstanding bank loans. Housing market activity has remained subdued in most European countries outside the euro area, reflecting the persistence of tight credit conditions. At the same time, household leverage and house prices remained high relative to fundamentals in some economies in the region. A key vulnerability facing many European countries outside the euro area stems from tight banking linkages across Europe. In particular in central, eastern and south-eastern Europe (CESEE), these could lead to a reduction of activity by strained parent banks in countries that are facing financial stress.

In several CESEE countries, vulnerabilities stemming from currency mismatches have been a key concern for some time. Since the June 2011 FSR, some risks associated with these foreign currency mismatches have materialised following the appreciation of the Swiss franc (see Chart 1.9). Vulnerabilities exist in particular among unhedged borrowers, such as many households and local governments, in Hungary and to a lesser extent in Poland and Romania (see Chart 1.10). Although the Swiss National Bank took measures to curtail the appreciation of the Swiss franc in August and September 2011, the impact of the Swiss franc's past rise vis-à-vis currencies in CESEE countries is still feeding through into higher debt servicing costs and principals, thereby lowering the quality of outstanding loans in the countries concerned. These tensions could worsen in case of further exchange rate volatility.

Looking ahead, the risks stemming from financial imbalances in the European countries outside the

Chart 1.9 Evolution of exchange rates vis-à-vis the Swiss franc

(Jan. 2008 – Nov. 2011; index: Jan. 2008 = 100)

Polish zloty
Croatian kuna
Hungarian forint
euro

Source: ECB.

Chart 1.10 Outstanding foreign currency loans broken down by currency in selected European countries

(June 2011; percentage of total loans)

local currency
Swiss franc
euro
other FX

1 Latvia   5 Bulgaria
2 Croatia[1]   6 Hungary
3 Lithuania   7 Poland
4 Romania   8 Austria
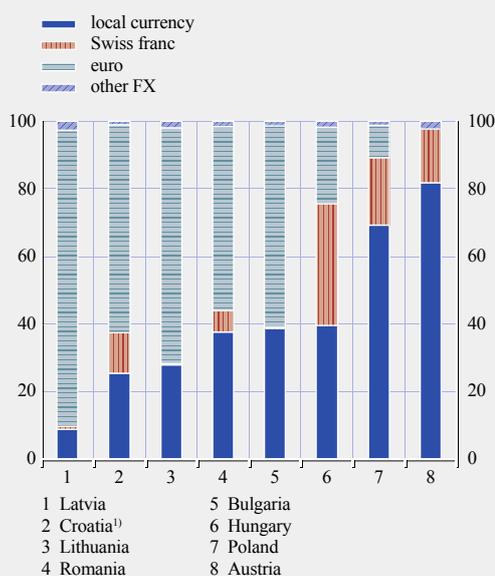
Sources: National central banks and ECB calculations.
Notes: Loans of MFIs excluding the ESCB to the non-MFI sector.
1) For Croatia, loans of commercial banks to all sectors are taken into account.

euro area are closely tied to the macroeconomic and financial outlook, which could turn out weaker than currently expected. In the United Kingdom, Sweden and Denmark, banks remain vulnerable to potential declines in house prices. Potential contagion from stresses in government bond markets in the euro area could hamper bank funding and curtail credit growth in CESEE countries, thereby contributing to an adverse feedback loop to the euro area financial system. Moreover, further exchange rate volatility could lead to financial tensions in countries with large foreign currency mismatches.

Concerning **commodity markets**, crude oil prices have been volatile through most of 2011 amid several outbursts of volatility. Looking at option-implied volatility (see Chart 1.11), a number of spikes in volatility can be identified since the beginning of 2011: the first one corresponds with the outbreak of the civil war in Libya, which led to mounting tightness on the supply side; the second one is associated with the release of the International Energy Agency's Strategic Petroleum Reserves in an attempt to dampen price pressures and prevent increasing market tightness. Starting in September, the emergence and intensification of tensions on sovereign bond markets led to additional spikes and a general heightening of volatility, as well as prices declining somewhat owing to concerns about the global macroeconomic environment. Looking ahead, while crude oil prices have stabilised and now stand at around USD 110 per barrel (down from USD 120 per barrel in June), the current market volatility is expected to persist, as the interplay of risks from both the demand side (e.g. a slowdown in global growth) and the supply side (e.g. further tensions in oil-producing countries) are likely to spawn uncertainty.

Regarding precious metals, the gold price has also exhibited a high degree of volatility and continued its upward trend since the finalisation of the June FSR (see Chart 1.12). The escalation of tensions in other financial market segments has led to safe-haven flows into gold investments.

Chart 1.11 Brent crude oil price and annualised implied volatility

(Jan. 2008 – Nov. 2011)

oil price (USD per barrel)
implied volatility (percentage)
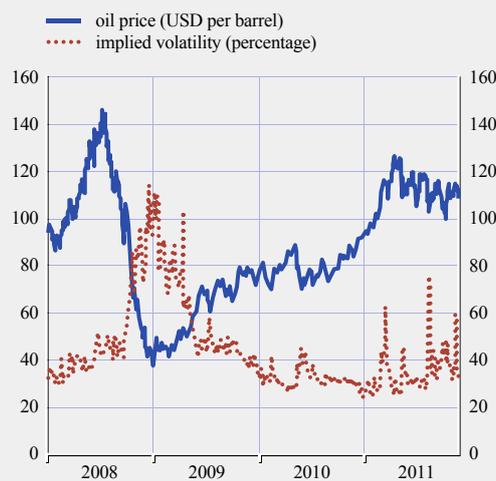
Source: Bloomberg.

Moreover, the low real interest rates for high-rated assets continue to create search-for-yield pressure in alternative asset classes such as gold. Looking ahead, these flows could reverse if the financial stress in other market segments were to decrease, the economic outlook were to improve

Chart 1.12 Gold price and gold holdings of exchange-traded funds (ETFs)

(Jan. 2005 – Nov. 2011)

ETFs' gold holdings (tons; left-hand scale)
price of gold (USD; right-hand scale)
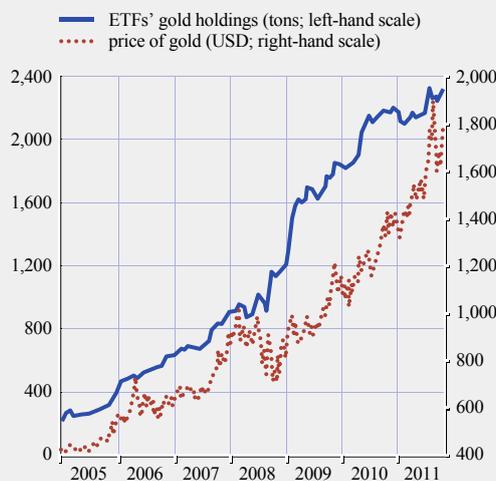
Sources: Bloomberg and ECB calculations.

or real interest rates for high-rated assets were to increase. However, the resulting fall in the gold price would mainly reflect portfolio shifts to other asset classes. Therefore, the effect on euro area financial stability is expected to be relatively limited.

FINANCIALISATION OF COMMODITIES

Surging and volatile commodity prices have been a concern for policy-makers over the last few years from many different angles. One such angle has been the "financialisation of commodity markets", whereby commodity markets would be increasingly influenced by agents with limited interest in hedging physical exposures, but rather an interest in commodities as an asset class. One particular financial stability risk stems from the potential for concentrated exposures and unexpected spillovers among markets that create pockets of instability that may affect individual financial institutions and could have repercussions on the wider financial system. This box outlines the main aspects of this debate, first describing the basic premise, followed by an assessment of the literature, and the reporting of some illustrative results of an empirical model designed to capture time-varying correlations of selected commodities with financial market developments.

In considering the basic mechanics of the financialisation of commodities, futures markets play an integral role. In addition to *commercial traders*, who mainly seek to hedge an underlying exposure to commodity risk, two other groups are noteworthy given their interest in commodities predominantly as an asset class. This group includes both *non-commercial agents*, who actively seek exposure to commodity price fluctuations in an attempt to achieve returns, and *index-related traders*, i.e. passive investors aiming to replicate and hold a diversified commodity index as part of their asset allocation strategy, so as to benefit from its low correlation with financial asset returns. Index investors have grown in numbers over the last years as the creation of exchange-traded commodity index funds has made it possible for investors to channel their money into commodity funds, which in turn place them in a defined basket of commodity futures or aim to track a given index.

Over the past decade or so, commodity prices have shown a fairly steady parallel rise in concert with signs of increased financial activity of such investors (see Chart A). Some commentators have argued that the financialisation process is in part responsible for high and volatile commodity prices, as well as for the increase in the return correlation between commodities and equity indices, which has historically been very low. In addition, the concomitant creation of financial investment products related to commodities was seen as strengthening the linkages between the two sets of assets.

The academic literature on the topic of index investing and commodity prices has reached mixed conclusions focusing in two different directions. First, many studies have examined the extent to which financialisation has affected the price formation mechanism, in terms of both direction and volatility. Stoll and Whaley (2010)[1] reported that index investment does not cause changes in futures prices, while Irwin and Sanders (2010)[2] found that it does not increase volatility. On the

1   H. Stoll and R. Whaley, "Commodity index investing and commodity futures prices", *Journal of Applied Finance*, 20, pp. 7-46, 2010.
2   S. H. Irwin and D. R. Sanders, "The impact of index and swap funds on commodity futures markets", *OECD Food, Agriculture and Fisheries Working Paper Series*, No 27, 2010.

(Jan. 2000 – Nov. 2011; thousands of contracts)

- WTI
- maize
- soybeans
- wheat
- gold
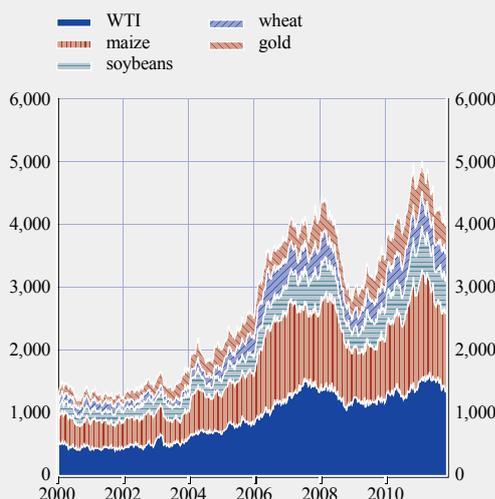
Source: Commodity Futures Trading Commission.
Note: WTI stands for West Texas Intermediate oil.

(Jan.1998 – Nov. 2011)

- WTI
- corn
- copper

Sources: Bloomberg, Thomson Reuters, Commodity Futures Trading Commission and ECB calculations.
Note: Based on a multivariate GARCH model.

other hand, Mou (2010)[3] found that index funds affect futures prices around rollover dates and Singleton (2011)[4] reached the conclusion that index investment affects prices beyond the short term. Second, a different strand of literature studies the extent to which financialisation has pushed up correlations of commodities with other asset classes. Empirical findings also diverge: Büyüksahin and Robe (2011)[5] concluded that the increase in commodity correlation is to some extent caused by hedge funds, contrary to the findings of Tang and Xiong (2010)[6] who claim that it is caused by index investment.

Following the collapse of Lehman Brothers, the correlations of commodities with other asset classes increased markedly (see Chart B) and have remained at heightened levels since then. This can be attributed to both commodity and equity prices having become more sensitive to investors' risk aversion and to news about the global economy rather than to sector-specific fundamentals.

All in all, robust evidence to support the hypothesis that serious financial stability consequences follow from the financialisation of commodity prices remains scarce. That said, it has to be borne in mind that the structure of the market itself (the sources and demand for major commodities) and the structure of the market players (the increased share of non-commercial market participants in commodities markets) has significantly changed during recent years. This requires an attentive surveillance of the developments in commodities markets in order to ensure the proper functioning of these markets.

3 Y. Mou, "Limits to arbitrage and commodity index investment: front-running the Goldman roll", working paper, Columbia Business School, 2010.
4 K. J. Singleton, "Investor flows and the 2008 boom/bust in oil prices", working paper, Stanford Graduate School of Business, 2011.
5 B. Büyüksahin and M. Robe, "Does 'paper oil' matter?", working paper, Johns Hopkins University, 2011.
6 K. Tang and W. Xiong, "Index investing and the financialization of commodities", working paper, Princeton University, 2011.

2 CREDIT RISKS

Pubic finance positions in several euro area countries remain precarious and sovereign debt strains have spread from the three euro area countries under EU/IMF programmes to other vulnerable euro area economies. These strengthened contagion effects have proved difficult to contain, and thus represent a very challenging complication of the previously more country-specific adverse feedback between the vulnerability of public finances and the financial sector.

The balance sheet condition of euro area households improved somewhat after the finalisation of the June 2011 Financial Stability Review (FSR), building on the economic recovery recorded throughout the first part of the year. However, indebtedness remains high in some countries and there is a risk of a renewed deterioration in the sector as a result of the ongoing economic slowdown

The condition of euro area non-financial corporations recovered further after the finalisation of the June FSR, owing to still robust sales. However, the recovery was marked by a noticeable overall slowdown amid the deceleration in global demand and increasing pressures from the cost side, as well as by sustained cross-country and cross-sector disparities that were intensified by the sovereign debt crisis.

Financial stability risks stemming from euro area property markets have remained largely unchanged since the finalisation of the June FSR. Some residential property markets are deemed to still be vulnerable to corrections in prices, which could potentially give rise to further credit losses for banks. Capital values of commercial property in many countries remain well below the peaks seen around 2007 and conditions in some countries remain very challenging. Significant refinancing risks for many loan-financed property investors therefore remain.

2.1 HOUSEHOLD RISKS CONTAINED, ON AVERAGE, BUT HIGH IN SOME COUNTRIES

OVERALL ASSESSMENT OF RISKS IN THE HOUSEHOLD SECTOR

Since the finalisation of the June 2011 FSR, there has been a slight improvement of the balance sheet situation of households – building on the economic recovery recorded throughout the first part of the year. Underlying this aggregate development, the condition of households has remained highly heterogeneous across different euro area Member States.

One clear sign of improving aggregate euro area balance sheet conditions in much of 2011 relates to write-offs on loans to households, which continued to fall in the case of all loan categories in the third quarter of 2011 (see Chart S92). Write-offs on loans for house purchase were close to historical lows at that time – although these data have to be assessed with care on account of diverging accounting regulations at the country level.

While the improvement in households' balance sheets throughout much of 2011 has contributed to improved resilience, there is risk of a renewed deterioration as a result of a possible materialisation of intensified downward risks to economic growth. Aside from the uncertainty regarding the income outlook, the impact of volatility and losses in financial asset prices, there are still persistent risks of further downward adjustments of residential property prices in some countries (see Section 2.3). In this respect, one important conditioning factor is the structure of the initial interest rate fixation period of loans to households. The recent shift towards somewhat shorter initial interest rate fixation periods has contributed to an increased sensitivity of households to interest rate developments. While the distribution of risks among euro area countries remains dispersed and may have become even more pronounced lately, the household sector is not a predominant source of risk to euro area financial stability.

HOUSEHOLD SECTOR LEVERAGE

Household sector wealth improved in the first half of the year, benefiting from economic activity and associated improvements in disposable income that outpaced the increase in both households' financial liabilities and total indebtedness (see Chart 2.1).

The evolution of euro area households' total indebtedness was driven mainly by an expansion of MFI lending to households. However, the growth of total MFI lending to households decelerated somewhat in the second and third quarters of 2011, largely influenced by slower growth in lending for house purchase (see Chart S19). Consumer credit nonetheless contributed as well – reflecting a combination of higher lending rates on consumer loans and a drop in consumer confidence. In particular, households appeared to be somewhat reluctant to purchase big-ticket items (i.e. retail goods

that have a high selling price) (see Chart 2.2), as expectations regarding their future income situation continued to deteriorate towards the end of the period under review. The growth of other lending to households (i.e. business loans to sole proprietors, debt consolidation, education, etc.), by contrast, accelerated, although not sufficiently to avoid the slowdown in total lending growth.

A still high degree of heterogeneity at the country level underpinned aggregate euro area developments. For instance, households' borrowing was generally strong mainly in those countries that have not experienced significant housing market corrections over the last few quarters, as well as in those benefiting from positive income and unemployment prospects. By contrast, households residing in countries with a weaker economic environment expanded their outstanding debt only slightly, or even reduced it on an annual basis.

Chart 2.1 Euro area households' debt-to-income measures and total interest payment burden

(Q1 2001 – Q2 2011)

- household debt-to-gross disposable income ratio (percentage; left-hand scale)
- household dept-to-GDP ratio (percentage; left-hand scale)
- interest payment burden (percentage of gross disposable income; right-hand scale)

Sources: ECB and ECB calculations.
Notes: Household debt comprises total loans to households from all institutional sectors, including the rest of the world. Interest payments do not include the full financing costs paid by households, as they exclude the fees for financial services. Data for the last quarter shown have been partly estimated.

Chart 2.2 Euro area MFIs' total lending to households, consumer confidence and consumers' willingness to purchase big-ticket items

(Jan. 2000 – Sep. 2011)

- total lending (percentage change per annum; left-hand scale)
- consumer credit (percentage change per annum; left-hand scale)
- big ticket purchases (percentage change per annum; left-hand scale)
- consumer confidence (index; right-hand scale)

Sources: EU Commission, ECB and ECB calculations.

The latest figures on euro area households' housing wealth point to a slight increase in the first quarters of 2011. Contemporaneously, households' total financial assets increased visibly in the same period. However, financial market developments in the third quarter of 2011 are likely to have put some pressure on households' financial assets.

Looking ahead, the household sector's total indebtedness is likely to continue to increase, albeit at a pace that is moderating further. In addition, the muted economic outlook has the potential to give rise to a further tightening of credit standards for household lending – as also highlighted in the ECB's latest bank lending survey (see Section 4.2). Moreover, new regulatory requirements in the banking sector, as well as pressure on banks' balance sheets stemming from the sovereign debt crisis, may result in a shrinking credit supply and/or higher financing costs for households. Taken together with weakening consumer confidence, the outlook for household borrowing is subdued.

INTEREST RATE AND INCOME RISKS

Interest rate risks of households
Interest rates on new loans to households generally rose after the finalisation of the June FSR. Notwithstanding this increase in interest rates, the burden of households' interest payments relative to their gross disposable income decreased slightly in the period under review (see Chart 2.1), since the growth of their income outpaced that of their interest payments. By the end of the first half of the year, this ratio stood at an all-time low. Part of this appears to have stemmed from households shifting towards shorter periods of initial interest rate fixation. On the one hand, this has had a beneficial effect on households' balance sheets, by limiting the increase in their absolute debt servicing costs. On the other hand, it has left households, on aggregate, more sensitive to interest rate changes. However, this has to be seen against the background of the fact that initial interest rate fixation periods and the related interest rate sensitivity still varies

considerably among euro area Member States (see Chart 2.3). In general, contracts on new loans with long periods of initial interest rate fixation (over five years) have tended to be associated with a relatively strong annual growth in lending for house purchase.

Heterogeneity in initial interest rate fixation periods seems not to be linked to developments in the total absolute indebtedness of households in individual euro area Member States. For instance, Belgium, Slovakia, the Netherlands and Cyprus all recorded visible increases in households' absolute indebtedness. However, while the two former countries exhibited a tendency towards longer initial interest rate fixation periods, the opposite was true for the latter two countries. In a similar vein, households' total absolute indebtedness decreased in Ireland and Spain, with Ireland recording shorter initial interest rate fixation periods and Spain observing a tendency towards a lengthening of initial maturities.

Chart 2.3 Initial interest rate fixation period in MFI lending to euro area households

(Q3 2011; percentage of total new loans)

- over five years
- over one and up to five years
- floating rate and up to one year

1	Malta	7	Portugal	13	Netherlands
2	Finland	8	Slovenia	14	Belgium
3	Luxembourg	9	Italy	15	Germany
4	Austria	10	Spain	16	Slovakia
5	Ireland	11	Greece	17	France
6	Cyprus	12	euro area		
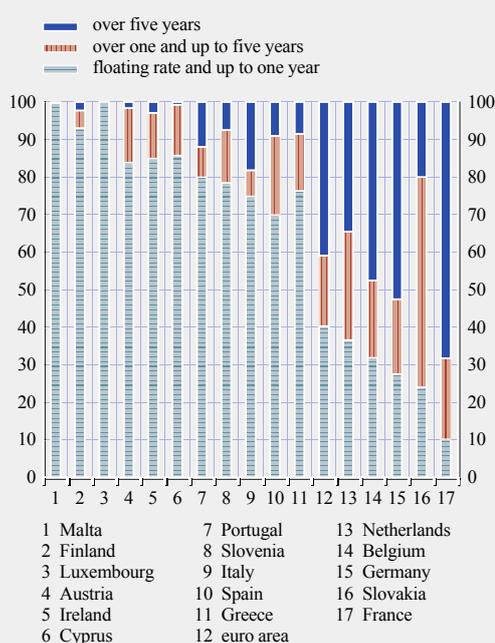
Sources: ECB and ECB calculations.

Risks to household income

Household balance sheet support from the macroeconomic environment, while solid throughout the first half of 2011, seems likely to diminish going forward. Risks to household income have intensified against the background of slowing economic activity and a deteriorating outlook since the finalisation of the June FSR (see Section 1.1). This deteriorating macroeconomic outlook has had clear implications for labour market developments, a key factor for households. In particular, unemployment rates have started to increase marginally since April – although there had been improvements in previous months. The results of the ECB's Survey of Professional Forecasters (for the third quarter of 2011), which suggested a prospectively improving employment situation in the euro area, need to be interpreted with caution as they may well deteriorate in line with the worsening macroeconomic situation. This is supported by the European Commission's survey, the results of which indicated expectations of worsening unemployment.

2.2 CONTINUED RECOVERY OF CORPORATE SECTOR CONDITIONS, BUT THE OUTLOOK IS DETERIORATING

OVERALL ASSESSMENT OF RISKS IN THE CORPORATE SECTOR

The profitability of euro area non-financial corporations stabilised in the second quarter of 2011, supported by still robust sales. At the same time, however, the recent recovery was marked by a noticeable overall slowdown amid a deceleration of global demand and increasing pressures from the cost side, as well as by sustained cross-country disparities that were intensified by the sovereign debt crisis. Corporate sector indebtedness remained broadly unchanged, albeit at historically high levels. In spite of this, firms' ability to service their debt was supported by the low interest rate environment.

Looking forward, a downward correction in the recovery of firms' earnings is expected against the background of the projected slowdown in economic growth. A potentially protracted decline in retained earnings could reinforce balance sheet vulnerabilities and contribute to firms' funding risks that are related to overall financial market tensions, albeit mitigated by the still relatively low cost of financing at the aggregate level. Nonetheless, historically high leverage ratios, as well as tightening lending standards, indicate considerable vulnerabilities to upward pressures on the cost of financing for some segments of the euro area corporate sector. This may hold particularly true for more bank-dependent segments, such as small and medium-sized enterprises (SMEs), as well as for firms located in countries predominantly affected by the recent re-intensification of the sovereign debt crisis.

DEVELOPMENTS IN EARNINGS

Overall, economic data suggest that the profitability of the euro area corporate sector stabilised in the second quarter of 2011. According to data on the euro area accounts, the quarterly gross operating surplus of all euro area non-financial corporations declined in that quarter, after having increased noticeably in the first quarter, but rose slightly in cumulated annual terms. Likewise, firms' retained earnings turned negative in the second quarter, but still increased slightly at the cumulated annual level.

At the same time, the latest data for large and medium-sized listed corporations indicate a slightly improving profitability in the second quarter of 2011, but a small decrease in their retained earnings. On account of, in particular, still robust external trade in the middle of 2011, the annual growth of firms' net sales continued to rise, albeit at substantially lower rates than in the four previous quarters (see Chart 2.4). Firms' operating expenses seem to be on the rise, however, as reflected in an increase in the ratio of operating expenses to operating income or in comparison with the operating expenses-to-sales ratio, despite a small decrease reported for the second quarter. Both the slowdown in the growth of sales and the increase in costs point to increasing pressures on the development of firms' earnings.

Chart 2.4 Sales growth, return on assets and operating expenses-to-sales ratio of listed non-financial firms in the euro area

(Q1 2002 – Q2 2011; percentages; medians)

- annual sales growth (left-hand scale)
- return to assets (left-hand scale)
- operating expenses to sales (right-hand scale)
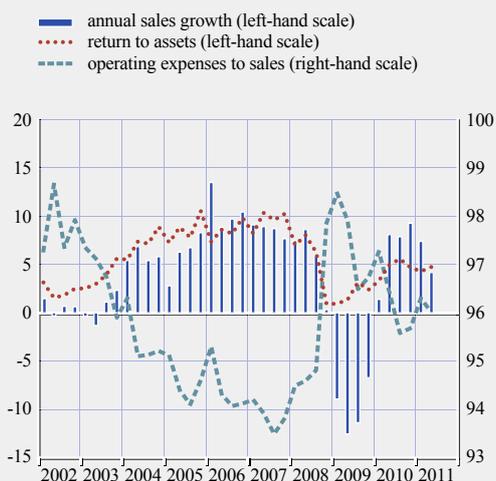
Sources: Thomson Reuters Datastream and ECB calculations.

Chart 2.5 Total debt and interest burden of non-financial corporations in the euro area

(Q1 2001 – Q2 2011; percentages)

- debt to equity (notional stock) (left-hand scale)
- debt to equity (market prices) (left-hand scale)
- net interest payments to gross operating surplus (right-hand scale)
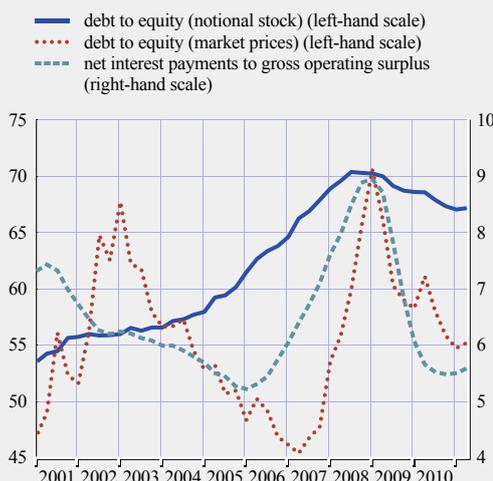
Sources: ECB and ECB calculations.

Profitability was broadly stable across the various sectors of industry, but remained weakest in the wholesale and retail sectors, and decreased for utilities. By contrast, the observed recovery in profitability was not noted for medium-sized companies. Their ratio of net income to net sales moved back deeper into negative territory again.

Likewise, earning conditions for small firms remained broadly feeble. According to the ECB's latest survey on the access to finance of SMEs in the euro area (SME survey),[1] profits of SMEs continued to deteriorate when compared with the previous survey, despite a further net increase in turnover that was possibly counterbalanced by a general increase in production and financing costs.

LEVERAGE AND FUNDING

The corporate sector's leverage stabilised in the second quarter of 2011, as demonstrated by several debt ratios (see Charts 2.5 and S9). Nonetheless, according to listed firms' balance sheets, leverage again increased slightly in the second quarter of 2011 and continues to remain at historically high levels. From a sectoral perspective, leverage in the second

quarter of 2011 was highest for the transport, communication and construction sectors.

Firms' ability to service their outstanding debt – measured as the ratio of net interest payments to the gross operating surplus – remained broadly unchanged in the first half of 2011, standing at 5.6% in the second quarter of 2011. This was due mainly to the still low interest rate environment, a further slight increase in the annual gross operating surplus and firms' broadly unchanged leverage.

Adding to firms' risk from persistently high levels of leverage, funding risks related, in particular, to the rolling over of some of their existing debt intensified. This was most notable in the case of firms located in countries more affected by the re-intensification of the sovereign debt crisis. Despite firms' broadly stable retained earnings in annual terms, which limited their external financing needs to some extent and, hence, also limited their refinancing requirements, a pick-up

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1 The latest survey covered the period from April to September 2011. For more information thereon, see ECB, "Survey on the access to finance of SMEs in the euro area", December 2011.

in fixed investment added further to firms' financing needs. Indeed, the latest SME survey reported stable financing needs, mainly related to fixed investment and inventories, and working capital. By contrast, the October 2011 bank lending survey indicated some decline in corporate loan demand, for the first time since mid-2010.[2]

With respect to their remaining needs for external financing, companies continue to face challenging financing conditions amid the re-intensification of market turmoil and particularly tight lending standards for firms located in countries that are rather significantly affected by the crisis. Nonetheless, for the euro area aggregate, the growth in bank lending to non-financial corporations stabilised over the summer. More specifically, according to the latest SME survey, financing conditions for SMEs have deteriorated across countries. Likewise, the October 2011 bank lending survey points to a significant tightening in credit standards for corporate loans.

As to alternative means of finance, the conditions for large firms' access to market-based funding in the third quarter of 2011 were marked by an overall rise in the cost of funding, as well as by substantial cross-country disparities. The cost of quoted equity rose and remained at historically high levels, while the aggregate real cost of market-based debt increased as well (see Chart S7). Here again, aggregate figures mask substantial differences across countries against the background of re-intensified tensions in euro area sovereign bond markets. Increasing disparities were likewise observed across firms' rating classes. Accordingly, the issuance of equity remained broadly unchanged at very low levels, while the annual growth rate of debt securities issued rebounded.

EARNINGS AND RISK OUTLOOK

Going forward, the recovery of listed firms' earnings is likely to slow down in the course of 2011, as overall macroeconomic conditions weaken. This is also indicated by expectations regarding the earnings per share of the

Chart 2.6 Expected default frequencies for selected non-financial sectors in the euro area

(Jan. 2006 – Sep. 2011; percentage probability)

— construction
···· consumer cyclical
─ ─ capital goods
— utilities
···· media and technology
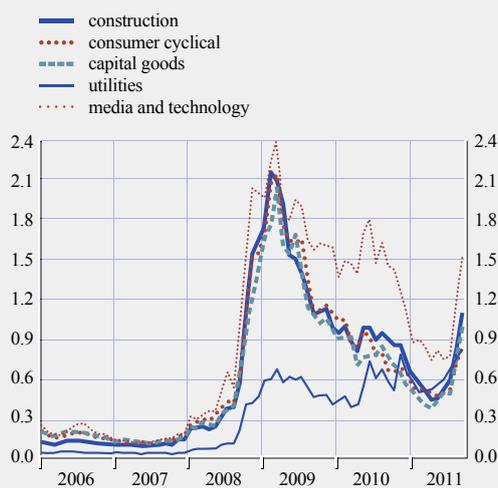
Sources: Moody's KMV and ECB calculations.
Notes: The expected default frequency (EDF) provides an estimate of the probability of default over the following year. Owing to measurement considerations, the EDF values are restricted by Moody's KMV to an interval between 0.1% and 35%. The "capital goods" sector covers the production of industrial machinery and equipment.

non-financial companies included in the Dow Jones EURO STOXX index (see Chart S10).

Apart from a slowdown in global demand, which would be expected, prima facie, to affect primarily large listed companies, limited domestic demand in a context of tightening fiscal conditions and moderating household consumption are likely to also have a negative impact on the already slower growth of SMEs' earnings. At the same time, the re-intensification of the euro area sovereign debt crisis is aggravating already pronounced cross-country disparities.

Against this background, in the October 2011 bank lending survey, euro area banks expected a further perceptible decline in corporate financing needs for the fourth quarter of 2011. Together with lower fixed investment, the availability of internal funds and firms' need for further deleveraging, companies' overall demand for external funding should weaken.

2 See ECB, "Euro area bank lending survey", October 2011.

At the same time, credit standards are expected to be tightened further at the aggregate euro area level, with an ongoing focus on large enterprises as balance sheet constraints are viewed as being somewhat more binding for this category of loans. However, as regards cross-country dispersion, the further tightening was in fact expected to be more broadly based and not limited to countries that are significantly affected by the sovereign debt market crisis. In addition, a historically high level of corporate leverage continues to imply considerable vulnerabilities to upward pressures on the cost of financing and to any constraints on rollover credit.

As regards overall insolvency risks within the non-financial sector, the slowdown in the pace of the macroeconomic recovery is expected to limit the decline in corporate insolvencies in several euro area countries in 2011, and particularly so in 2012. Likewise, expected default frequencies (EDFs) for euro area corporations point to a less favourable outlook (see Charts 2.6 and S13). After a notable decline, EDFs started to increase again in the first half of 2011 and, according to data for the third quarter of 2011, default rates are expected to rise again in the next twelve months (see Chart S11).

Box 5

FIRMS' LIQUIDITY MANAGEMENT DURING PERIODS OF FINANCIAL STRESS

It has long been argued that banks' liquidity problems can have a pernicious influence on the credit conditions of non-financial firms. Banks' inability to access market financing can contribute to the tightening of lending standards for firms – a situation clearly observed in the bank lending surveys conducted by the ECB in the wake of the financial crisis in 2007 and 2008.[1] Such a development can contribute to the transformation of non-financial firms' initial liquidity problems into solvency problems for the firms whose bank credit lines are cut, thereby increasing the likelihood of loan defaults and capital losses for banks.

Undeniably, a tightening of bank lending standards, whatever form it takes (e.g. higher borrowing rates, credit rationing, etc.), ultimately materialises in an adverse liquidity shock to non-financial firms. But one factor of central significance for governing the size of these second-round effects that are key for financial stability is the question as to whether firms are able to find alternative sources of funds and – more generally – how they manage their liquidity during periods of financial stress. Two common reactions of firms include, first, reducing activity at the firm level and, second, drawing on already existing explicit (i.e. pre-agreed) and implicit credit lines. Firms may react to credit constraints by curtailing their activity – cutting back on inventories, investment, workforce and, therefore, production. Recent evidence suggests that an important channel is international trade, where the decline in the credit supply during the 2008-09 crisis significantly reduced the volume of exports.[2] This box examines the second avenue, with a focus on the role of trade credit and its importance over the last few years. It argues that buffers were in place within the non-financial corporate sector that helped to mitigate the contraction of activity. For instance, financially constrained (i.e. small, private, non-investment-grade) European and US firms reportedly drew on credit lines available from their banks in 2008 and early 2009. During the crisis, these constrained firms also invested relatively more (or disinvested less) than those that did not have

1   See, for example, Box 1 in ECB, *Monthly Bulletin,* January 2009.
2   See D. Paravisini, V. Rappoport, P. Schnabl and D. Wolfenzon, "Dissecting the effect of credit supply on trade: evidence from matched credit-export data", December 2010 (available at: http://pages.stern.nyu.edu/~sternfin/pschnabl/PRSW_Dec10.pdf).

any such credit line.[3] All in all, these results suggest that, as "options on liquidity", credit lines help firms absorb adverse liquidity shocks and insulate their real activity from liquidity conditions. Lines of credit from banks, however, appear to be short-lived as their terms and availability deteriorate rapidly during financial crises, when banks themselves become financially strained.

In addition to these explicit lines of credit, firms usually have the possibility to draw on implicit lines from their suppliers as well, by postponing the payment of trade payables that come due. Given that trade payables represent about one-fourth of firms' liabilities in the EU, such lines of credit are potentially an important source of emergency funding for firms. For example, there is evidence that, because of a shortage of liquidity, more than 2% of French firms pay their trade debt later than initially agreed upon with their suppliers every quarter and that, when they occur, payment incidents amount to, on average, 8.5% of all trade payables.[4]

Estimates suggest that a sizeable fraction of the liquidity shocks faced by credit-constrained firms are thus passed on to suppliers along the trade credit chain. The chain of payment incidents, however, stops whenever it reaches firms that have access to outside finance (so-called "deep pockets"). Overall, these findings are consistent with the idea that firms provide liquidity insurance to each other in a way that alleviates the adverse consequences of credit crunches. The substitutability between bank loans and trade credit observed over the business cycle can be viewed as a consequence of this liquidity insurance mechanism (see the chart below).

During periods of financial distress, liquidity is re-allocated within the non-financial corporate sector from firms with access to outside finance along trade credit chains to credit-constrained firms. This re-allocation process goes beyond the mere bilateral relationships of constrained firms with unconstrained suppliers, however. In effect, all types of firms, including credit-constrained firms, supply liquidity insurance to their customers. The reason is that, when confronted with payment incidents, credit-constrained firms also have the option to postpone payments to their suppliers, and so on. In other words, they can afford to provide liquidity insurance because they are themselves insured by their suppliers. It follows that, by extending the maturity period of their trade credit, suppliers do not only ease the financial constraints faced by their direct customers, but ultimately also those faced by their customers' customers and other firms they may not have direct business relations with. Only deep pockets ultimately inject fresh liquidity

Substitution effects between trade credit and bank loans during the 2008-2009 crisis in the euro area

(Q1 1999 – Q1 2011; percentage deviation from trend)
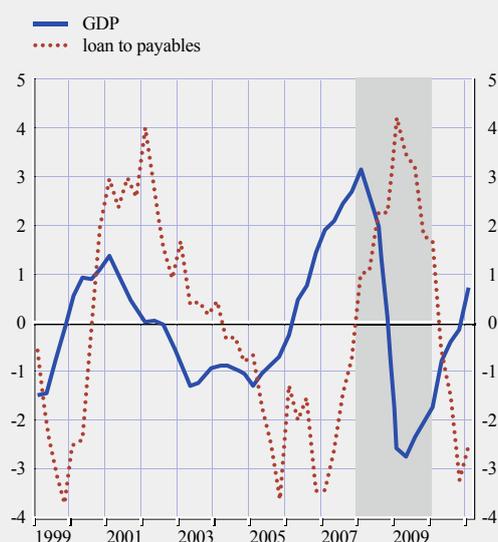
Sources: ECB, Eurostat and ECB calculations.
Note: The GDP series is the Hoddrick-Prescott filtered series of real GDP. The loan-to-payables series is the Hoddrick-Prescott filtered series of the ratio of bank loans to trade payables.

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3 See M. Campello, E. Giambona, J.R. Graham and C.R. Harvey, "Liquidity management and corporate investment during a financial crisis", November 2010 (available at: http://faculty.fuqua.duke.edu/~charvey/Research/Working_Papers/W99_Liquidity_management_and.pdf).
4 See F. Boissay and R. Gropp, "Trade credit defaults and liquidity provision by firms", *ECB Working Paper Series*, No 753, 2007.

into the system, however. For instance, a study based on French firms shows that firms that have unconstrained (notably listed) suppliers have 12% more payment incidents that are due to cash shortages than firms that do not have any unconstrained supplier.[5] They also keep significantly less cash as a precautionary provision on their balance sheet (11% of total assets) than other firms (16% of total assets). Accordingly, unconstrained suppliers face a disproportionate amount of payment incidents: on average, the findings suggest that French listed firms face 33% more payment incidents that are due to the illiquidity of their customers than similar but unlisted firms.

All in all, these results suggest that credit lines provide some means of mitigating adverse feedback loops between price- or quantity-rationed bank funding and firm-level activity. In the end, the extent to which listed firms accommodate payment incidents and inject liquidity into the rest of the economy depends, of course, on their ability to raise fresh funds. This box suggests that, ultimately, a factor contributing to alleviating financial stability strains may be an inbuilt backstop in the form of a vibrant and liquid market for non-financial corporate commercial paper, which would replace bank loans during periods of financial stress.

5   Boissay and Gropp, op. cit.

2.3 STRETCHED PROPERTY VALUATION IN SOME COUNTRIES COMBINED WITH REFINANCING RISKS

OVERALL ASSESSMENT OF RISKS IN THE PROPERTY MARKETS

Financial stability risks stemming from euro area property markets have remained largely unchanged since the finalisation of the June FSR. In an environment in which both residential and commercial property prices have lost momentum after an earlier recovery, renewed weakness – particularly in fragile segments – remains a possibility.

On the residential side, notwithstanding considerable heterogeneity, house prices appear to remain overvalued in several countries. Therefore, some residential property markets are assessed as being still vulnerable to corrections in prices, which could create the potential for further credit losses for banks (see Section 4.2).

With respect to commercial property markets, although conditions have improved in most euro area countries since the finalisation of the June FSR, capital values in many countries remain well below the peaks seen around 2007, and conditions in some countries remain very challenging. At the same time, the deteriorating economic outlook has increased the uncertainty surrounding future commercial property developments. Refinancing risks for many loan-financed property investors therefore remain significant.

RESIDENTIAL PROPERTY MARKETS

Data which have become available after the finalisation of the last FSR imply some slowdown in the gradual pace of recovery in aggregate euro area house prices observed since end-2009. In the first and second quarters of 2011, residential property prices increased by 2.3% and 1.1%, year on year, respectively, down from growth rates of close to 3% in the third and fourth quarters of 2010 (see Chart S25 and Table S1). The average growth rate, however, remains well below the average recorded between 1999 and 2008.

Country-level developments within the euro area remain highly heterogeneous – with some markets still experiencing falling house prices and others showing robust price increases (see Table S1). Among those countries for which intra-annual information is available, Ireland, Greece, Spain, Cyprus, the Netherlands and Slovakia all recorded continued year-on-year declines in house prices up to the end of the first or second quarters of 2011, and the pace of the declines was generally faster than in the fourth quarter of 2010. Belgium,

Estonia, France, Luxembourg, Austria, Slovenia and Finland, by contrast, continued to see increases in property prices.

On the supply side of the housing market, residential investment increased in real terms in the first and second quarters of 2011, namely by 3.6% and 1.1%, year on year, respectively, after more than three years of contraction. Moreover, approval of building permits, which are often used as a leading indicator for housing investment, picked up in the first quarter of 2011, recording the highest growth rate since 2007, but decreased sharply in the second quarter. Anecdotal evidence suggests that the construction and real estate sector is still operating at capacity levels considerably below those recorded prior to the crisis. Indeed, prices of new buildings remain under downward pressure on account of not only increased competition, but also an excessive supply and low demand. The latter was significantly affected by some tightening in aggregate financing conditions and has, in turn, had an impact on companies' investment plans. The outlook for residential investment is clouded by overall economic uncertainty, in particular that related to the sovereign debt crisis and a possible worsening of credit supply conditions. Marked cross-country differences in housing market investment persist, however, with an expansion being recorded in some large countries, notably Germany, while volumes are still shrinking sharply in some fiscally distressed countries.

Looking ahead, the prospects for house price developments have remained broadly unchanged since the June FSR. In particular, they entail moderate nominal increases in the coming years. Nevertheless, the potential for a further correction in house prices in some countries in the near-term remains a possible downside risk for financial stability in the euro area.

Various basic metrics for detecting residential property price misalignments in fundamentals indicate a declining but still persistent degree of property market overvaluation at the aggregate euro area level (see Charts 2.7 and S26).[3]

Chart 2.7 Residential property price valuation measures for selected euro area countries

(estimated percentage overvaluation)

- affordability index
- log-linear regression
- house price-to-rent ratio
- simplified static asset pricing framework
- average

1 Belgium   5 Italy   9 Germany
2 France   6 Netherlands 10 euro area
3 Spain   7 Austria
4 Finland 8 Portugal
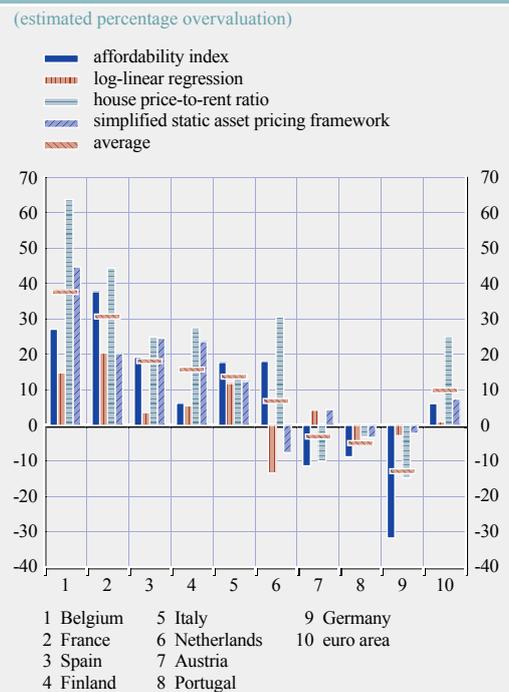
Sources: Eurostat, OECD, national sources and ECB calculations.
Notes: Estimates are based on data up to the second quarter of 2011 for all countries except Austria, where they are based on data up to the first quarter of 2011. House price data for Italy are semi-annual and those for Germany annual.

While the quantitative signals coming from these indicators must be interpreted with caution, given many caveats – including data quality issues, the possible presence of structural breaks and the influence of other factors not accounted for – they qualitatively suggest an overvaluation in several euro area countries. Elevated vulnerabilities are to be found, in particular, in countries where there is potential for a decline in residential property prices and where the household sector is more indebted (see Section 2.1).

Possible triggers for property market price corrections include signs of a weakening macroeconomic recovery, which could undermine households' debt servicing capabilities and

3 See Box 3 in ECB, *Financial Stability Review,* June 2011, for further details of these valuation measures.

put house prices under downward pressure. At the same time, the impact of increases in long-term interest rates continues to be a risk in some countries, in that this would increase households' debt servicing costs.

COMMERCIAL PROPERTY MARKETS

Conditions in commercial property markets have improved in most euro area countries since the finalisation of the June FSR, thereby confirming expectations. Nevertheless, the growth of capital values decelerated on average, and values in many countries remain well below the peaks seen around 2007. In addition, conditions in some countries remain very challenging. At the same time, the deteriorating economic outlook has increased the uncertainty surrounding future commercial property developments. The refinancing risks for many loan-financed property investors therefore remain significant. Continued losses for some banks as a result of their exposure to commercial property lending and investment can therefore not be ruled out in the period ahead (see Section 4.2).

A general feature of the recovery in capital values has been that it is concentrated in the prime segment in relatively few countries, whereas values of non-prime property have continued to decline, or have only seen modest improvements. In this vein, it is noteworthy that capital value growth for prime property decelerated after the June FSR, with annual growth rates of 3.5% for the euro area as a whole in the third quarter of 2011 (see Chart 2.8). Widely diverging developments, however, were apparent at the country level. On the one hand, capital values continued to decline in Greece and Ireland, namely by 28% and 11% respectively. On the other hand, values increased by over 10%, year on year, in Austria, Finland and the Netherlands.

To some extent, these price dynamics follow from relatively steady supply dynamics. Quarterly investment volumes appear to have stabilised at around €12 billion in recent quarters, well below the €20-30 billion per quarter seen in the period from 2006 to 2008.[4]

Chart 2.8 Changes in the capital value of prime commercial property in euro area countries

(Q1 2007 – Q3 2011; percentage change per annum; maximum, minimum, inter-quartile distribution and weighted average)
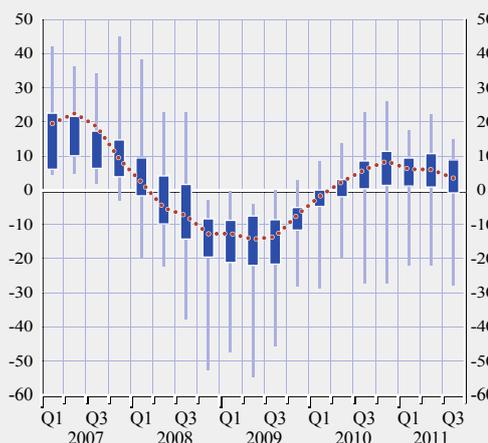
Source: Jones Lang LaSalle.
Note: Data for Cyprus, Estonia, Malta, Slovakia and Slovenia are not available.

The growth of rents has fallen into a historical pattern of exhibiting less amplitude than capital value growth – continuing to be more muted than capital value growth after the finalisation of the June FSR. On average, rents remained broadly flat in the second and third quarters of 2011. On account of increases in capital values but stable rents, capital value-to-rent ratios have risen for most euro area countries in recent quarters. This, together with other valuation measures, suggests an increase in valuation relative to fundamentals for the euro area as a whole (see Box 6).

The income risks for commercial property investors identified in the June FSR remain broadly unchanged. In most countries capital values remain well below the levels seen in previous years, and rental growth continues to be sluggish. In particular, demand for renting, and investing in, non-prime property remains low.

About a third of outstanding commercial property mortgages in the euro area are due to mature by 2013. Many of these mortgages were originated or refinanced when commercial

4 According to data from DTZ Research.

property prices peaked in 2006-07, and were often granted with high loan-to-value ratios (often 75-85%). Since prevailing commercial property prices in many euro area countries stand well below peak levels, property investors continue to be exposed to high refinancing risks. More challenging financing conditions may force property investors to raise capital, for example by selling property,

with a view to increasing the equity share in their investments.

On average, commercial property values in the euro area are expected to recover only gradually in the coming years – although continued or renewed declines cannot be excluded in some countries if economic conditions should worsen.

INDICATORS FOR DETECTING POSSIBLE VALUE MISALIGNMENTS IN COMMERCIAL PROPERTY MARKETS

Commercial property loans represent a considerable proportion of most banks' assets and, given their tendency to exhibit strong pro-cyclical volatility,[1] embed financial stability risks that tend to crystallise in property value downturns. At the level of individual commercial properties, well-accepted metrics exist for assessing valuations – which, typically, involve discounting the future income stream the properties are expected to generate.[2] At the aggregate level, however, widely accepted valuation metrics are more scarce – not least given a lack of suitable data (particularly acute in the case of euro area countries). One alternative approach to detecting possible value misalignments in commercial property markets, which is explored in this box, can therefore be to compare property values with some macroeconomic variables – since commercial property values tend to follow economic developments rather closely – and some aggregate commercial property data that can give indications of the demand and supply factors in commercial property markets.

Using macroeconomic data as a benchmark, three broad sets of indicators can be computed for the euro area countries for which data are available. The first set compares commercial property values with variables that proxy macroeconomic conditions with a strong bearing on property demand: *overall GDP*, since commercial property markets tend to follow business cycle developments rather closely, and *private consumption* and *employment*, since they are important determinants of the demand for retail shop and office space respectively. The second set of indicators compares commercial property values with variables associated with future income streams of properties – notably *rents* and *initial yields* – loosely fitting into a standard dividend-discount asset-pricing framework.

While these indicators provide some insight into valuations, they are subject to several caveats, which can be grouped into four categories. First, owing to the fragmented and opaque nature of commercial property markets in many countries, official data on, for example, commercial property values and rents do not exist for most euro area countries. This box therefore uses data from private sources, which only cover larger cities and only prime property. Second, long time series are not available, which hampers the analysis significantly.[3] Third, the indicators do

1 See, for example, ECB, "Commercial property markets – financial stability risks, recent developments and EU banks' exposures", 2008.
2 The most commonly used methods are (i) the cost approach, (ii) the sales comparison approach and (iii) the income approach.
3 The box used quarterly data from 2007 and annual data from 1997 (from 1999 for Greece and from 2002 for Portugal) that were interpolated to create a quarterly time series.

Chart A Value misalignment indicators for prime commercial property in selected euro area countries

(percentage deviation from average values from Q1 1997 to Q3 2011)

- capital value-to-GDP ratio
- capital value-to-private consumption ratio
- capital value-to-employment ratio
- capital value-to-rent ratio
- yield
- average

(Q1 2007)

(Q3 2011)

1 Ireland	5 Italy	9 Portugal
2 Spain	6 Finland	10 Austria
3 France	7 euro area	11 Germany
4 Netherlands	8 Belgium	12 Greece

1 Netherlands	5 Italy	9 Austria
2 France	6 euro area	10 Spain
3 Finland	7 Germany	11 Greece
4 Belgium	8 Portugal	12 Ireland
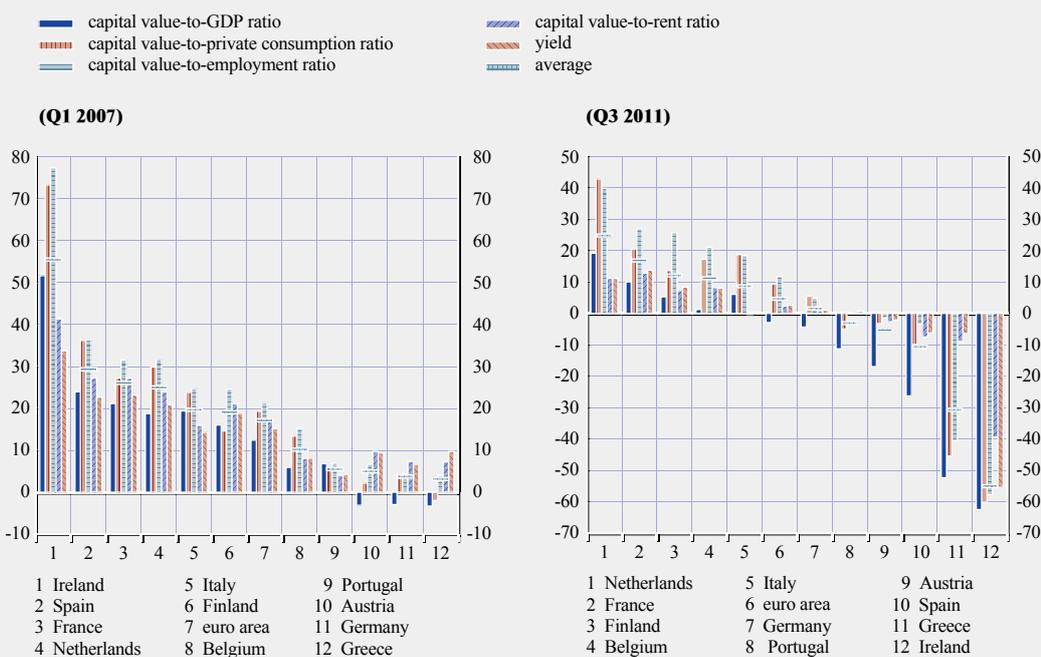
Sources: Jones Lange LaSalle, ECB and ECB calculations.

not take into account the influence of factors such as commercial property supply elasticity or national tax treatments, which are factors that can have a significant impact on property values. Fourth, prime commercial property values often adjust more rapidly than macroeconomic aggregates or variables that proxy cash flows. For example, rents in lease contracts are often fixed for some years, and some countries have rent controls that mute the fluctuation of rents. As a result, negative values for the misalignment indicators can therefore be a result of the fact that capital values have adjusted faster than the denominators of the indicators, so that they are not necessarily an indication of an undervaluation of commercial property.

Notwithstanding these caveats, the indicators suggest that at the beginning of 2007, a period when commercial property markets in most euro area countries reached their recent peaks (see Chart A), commercial property markets in most euro area countries showed signs of heightened valuations in comparison with previous norms over the past decade. After 2007, commercial property values fell considerably in most countries, which led to adjustments to the indicators of value misalignments (see Charts A and B). The adjustments were rather broadly based across the five different indicators.

At the moment, the indicators suggest that commercial property values for the euro area as a whole are not greatly misaligned in terms of the price movements recorded since the mid-1990s, although there are significant cross-country differences. At the level of individual countries, the amplitude of the cycle is eye-catching in Ireland, Greece and, to some degree, Spain (see Chart B). The large negative values, however, to some extent reflect the caveats mentioned earlier. Most importantly, in the case of Ireland, Greece and Spain, the analysis is particularly hampered by

the relatively short time series available, which results from the fact that the high increases in value seen during the boom period from 2003 to 2007 had a marked impact on the average historical values, with which current levels are compared.

All in all, these measures of misalignment suggest that the decline in values seen in most euro area countries since 2007 has substantially reduced the average overvaluation of commercial property in most countries. Nevertheless, some countries are still showing signs of overvaluation and some have even witnessed renewed increases in the misalignment indicators in recent quarters. Despite several caveats, they present a means of augmenting analysis based solely on comparisons of value developments with some benchmarks illustrating possible value misalignments.
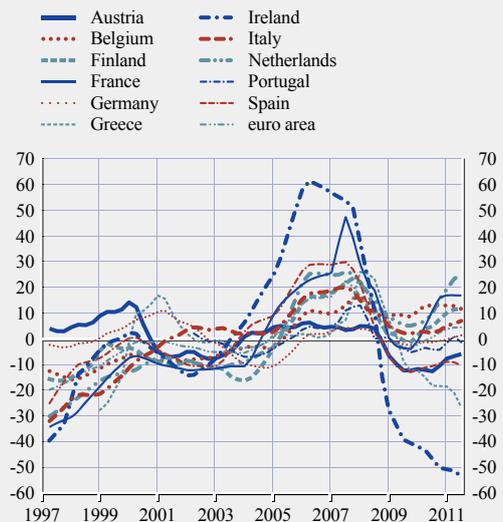
Sources: Jones Lange LaSalle, ECB and ECB calculations.

2.4 MALIGN INTERPLAY BETWEEN PUBLIC FINANCES AND THE FINANCIAL SECTOR AMID FORCES OF CONTAGION

OVERALL ASSESSMENT OF RISKS IN THE GOVERNMENT SECTOR

The fiscal situation in the euro area remains challenging. While aggregate fiscal fundamentals are not unlike those in other advanced economies, there is considerable heterogeneity in fiscal positions across euro area countries. In this setting, financial market concerns have led to further contagion in euro area countries with what are perceived as weak fiscal fundamentals and structural problems that impact on their growth prospects. In particular, since the finalisation of the June 2011 FSR, market concerns with respect to fiscal sustainability have grown and spread to some larger euro area countries, from those currently under EU/IMF programmes. At the same time, both a weakened outlook for economic growth in the euro area and banking sector stress have contributed to concerns about the fiscal dynamics in these economies.

In the context of these strains, substantial efforts to reduce fiscal vulnerabilities and prevent further contagion are now under way, at both the country and a European level. At the country level, several governments have announced additional fiscal consolidation measures and new structural reforms. This has caused the medium-term fiscal position for the euro area as a whole to improve slightly in comparison with the spring outlook, although fiscal positions continue to differ substantially across countries. Moreover, EU-wide initiatives aimed at enhancing the crisis resolution mechanisms provide complementary means of stemming contagion. Likewise, recently agreed reforms to strengthen fiscal surveillance and economic governance in the EU should contribute to yielding sounder national policies that lay the foundations for a stable economic and monetary union.

Notwithstanding these initiatives, market participants have become increasingly concerned about the ability of some governments to restore or maintain sustainable public finances over the medium term. This

heightened uncertainty is affecting views on the backstop potential of governments to support national banking systems. At the same time, still high government refinancing needs have created concerns that the public sector may in some cases compete with – and, at the limit, even crowd out – issuance of debt securities by banks. Finally, market uncertainty about the scope and size of the potential adverse feedback between the sovereign and the financial sector has increased since the June FSR. Such complex interdependencies are magnified by the different timelines that financial markets and governments often have in terms of reform requirements and their impact. Fiscal and, in particular, structural adjustments can take time to bear fruit, which may not always match investors' decision-making horizon.

In such a fragile environment, the value of a firm anchoring of fiscal policies is clear. The full implementation of the substantial fiscal consolidation efforts announced by euro area governments would help ameliorate the situation at a minimum. A frontloading of consolidation measures could in several cases be a superior outcome in that they would yield a more tangible improvement in long-term debt sustainability. Complementing this, clear and enforceable fiscal rules, at both the national and the EU level, can also further solidify and anchor expectations of sound fiscal policies. Any adverse short-term economic impact of fiscal measures, while debateable in stressed market conditions, can be fruitfully complemented by comprehensive structural reforms that sustainably boost growth prospects. In the latter respect, a relaxation of considerable product and labour market rigidities in several euro area countries could have even more immediate beneficial macroeconomic results.

LATEST FISCAL DEVELOPMENTS

In mid-June 2011, the European Council concluded the first "European semester".[5] It called upon euro area governments to adhere strictly to the budgetary targets set out in their 2011 stability programmes, as well as in the Memoranda of Understanding for countries receiving EU/IMF financial assistance.

Against the background of rising financial market uncertainty and still spreading debt sustainability concerns, several euro area countries have announced additional consolidation plans and/or adopted legislative measures to correct their excessive deficits (see Table 2.1 for the euro area countries' medium-term fiscal outlook according to the European Commission's 2011 autumn forecast). In Greece, Portugal and Ireland, consolidation measures endorsed by the governments in the context of the EU/IMF programmes amount to over 19% of GDP in the period 2011-15, more than 10% of GDP in the period 2011-13, and about 8.5% of GDP over the period 2011-13 respectively. Aside from the three countries under EU/IMF programmes, wide-ranging additional fiscal measures in several larger euro area countries, in particular Italy and Spain, aim at more aggressively adjusting public accounts. Furthermore, to better anchor expectations regarding the future fiscal path, the two latter countries have announced and/or incorporated the introduction of balanced budget rules in their constitutions.

Notwithstanding these additional fiscal consolidation efforts, several euro area countries continue to face particularly acute fiscal challenges. Market concerns about some governments' ability to restore sustainable public finances over the medium term have led to higher sovereign bond yields in the secondary market (see Section 3.1 of this FSR).

To further support market confidence and debt sustainability efforts in the euro area, four policy initiatives taken at the EU level are particularly noteworthy. First, some relief regarding the financing conditions for countries under EU/IMF programmes was endorsed at the summit

5 The European semester is a six-month period every year during which EU Member States' budgetary and structural policies are reviewed to detect any inconsistencies and emerging imbalances. The aim is to reinforce supervision and coordination while major budgetary decisions are still under preparation.

Table 2.1 General government budget balance and gross debt

(2008 – 2013; percentage of GDP)

	General government budget balance						General government gross debt					
	2008	2009	2010	2011	2012	2013	2008	2009	2010	2011	2012	2013
Belgium	-1.3	-5.8	-4.1	-3.6	-4.6	-4.5	89.3	95.9	96.2	97.2	99.2	100.3
Germany	-0.1	-3.2	-4.3	-1.3	-1.0	-0.7	66.7	74.4	83.2	81.7	81.2	79.9
Estonia	-2.9	-2.0	0.2	0.8	-1.8	-0.8	4.5	7.2	6.7	5.8	6.0	6.1
Ireland	-7.3	-14.2	-31.3	-10.3	-8.6	-7.8	44.3	65.2	94.9	108.1	117.5	121.1
Greece	-9.8	-15.8	-10.6	-8.9	-7.0	-6.8	113.0	129.3	144.9	162.8	198.3	198.5
Spain	-4.5	-11.2	-9.3	-6.6	-5.9	-5.3	40.1	53.8	61.0	69.6	73.8	78.0
France	-3.3	-7.5	-7.1	-5.8	-5.3	-5.1	68.2	79.0	82.3	85.4	89.2	91.7
Italy	-2.7	-5.4	-4.6	-4.0	-2.3	-1.2	105.8	115.5	118.4	120.5	120.5	118.7
Cyprus	0.9	-6.1	-5.3	-6.7	-4.9	-4.7	48.9	58.5	61.5	64.9	68.4	70.9
Luxembourg	3.0	-0.9	-1.1	-0.6	-1.1	-0.9	13.7	14.8	19.1	19.5	20.2	20.3
Malta	-4.6	-3.7	-3.6	-3.0	-3.5	-3.6	62.2	67.8	69.0	69.6	70.8	71.5
Netherlands	0.5	-5.6	-5.1	-4.3	-3.1	-2.7	58.5	60.8	62.9	64.2	64.9	66.0
Austria	-0.9	-4.1	-4.4	-3.4	-3.1	-2.9	63.8	69.5	71.8	72.2	73.3	73.7
Portugal	-3.6	-10.1	-9.8	-5.8	-4.5	-3.2	71.6	83.0	93.3	101.6	111.0	112.1
Slovenia	-1.9	-6.1	-5.8	-5.7	-5.3	-5.7	21.9	35.3	38.8	45.5	50.1	54.6
Slovakia	-2.1	-8.0	-7.7	-5.8	-4.9	-5.0	27.8	35.5	41.0	44.5	47.5	51.1
Finland	4.3	-2.5	-2.5	-1.0	-0.7	-0.7	33.9	43.3	48.3	49.1	51.8	53.5
Euro area	-2.1	-6.4	-6.2	-4.1	-3.4	-3.0	70.1	79.8	85.6	88.0	90.4	90.9

Source: European Commission, "European Economic Forecast – autumn 2011".

of the euro area Heads of State or Government on 21 July 2011. For all countries under EU/IMF programmes, official loan maturities were lengthened significantly and interest rates were lowered. Furthermore, in the case of Greece, the Heads of State or Government decided at their euro summit on 26 October 2011 that a new three-year programme should be prepared, supported by additional official financing of up to €100 billion until 2014, including resources to recapitalise Greek banks. They also invited private investors and other parties concerned to develop – on an exceptional basis – a voluntary bond exchange with a 50% nominal discount on notional privately held Greek debt. The euro area governments also committed themselves to contribute up to €30 billion to the scheme for private sector involvement. The plan aims to enable Greece to reduce its public debt-to-GDP ratio to 120% by 2020. The unique and exceptional nature of the decision concerning Greek debt was reaffirmed at the summit of the euro area Heads of State or Government on 9 December. Moreover, it was also decided at the summit that any prospective involvement of the private sector under the future European Stability Mechanism (see below) would strictly follow well-established IMF principles and practices.

Second, at the summits of July, October and December 2011, euro area governments agreed on measures to improve the effectiveness of the stability mechanisms for countries in severe economic distress, i.e. the current European Financial Stability Facility (EFSF) and the future European Stability Mechanism (ESM). On an earlier occasion (in March 2011), the euro area Heads of State or Government had agreed to bring the effective lending capacity of the EFSF to €440 billion and to allow it to intervene in the primary markets. To make the stability mechanisms more flexible, while ensuring strict conditionality, it was decided at the summit on 21 July to allow the EFSF/ESM to take action and – on the basis of a precautionary programme – to (i) finance the recapitalisation of financial institutions through loans to governments, also in euro area countries not covered by a programme, and (ii) intervene in the secondary bond markets. EFSF purchases in the secondary markets, if necessary, need to be based on an ECB analysis recognising the existence of exceptional financial market circumstances. The summit of 26 October saw a decision on additional EFSF leveraging to expand its lending capacity, to be implemented through two options: (i) credit

enhancement for new debt issued by Member States, thus offering risk insurance to private investors purchasing government bonds in the primary market; and (ii) raising additional funds from both public and private financial institutions and investors on the basis of special-purpose vehicles. Subsequently, at the summit of 9 December, it was decided to reassess the adequacy of the overall ceiling of €500 billion for the EFSF/ESM in March 2012 and to bring forward the entry into force of the ESM treaty to July 2012. It was also decided that euro area and other EU Member States would consider the provision of additional resources of up to €200 billion for the IMF, in the form of bilateral loans, to ensure that the IMF has adequate resources to deal with the crisis.

Third, in mid-September 2011, the Ecofin Council, the European Parliament and the European Commission reached agreement on a new EU framework of economic governance. The reform package, consisting of six legal texts (the so-called "six-pack") aims at strengthening economic governance in the EU and in the euro area, in particular. Several proposals are intended to improve fiscal sustainability in the future, the most important of which are the proposals to (i) introduce a surveillance mechanism for the prevention and correction of macroeconomic imbalances, (ii) make the government debt criterion operational, (iii) strengthen the preventive arm of the Stability and Growth Pact through the introduction of an expenditure benchmark aimed at ensuring that countries no longer finance expenditure growth out of revenue windfalls, (iv) introduce new financial sanctions to strengthen enforcement and (v) set new minimum requirements for the rules and procedures governing national budgetary frameworks. In addition, building on this legislative package, on the European Semester and the Euro Plus Pact, the euro area Member States committed themselves at the summit on 26 October 2011 to adopt national fiscal rules by the end of 2012 that introduce balanced budgets in structural terms.

Finally, building on previous agreements, the euro area Heads of State or Government agreed at the meeting of 8-9 December 2011 to move closer towards an economic union and to establish a new fiscal compact. From a fiscal perspective, a first key element of the new fiscal compact is the commitment to establish a balanced budget rule, formulated in structural terms (the annual structural deficit shall not exceed 0.5% of nominal GDP), in the form of an intergovernmental treaty at the European level. This rule will also be enshrined in national legislation at the constitutional or equivalent level, and will be combined with an automatic correction mechanism in the case of deviations. A second major element is the endorsement of quasi-automatic sanctions if the headline budget deficit exceeds the reference value of 3% of GDP.

In addition, the ECB action aimed at ensuring the functioning of the monetary policy transmission process, notably the Securities Markets Programme (SMP) that was introduced in May 2010 and reactivated in early August 2011, also contributed to limiting spillover effects and the adverse feedback loop between the sovereign and the financial sectors.[6]

MAIN CHALLENGES TO FISCAL SUSTAINABILITY
Challenges to fiscal sustainability have become prominent and even acute in some countries since the June FSR. In particular, a worsened interplay between fiscal, financial sector and macroeconomic conditions has made many sovereigns and banks vulnerable in three key ways.

First, against the backdrop of heightened uncertainty, market tolerance for high sovereign debt ratios in the euro area has diminished

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6 Under the SMP, Eurosystem interventions can be carried out in the secondary public and private debt securities markets of euro area countries to ensure depth and liquidity in dysfunctional market segments and to restore the proper functioning of the monetary policy transmission mechanism. The SMP interventions are temporary, limited and fully sterilised.

Chart 2.9 Government debt and planned structural fiscal adjustment in euro area countries

x-axis: government debt in 2010 (percentage of GDP)
y-axis: change in the structural budget balance in the period 2010-12 (percentage points of GDP)

Sources: European Commission, "European Economic Forecast – autumn 2011", and ECB calculations.
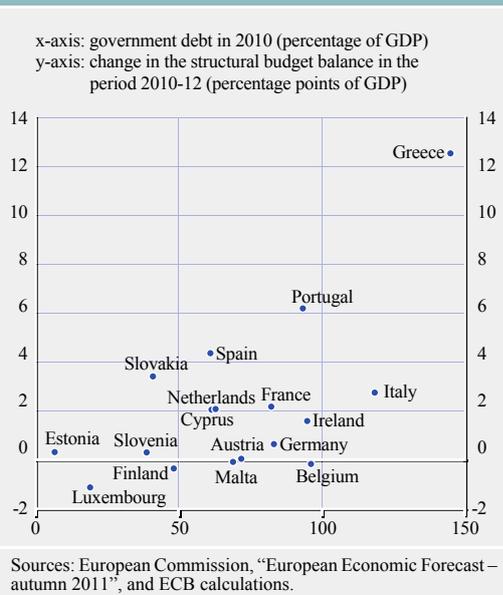
considerably. To stabilise the debt dynamics and put the debt ratio on a declining path, sufficiently large primary surpluses need to be created and then maintained by governments over an extended period of time. Accordingly, the most indebted governments have been those adopting the most ambitious consolidation programmes (see Chart 2.9). Obviously, a swift implementation of such programmes would contribute to reducing the perception of risks that undermine market confidence. Moreover, near-term consolidation will help to create room to accommodate demographic trends that are likely to place additional pressure on government debt sustainability in the longer run. Indeed, implicit government liabilities related to population ageing could already start to become apparent as early as at the end of the current decade.[7]

Second, significant contingent liabilities resulting from interventions to support the financial sector in some countries continue to pose fiscal risks and may increase further in the event of additional bank recapitalisation. During the

period from 2008 to the end of September 2011, direct government interventions to support the financial sector caused gross government debt in the euro area as a whole to increase by about 4.7 percentage points of GDP. Over the same period, euro area governments recovered funds in the order of 1.3% of GDP (redemptions). The guarantees effectively granted represented around 6.0% of euro area GDP at end-September 2011 and stood at about half the amount set by the governments as the implicit ceilings (about 12% of GDP). Further government support for the banking sector may be needed in some cases, although only as a last resort. In this vein, the euro area summit of 26 October called for a fully coordinated approach to strengthen Europe's banks through recapitalisation, requiring banks to first use private sources of capital, with national governments called upon to provide support where necessary. Where national support is not available, recapitalisation should be funded via a loan from the EFSF.

Finally, a general deterioration in both macroeconomic and financial conditions has increased fiscal sustainability risks since the finalisation of the June FSR. They include a weaker outlook for growth in the short run, in addition to the prospect of lower trend growth in the longer run. The persistence of high government bond yields in the most vulnerable euro area countries, and spillovers to large countries such as Spain and Italy, have put additional pressure on their fiscal positions (see Section 3.1).

SOVEREIGN FINANCING NEEDS
Government borrowing needs in financial markets represent the most immediate direct

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7 For the euro area as a whole, projections of the European Commission and the Economic Policy Committee's 2009 Ageing Report indicate that public spending will increase by up to 5.2 percentage points of GDP over the period from 2010 to 2060 if no corrective action is taken. Revised estimates will become available next year, in the context of the forthcoming 2012 Ageing Report.

interaction between fiscal policies and the financial system. Sovereign bond issuance in the euro area increased significantly after late 2008 and remained at high levels throughout most of 2010.

After having peaked at 27% of GDP in 2010, euro area governments' gross financing needs (related to maturing debt and deficits) are expected to decrease slightly to about 26.3% of GDP in 2011. This is due to declining deficits, which more than offset still rising debt rollovers from higher debt and an earlier shortening of maturities. Looking ahead, the gross financing needs of euro area governments are expected to decrease further in 2012, with significant cross-country differences (see Chart 2.10).

To a certain extent, government financing needs could be attenuated through recourse to selected existing financial assets of the government. Such assets, the degree of liquidity of which varies, include mainly currency and deposits, loans granted by the government, securities other than shares, shares and other equity, and other accounts receivable. At the end of June 2011, the average amount of consolidated financial assets held by euro area governments stood at 34.5% of GDP, with some variation across countries. The market value of consolidated government liabilities at the time was 91.6% of GDP. Accordingly, the net debt of euro area governments (the liabilities of the governments minus the financial assets held, both recorded at market value) totalled 57.1% of GDP at the end of June 2011.

The maturity structure of public debt is an important determinant of the marginal rate that applies to government refinancing. A sizeable share of debt with a short residual maturity can imply higher financing risk. In the euro area, the share of securities with a residual maturity of up to one year in total outstanding government securities increased from a monthly average of 20.7% in 2008 to 23% in 2009. A partial reversal of this trend was noted in 2010, with a decline

Chart 2.10 Estimated financing needs of the euro area countries in 2012

(as of end-Sep. 2011; percentage of GDP)

Legend:
- general government deficit
- maturing sovereign debt

1 Cyprus	6 France	11 Ireland	16 Estonia
2 Greece	7 Portugal	12 Austria	17 Luxembourg
3 Italy	8 Germany	13 Slovakia	
4 Belgium	9 Malta	14 Slovenia	
5 Spain	10 Netherlands	15 Finland	
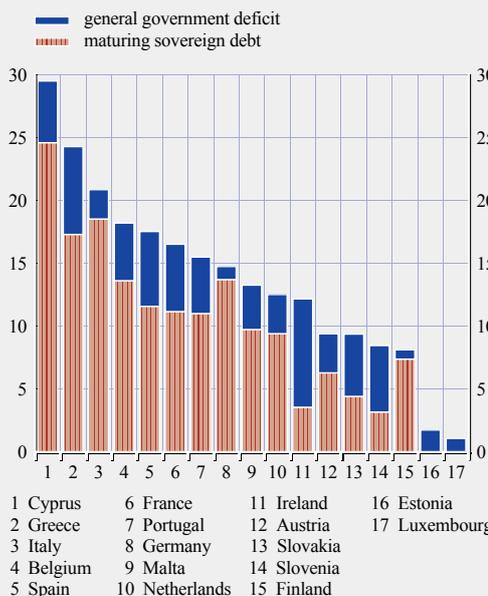
Sources: European Commission's autumn 2011 economic forecast for the general government balance, ECB for maturing sovereign debt and ECB calculations.
Notes: The gross financing needs for 2012 are broad estimates consisting of the redemption of maturing debt (outstanding at end-September 2011) and the government deficit (assuming no additional financial operations "below the line"). The estimates are subject to the following caveats. First, they only take into account redemptions of securities, while maturing loans (e.g. from domestic banks) are not included on account of a lack of data (this may lead to underestimation). Second, some government securities do not fall into the ESA definition of general government debt (which might lead to overestimation). For Cyprus in particular, the special purpose bond of €2.2 billion (12% of GDP) issued with the aim of improving the liquidity of the banking sector is expected to be paid back by banks and not to be rolled over by the government. Third, estimates do not take account of the fact that some maturing government securities are held within the government sector. Finally, refinancing needs corresponding to short-term debt issued after September 2011 are not reflected in the 2012 data (by contrast, the 2010 and 2011 euro area aggregates included in the text fully reflect the rollover of short-term debt).

to 21.4%, a proportion that was kept broadly unchanged in the first nine months of 2011. Potentially of greater relevance to governments' refinancing risk is the fact that, as of the end of September 2011, cumulatively about 33.2% of euro area government debt securities outstanding will mature within two years, a slight increase in comparison with the monthly average of 32.6% in 2010.

BOX 7

PUBLIC DEBT SUSTAINABILITY: EXPANDING THE TOOLBOX [1]

Assessing sovereign debt sustainability has become a key issue for several advanced economies – both inside and outside the euro area – at this stage of the financial crisis. The methodologies used to make such assessments have tended to vary in their assumptions and rigour – perhaps not surprisingly given the difficulty of accurately modelling the complex interplay between fiscal fundamentals, macro-financial conditions and financial sector strength. A commonly used approach is based on a stock-flow identity for public debt accumulation, treating macro-financial conditions as exogenous.

This box seeks to expand the common approach to debt sustainability analysis for the euro area countries, by accounting for the interactions between the key drivers of government debt dynamics.[2] Practical applications of debt sustainability analysis usually consist of a baseline scenario for the development of the debt ratio that is of particular interest from the analyst's perspective and sensitivity tests to assess how the key conclusions are altered by changes in certain assumptions. These scenarios are based on a partial perspective, i.e. they are derived by separately changing one or more variables in the standard stock-flow debt dynamics equation[3] (primary balance-to-GDP ratio, interest rate or economic growth rate), while ignoring potential interdependencies between them. The benefit of this approach is that it allows a straightforward assessment of the "mechanical" implications of alternative assumptions on debt developments. At the same time, economic intuition and empirical evidence provide strong support that fiscal and macro-financial developments are interlinked.

One approach to capture these interdependencies empirically is to estimate a simultaneous equations model consisting of three equations, i.e. for interest rates, growth rates and primary balance ratios, in a panel of euro area countries over the period from 1970 to 2009. Each of these variables is treated as dependent on the others. In addition, further explanatory variables for each of the three equations are chosen in line with the related theoretical and/or empirical literature, including terms to capture potential non-linear responses. Interestingly, it is found that a lower primary deficit contributes to reducing long-term sovereign bond yields, but it does not show a robust impact on growth. Moreover, beyond a certain threshold, the higher the debt-to-GDP ratio, the lower the growth rate and the higher the sovereign yields, but also the stronger the consolidation efforts that countries tend to implement.

In a second step, the estimated relationships, based on the coefficients found to be statistically significant above, are incorporated into the debt sustainability framework to construct scenarios that

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1 This box draws on C. Checherita-Westphal and F. Holm-Hadulla, "Public debt sustainability: expanding the toolbox", proceedings of the ECB's Macro-prudential Research Network (MaRs), 2011.

2 Other similar strands of research include: (i) the European Commission's expanded debt sustainability analysis that is based on a general equilibrium approach using the QUEST model (see European Commission, *Public finances in EMU – 2011*, September 2011) and (ii) the IMF's fan charts that are based on stochastic simulations. This second approach is intended to capture the uncertainty surrounding the baseline scenario by examining the impact of a series of shocks drawn from historical experience (see, for example, IMF, *Fiscal Monitor*, November 2010, and IMF, *Modernizing the Framework for Fiscal Policy and Public Debt Sustainability Analysis*, August 2011). The analysis in this box builds on an empirical model of the interdependencies between the variables relevant for debt sustainability analysis, as opposed to simulations or a pre-determined model-based approach. At the same time, this analysis is less prone to small sample bias as it exploits both the time and the cross-sectional dimension of the data. As such, it reflects an average euro area behaviour, for which the usual caveats apply in terms of extrapolating the panel findings to country-specific debt sustainability analyses.

3 For a detailed discussion of all constitutive terms of the debt accumulation equation and the related policy implications, see, for example, ECB, "Ensuring fiscal sustainability in the euro area", *Monthly Bulletin*, April 2011.

are "internally consistent" (i.e. calibrated such that a deviation from the baseline assumptions with respect to one variable is accompanied by the estimated response in all other variables). For illustrative purposes, the chart presents a baseline debt path for the entire euro area where, for simplicity, primary balance ratios, as well as interest and growth rates, are set at their average values over the years 1999 to 2007, i.e. the period between the start of EMU and the beginning of the financial crisis. Moreover, the chart displays two alternative debt paths: (i) the standard "mechanical" approach derived by separately modifying the primary balance (assuming that governments immediately reduce their headline deficits to the threshold of 3% of GDP set in the Stability and Growth Pact and adopt further fiscal tightening of 1% of GDP per annum until they reach a balanced budget position) and (ii) the "endogenous" approach, which incorporates, in addition, the corresponding interest rate and growth rate effects.

Impact of fiscal consolidation under a "mechanical" and "endogenous" debt sustainability analysis

(2010 – 2020; percentages of GDP)

y-axis: gross government debt

—— baseline
········ fiscal consolidation – endogenous approach
------ fiscal consolidation – mechanical approach
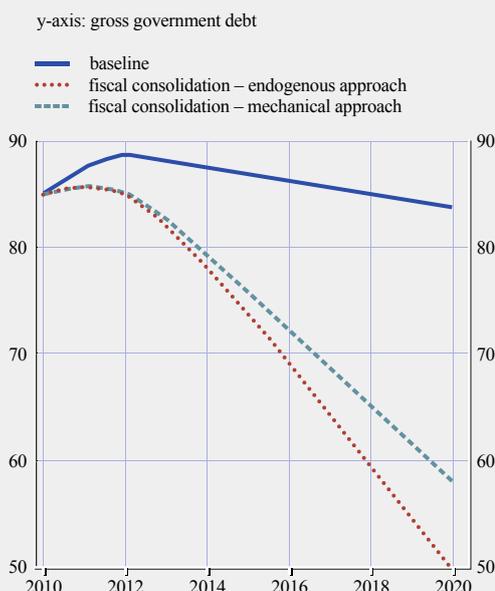
Sources: European Commission (AMECO database) and ECB calculations.

While the debt ratio would move along a slightly downward sloping path as from 2013 in the baseline scenario, debt dynamics are significantly more favourable in the scenarios assuming more ambitious fiscal adjustment. At the same time, the conclusions emerging from the two consolidation scenarios are subject to notable differences: based on the mechanical approach, the debt-to-GDP ratio is projected to fall somewhat below 60% of GDP in 2020, whereas the consolidation scenario, which takes interdependencies into account, would imply a debt ratio that is almost 10 percentage points lower. This reflects findings (derived from the aforementioned estimations) that in the case of high debt-to-GDP ratios, debt-reducing fiscal efforts go along with lower future yields and more favourable growth prospects, thereby reinforcing the direct effect of fiscal consolidation on sustainability.

Overall, the analysis summarised in this box illustrates the difficulties inherent in accurately gauging the interplay between fiscal and macro-financial conditions in coming to an overall determination of fiscal sustainability in any particular country. It underscores the importance of a joint approach, taking into account all relevant factors, in conducting effective debt sustainability analysis – with appropriate consideration of various scenarios to provide a robust signal. Taken alone, however, it is not sufficient to make an overall assessment, but rather provides a crucial ingredient in fiscal (and financial stability) analysis – which needs to be cross-checked with (often numerous) other relevant factors.

III THE EURO AREA FINANCIAL SYSTEM

3 FINANCIAL MARKETS AND GLOBAL FINANCIAL INSTITUTIONS

Since the finalisation of the June 2011 Financial Stability Review (FSR), concerns have surfaced about the financial condition of some euro area banks, causing tensions in the euro money market. At the same time, the money market has remained polarised, with some banks in euro area countries under stress continuing to be dependent on the Eurosystem's liquidity support.

Developments in capital markets were characterised by a significant rise in risk aversion and an increased heterogeneity of developments across countries. In particular, uncertainty about the evolution of the euro area sovereign debt crisis contributed to the widening of intra-euro area government bond spreads and increased illiquidity in some government bond markets. Moreover, adverse feedback and contagion effects were reinforced by signs of a deteriorating outlook for economic growth in both the euro area and other major economies. Lastly, uncertainty associated with discussions about the government debt ceiling in the United States – culminating in the downgrading of US sovereign debt by one of the major credit rating agencies at the beginning of August 2011 – impaired market confidence further.

Downward revisions to the global economic outlook, the fiscal tensions confronting both countries in Europe and the United States, together with asset price declines and high volatility, resulted in a more challenging operating environment for global financial institutions. The profitability of global large and complex banking groups declined and the global hedge fund sector suffered significant investment losses.

## 3.1 INTENSIFICATION OF TENSIONS IN MONEY AND CAPITAL MARKETS

MONEY MARKETS

After the finalisation of the June 2011 FSR, heightened concerns about the euro area sovereign debt crisis and the financial condition of some euro area banks led to further tensions in the euro money market. Given the renewed tensions, the ECB reintroduced a supplementary longer-term refinancing operation (LTRO) with a maturity of around six months in August 2011 and announced two supplementary LTROs with a maturity of approximately 12 months in October. The ECB also extended the full allotment policy to July 2012. Furthermore, on 8 December 2011, the ECB decided on additional enhanced credit support measures to support bank lending and liquidity in the euro area money market. In particular, the ECB decided to conduct two LTROs with a maturity of 36 months and the option of early repayment after one year, to discontinue, for the time being, the fine-tuning operations carried out on the last day of each maintenance period, to reduce the reserve ratio from 2% to 1% and to increase collateral availability by (i) reducing the rating threshold for certain asset-backed securities (ABSs) and (ii) allowing national central banks, as a temporary solution, to accept as collateral additional performing credit claims (i.e bank loans) that satisfy specific eligibility criteria.

Chart 3.1 Financial market liquidity indicator for the euro area and its components

(Jan. 1999 – Nov. 2011)

- composite indicator
- money market
- foreign exchange, equity and bond markets
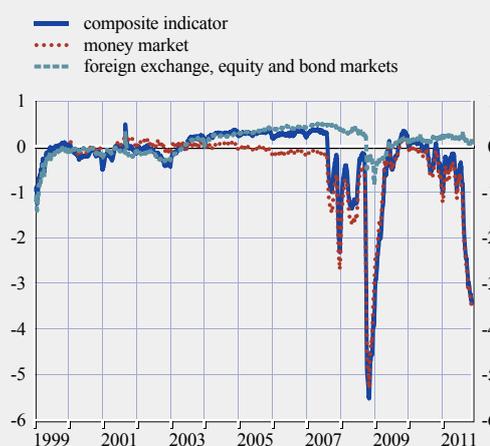
Sources: ECB, Bank of England, Bloomberg, JPMorgan Chase & Co., Moody's KMV and ECB calculations.
Notes: The composite indicator comprises unweighted averages of individual liquidity measures, normalised over the period from 1999 to 2006 for non-money market components and from 2000 to 2006 for money market components. The data shown have been exponentially smoothed. For more details, see Box 9 in ECB, *Financial Stability Review*, June 2007.

Several indicators illustrate the tensions in the euro money market over the past six months. For example, the money market component of the ECB's financial market liquidity indicator suggested that liquidity conditions worsened after the finalisation of the June FSR (see Chart 3.1).

In addition, the extensive use of the ECB's deposit facility underlined banks' desire to hold large cash buffers and could also be seen as a sign of the return of increased counterparty credit risk concerns among banks (see Chart 3.2). Moreover, EONIA volumes have remained rather low since June 2011 despite the large excess liquidity (see Chart 3.2), as did activity in the unsecured term money market segments. These developments pointed to limited interbank activity. At the same time, the amount outstanding of Short-Term European Paper (STEP) issued by financial institutions declined significantly over the summer months, also on account of outflows from prime euro area money market funds, but it managed to recover thereafter.

The spread between the EURIBOR and the EONIA overnight index swap (OIS) rate widened as OIS rates declined markedly as from the summer of 2011, while the EURIBOR tracked the OIS rates downwards, but only with some delay and in a lesser order of magnitude (see Chart 3.3). The decline in OIS rates reflected many factors, including the increase in excess liquidity, the extension of the full-allotment policy and precautionary bidding by banks, as well as a perceived change in the ECB's monetary policy stance and increased expectations for lower ECB policy rates.

Funding liquidity in the US dollar money market remained abundant for US banks after the June FSR, mainly on the back of the very large excess reserves that resulted from the Federal Reserve System's various programmes and operations. European banks, by contrast, faced more challenging conditions of access to US dollar term funding amid the prevailing concerns about both the fiscal challenges confronting some euro area countries and the condition of some European banks. US investors and banks reduced their exposures to European financial institutions in terms of both amounts and maturities, resulting in more difficult access to US dollar liquidity for European banks (see Section 4.2).

Chart 3.2 Recourse to the deposit facility and EONIA volume

(Jan. 2007 – Nov. 2011; EUR billions)

- recourse to the deposit facility (right-hand scale)
- EONIA volume (20-working-day moving average; left-hand scale)
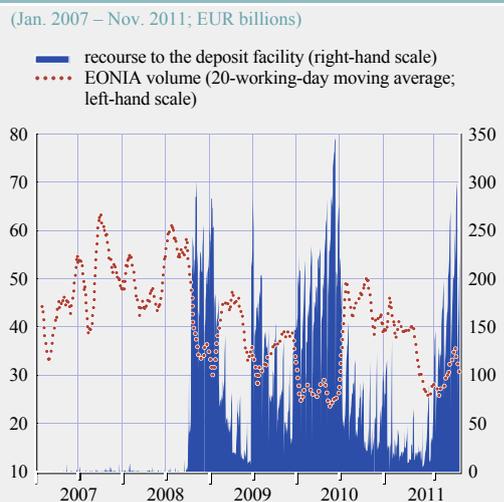
Source: ECB.

Chart 3.3 Spreads between three-month deposit and overnight index swap rates in selected money markets

(Mar. 2007 – Nov. 2011; basis points)

- EUR
- GBP
- USD
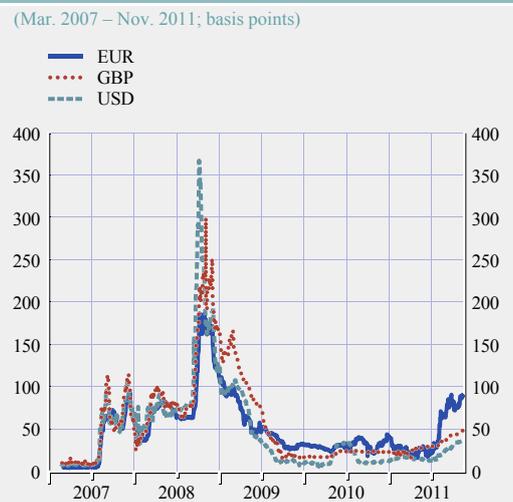
Source: Bloomberg.

The tensions in the US dollar market were particularly visible in EUR/USD cross-currency basis swaps, which continued to become more negative, indicating that it became more expensive to obtain US dollar liquidity by swapping euro for US dollars in the foreign exchange (FX) swap market than by borrowing at US dollar LIBOR (see Box 8). The tensions in the US dollar money market were also reflected in a continued gradual increase in the three-month US dollar LIBOR. In addition, market participants took note of the fact that, for the first time since February 2011, some banks took part in the ECB's collateralised one-week US dollar liquidity-providing operation (on 17 August 2011 and from 14 September 2011 onwards). The ECB's US dollar facility is priced at a penalty rate, so that market participants viewed its usage as a sign of increased US dollar funding pressures.

Nevertheless, although the EUR/USD basis swap and the EURIBOR/OIS spread have widened over recent months, both indicators remain at far lower levels than those reached in the immediate aftermath of the bankruptcy of Lehman Brothers in September 2008. Most euro area banks did not reportedly face difficulties in raising US dollar liquidity at short-term maturities, i.e. for periods below one week. In addition, the EUR/USD swap market continued to function and remained liquid. In aggregate, the amounts borrowed through the ECB's US dollar liquidity facility have remained very low in comparison with the period after the collapse of Lehman Brothers.

The extension of the full-allotment policy in the euro tenders by the ECB, the re-introduction of LTROs with maturities of six and approximately 12 months and the re-introduction of three-month US dollar tenders, in addition to the ECB's weekly US dollar liquidity-providing operations, partly explain these significant differences.

Against this backdrop, the ECB, in coordination with the Federal Reserve, the Bank of England and the Swiss National Bank announced on 15 September 2011 that it would conduct three US dollar liquidity-providing operations with a term of approximately three months, covering the end of the year.

On 30 November 2011, the ECB, the Bank of Canada, the Bank of England, the Bank of Japan, the Federal Reserve and the Swiss National Bank agreed to lower the pricing of the existing temporary US dollar liquidity swap arrangements by 50 basis points, so that the new rate will be the US dollar OIS rate plus 50 basis points. The authorisation of the swap arrangements was extended to 1 February 2013. In addition, the ECB, the Bank of England, the Bank of Japan and the Swiss National Bank will continue to offer three-month tenders until further notice. As a contingency measure, these central banks also agreed to establish temporary bilateral liquidity swap arrangements in order to make it possible in each jurisdiction to provide liquidity in any of their currencies if market conditions should so warrant.

THE EUR/USD BASIS SWAP AS AN INDICATOR OF STRESS IN MONEY MARKETS

The US dollar funding needs of European and other non-US banks has attracted a great deal of attention since the Lehman Brothers bankruptcy in 2008, not least given the fragility of this source of wholesale market funding. This box reviews the basic aspects of this market, and compares the situation in the foreign exchange (FX) swap market prevailing in the aftermath of the Lehman Brothers episode to the current situation by discussing the so-called basis swap as an indicator of stress in US dollar funding conditions.

FX swaps enable banks that have raised funds in one currency to swap those proceeds (and their subsequent interest payments) in another currency over a finite period – thereby broadening the availability of funding to cover multiple currency markets. In the EUR/USD swap market, the so-called "basis" is the premium paid by market participants to obtain US dollar funds. Normally, the premium is calculated as the difference between the US dollar interest rate implicit in the swap and the unsecured US dollar interest rate.

Prior to the financial crisis in 2008, many international banks, including European banks, used unsecured US dollar funding as an attractive alternative source of funding. The favourable funding conditions in US dollars reflected the size of the wholesale US dollar money market and the fact that unsecured funding was also available for longer money market maturities than in, for example, the euro money market. European banks active on the market often raised more USD-denominated funds than needed and therefore swapped back their US dollar surplus into their domestic currency. At that time, the cost of swapping euro into US dollars, as measured by the EUR/USD basis swap, was essentially zero, meaning that the cost of funding in US dollars was in line with the US dollar LIBOR and that there was no particular imbalance in the demand for US dollars or euro from market participants.

With the onset of the financial crisis, however, but also following the introduction of regulatory changes impacting US money market funds, the historic provider of US short-term funds, the EUR/USD basis in the FX swap market became negative in January 2010, underscoring a structural need for euro area banks to borrow US dollars via the FX swap market. Indeed, following the reduction in interbank unsecured lending at the start of the financial crisis, banks had to make greater recourse to FX swaps to fund their US dollar liabilities. After the bankruptcy of Lehman Brothers, the FX swap market became impaired – as did several other market segments – and banks became highly concerned about counterparty risks. Within the resulting struggle to reduce bilateral exposures, it became difficult and expensive to obtain US dollars via FX swaps and the EUR/USD basis swap widened significantly (see Chart A). In October 2008, the US dollar rate implied in short-term FX swaps reached 200 basis points above LIBOR in the three-month segment (see Chart A).

The general dislocation in money markets caused central banks across the globe to set up swap lines. At the end of 2008, the amount outstanding of US dollar liquidity provided by the ECB to Eurosystem counterparties peaked at almost USD 300 billion. The provision of US dollars outside the United States proved very effective in restoring the functioning of the EUR/USD swap market. The EUR/USD basis swap declined rapidly to levels close to those prevailing before the bankruptcy of Lehman Brothers. After a substantial narrowing of the EUR/USD basis swap, these lines were no longer necessary in 2010. Several factors may explain the more subdued

Chart A EUR/USD basis swap

(Jan. 2008 – Nov. 2011; basis points; five-day moving average)

- three-months
- six-months
- 12-months
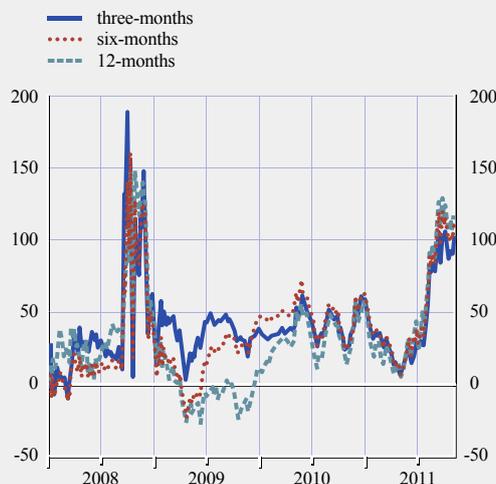
Sources: Bloomberg and ECB calculations.

increase in the EUR/USD basis swap and the shape of the basis swap curve in this period. First, there was an effective and unlimited backstop facility in the form of the ECB's US dollar facility. Second, international banks, including European banks, may have reduced their US dollar refinancing needs since 2008. Third, according to market participants, most European banks could still raise US dollar funds with short-term maturities, i.e. below one week, contrary to the situation prevailing in 2008. Fourth, international banks used the relatively good conditions in funding and capital markets in the first part of 2011 to build up US dollar cash buffers on the balance sheets of their US branches or subsidiaries. According to Federal Reserve data, a significant part of the excess reserves ended up on foreign banks' balance sheets.

Chart B Three-month EUR/USD basis swap and the spread between the three-month EURIBOR and the overnight index swap rate

(Jan. 2008 – Nov. 2011; basis points; five-day moving average)
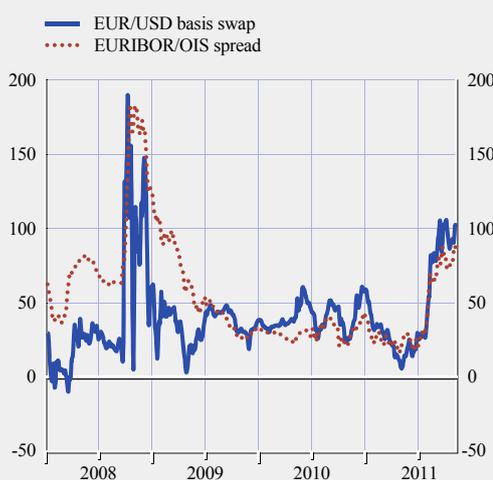
Sources: Bloomberg and ECB calculations.

A re-emergence of tensions in this market led to a re-opening of the swap lines as a precautionary measure in June 2011. This coincided with the intensification of sovereign debt concerns about some euro area countries in mid-2011, leading to an increase in the basis swap – albeit one that was less pronounced than in 2008 (see Chart A). Moreover, the shape of the basis swap curve remained upward-sloping after May 2011, reflecting that mainly term funding was impaired and suggesting that forward-looking concerns were dominant relative to immediate funding tensions. This was the opposite of the situation in 2008 when the EUR/USD basis swap curve inverted (see Chart A). Unlike previous occasions, however, actual use of the swap line established by major central banks appears to have been hampered by negative reputational costs. In this context, in September 2011, the ECB announced, in coordination with other central banks, additional US dollar liquidity-providing operations over the year-end.

Notwithstanding central bank policy initiatives aimed at alleviating strains in this market, the EUR/USD market has seen tensions and, accordingly, the basis swap has been used by some as an indicator of funding tensions. While central bank actions have been successful in easing liquidity issues in this market, it reflects a wider issue of funding strains – mirroring the overnight index swap (OIS) and the EURIBOR/OIS spreads closely followed by market participants (see Chart B). However, both the basis swaps and the EURIBOR/OIS spread have some limits and should be interpreted both with caution and in a broader context.

On 30 November 2011, the ECB also decided, in cooperation with other central banks, to establish a temporary network of reciprocal swap lines. This action will enable the Eurosystem both to provide euro to those central banks when required and, in the event of this being necessary, to undertake liquidity operations in Japanese yen, pounds sterling, Swiss francs and Canadian dollars (in addition to existing operations in US dollars).

Looking forward, some banks in the euro area that rely heavily on the liquidity provided by the Eurosystem may continue to face significant challenges in reducing this dependence, given limited access to market funding.

GOVERNMENT BOND MARKETS

Developments in government bond markets after the finalisation of the June FSR were characterised by a significant increase in risk aversion and greater heterogeneity across countries. The renewed upward pressure on sovereign bond yields in some euro area countries was strongest in countries which markets perceived to have some combination of malign fiscal positions, weak macro-financial conditions and, in some cases, large contingent liabilities to the banking sector.

These developments reflected the intensification of sovereign debt strains with strengthened contagion effects from the three euro area countries under EU/IMF programmes to other vulnerable euro area economies (see Chart 3.4). The discussions on, and uncertainty about, the resolution of the euro area sovereign debt crisis, including the form and timing of further support for Greece, contributed to a widening of intra-euro area government bond spreads and increased uncertainty in some government bond markets. Although market participants

Chart 3.4 Difference between ten-year euro area sovereign bond yields and the ten-year overnight index swap rate

(Jan. 2011 – Nov. 2011; basis points)

Sources: Bloomberg and ECB calculations.
Note: The euro overnight index swap rate, rather than German government bond yields, was used in order to account for the impact of flight-to-safety flows into German government bonds.

welcomed the political developments in Italy and Greece, uncertainty remained elevated.

Moreover, the adverse feedback and contagion effects were reinforced by the deteriorating outlook for economic growth both in the euro area and in other major developed economies, as well as by greater investor appetite for safer assets.

Uncertainty associated with discussions about the government debt ceiling in the United States and the downgrading of US sovereign debt by one of the major credit rating agencies at the beginning of August undermined market confidence further.

At the same time, the heterogeneity of developments across countries increased as yields on German, US and UK government bonds declined markedly. This was mainly due to flight-to-safety flows, the deterioration of the global economic outlook and downward revisions of the expected future path of short-term interest rates.

This downward pressure was not visible to the same extent in the case of other highly rated euro area countries, as investors' preferences shifted towards the larger and more liquid markets. In late autumn the stress in the euro area bond markets even had a negative impact on some AAA-rated euro area countries. This resulted in higher liquidity premia in the German sovereign bond market – as measured by the difference between zero coupon yields on German government bonds and less liquid, but German government-guaranteed, and thus credit-equivalent, agency bonds issued by the Kreditanstalt für Wiederaufbau (KfW) (see Chart 3.5).

In response to fluctuations in market prices and contagion, several policy measures have been taken to address the underlying stresses in the sovereign debt markets of vulnerable countries since the previous FSR. Fiscal consolidation measures have been strengthened with the aim of enhancing the fiscal sustainability of the affected countries. A comprehensive set of measures aimed at restoring confidence and address the current
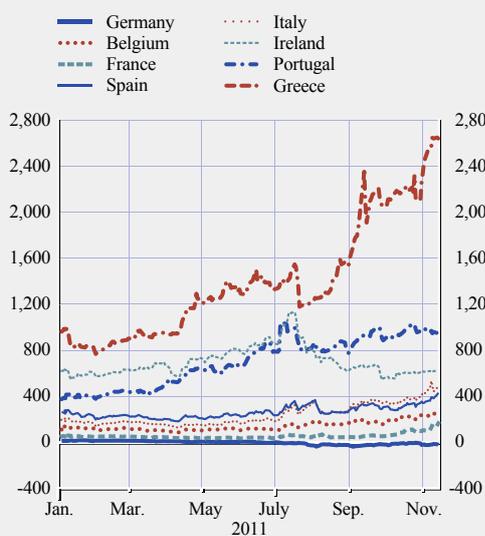
Chart 3.5 German five-year government bond liquidity premia

(Jan. 2008 – Nov. 2011; basis points)

Sources: Bloomberg and ECB calculations.
Note: Difference between zero coupon yields on German government-guaranteed KfW agency bonds and German bonds (for more information, see Box 4 in ECB, *Monthly Bulletin*, September 2009).

tensions in financial markets was also agreed by the Heads of State or Government of the EU.

In addition, the ECB's decision of 7 August 2011 to actively implement the Securities Markets Programme (SMP) played an important role in easing the malfunctioning of the most adversely affected euro area sovereign debt markets (see Chart 3.6 and Box 9).

Looking ahead, current levels of implied bond market volatility for the euro area are comparable with the levels observed in the aftermath of the Lehman Brothers' bankruptcy and higher than the levels observed in May 2010 (see Chart 3.7). The corresponding levels for the US market, by contrast, are currently below those recorded both in May 2010 and in the aftermath of the Lehman bankruptcy. The uncertainty surrounding future developments in the government bond markets remains elevated – particular for the euro area – and contagion of euro area sovereign debt strains remains the most pressing risk for financial stability in the euro area, the EU and even across the globe.

Chart 3.6 ECB net purchases of euro area government bonds under the Securities Markets Programme

(May 2010 – Nov. 2011; EUR billions)

- purchases under the SMP (left-hand scale)
- cumulative purchases (right-hand scale)
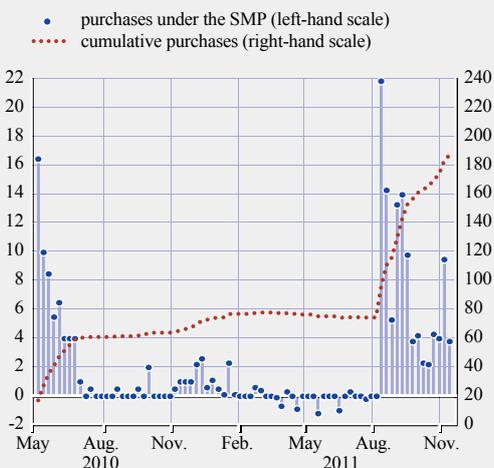
Source: ECB.
Note: Negative values indicate that maturing bonds exceeded purchases.

Chart 3.7 Implied bond market volatility in the euro area and the United States

(Jan. 2008 – Nov. 2011, percentages; three-day moving average of daily data)

— euro area
···· United States
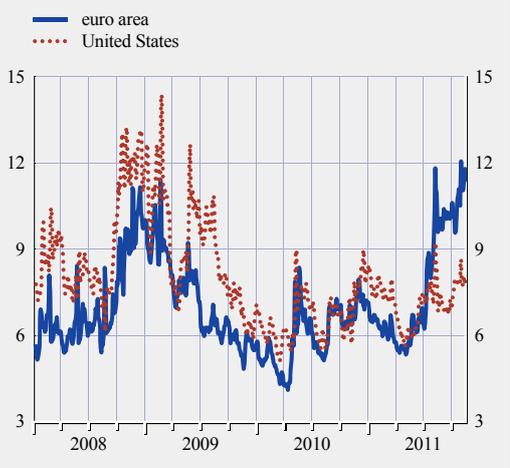
Source: Bloomberg.
Notes: Implied government bond market volatility is a measure of uncertainty surrounding the short term (up to three months) for German and US ten-year government bond prices. It is based on the market values of related traded options contracts. Bloomberg uses implied volatility of the closest-to at-the-money strikes for both puts and calls using near-month expiry futures.

Box 9

**A CREDIT DEFAULT SWAP-BASED MEASURE OF GOVERNMENT BOND MARKET IMPAIRMENTS
IN THE EURO AREA**

Since the first half of 2010, the government bond markets of some euro area countries have faced
illiquid market conditions and other impairments. To address these problems and contribute
to restoring an appropriate monetary policy transmission mechanism, the ECB has conducted
interventions in dysfunctional euro area market segments since 10 May 2010, using the Securities
Markets Programme (SMP). The impact of the SMP cannot be assessed merely on the basis
of declines in government bond yields, nor on that of any particular narrowing of spreads, as
neither gives an exact picture of market impairments or a robust indication of the effect of the
ECB's interventions. Indeed, government bond yields and spreads are affected by a multitude of
factors beyond the ECB's interventions, in particular by investors' risk aversion and by market
perceptions about the sustainability of public debt, as well as by other European measures such
as the actions and prospects of the European Financial Stability Facility (EFSF).

There are several metrics to measure sovereign debt market functioning, both on the price and
on the quantity side. This box focuses on the evolution of one such measure – the so-called
credit default swap (CDS)-bond basis and examines the evolution of this measure, as well as its
limitations.

The CDS-bond basis can be defined as the
"unadjusted" difference between a country's
sovereign CDS premium and its government
bond spread for the same maturity or, in
"adjusted" terms, as the difference between
the CDS-bond basis of a country relative to
that of a benchmark country. Deviations of the
unadjusted CDS-bond basis from zero provide
information on the functioning of the market,
as these deviations may result from difficulties
in arbitraging between the CDS and the bond
markets. The unadjusted CDS-bond bases of
euro area sovereign issuers tend to be highly
correlated (see Chart A). This is due to the
fact that they are driven predominantly by
common factors, in particular funding costs,
counterparty risks and market volatility.[1]
However, information more closely capturing
country-specific risks is provided by the
"adjusted" CDS-bond basis, taking Germany,
which has the most liquid and well-functioning
government bond market in the euro area,
as the benchmark country. This "adjusted"

**Chart A CDS bond-basis for Germany, France,
Italy and Spain**

(Jan. 2008 – Nov. 2011; basis points; five-year maturities;
five-day moving average)
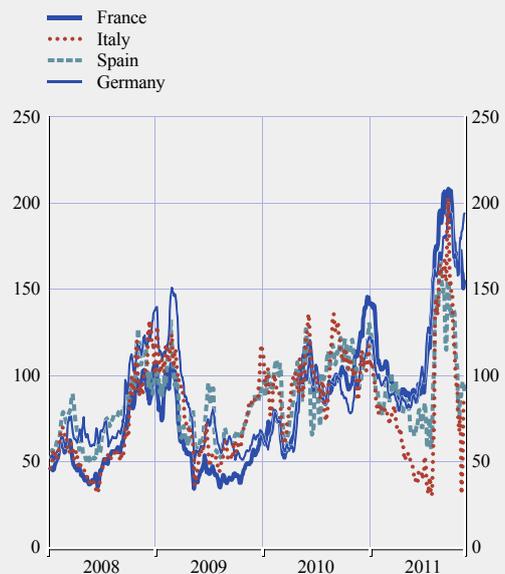
Sources: Bloomberg and ECB calculations.

1 A. Fontana and M. Scheicher, "An analysis of euro area sovereign CDS and their relation with government bonds", *ECB Working
Paper Series*, No 1271, December 2010.

**Chart B "Adjusted" CDS-bond basis
for France, Italy and Spain**

(Jan. 2008 – Nov. 2011; basis points; five-year maturities;
five-day moving average)

— France
···· Italy
- - - Spain

**Chart C "Adjusted" CDS-bond basis
for Greece, Ireland and Portugal,
and outstanding amounts in the SMP**

(Jan. 2010 – Nov. 2011)

— SMP outstanding (EUR billions; right-hand scale)
···· Greece (basis points; left-hand scale)
- - - Ireland (basis points; left-hand scale)
— Portugal (basis points; left-hand scale)
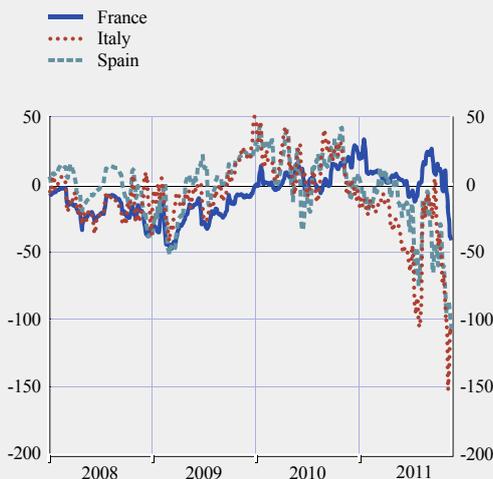
Sources: Bloomberg and ECB calculations.
Note: The "adjusted" CDS-bond basis is defined as the difference
between a country's CDS-bond basis and the CDS-bond basis of
Germany.
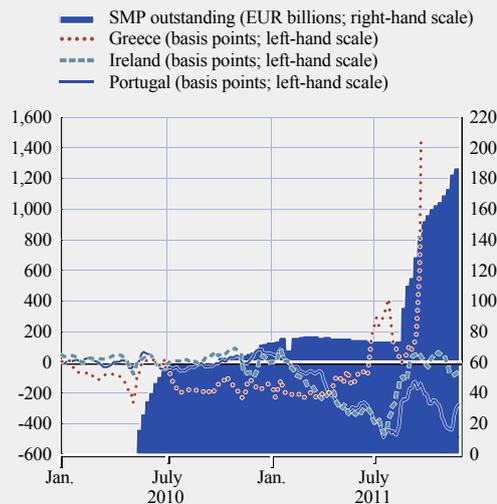
Sources: Bloomberg and ECB calculations.
Notes: The SMP outstanding amount is approximated by the
amount targeted by the ECB in its weekly absorbing operation.
No figures on the CDS-bond basis are available for Greece after
18 September 2011.

CDS-bond basis is also equal to the difference between the respective country's risk premium
over Germany, as priced in the CDS market and in the government bond market. If a country has
a negative "adjusted" CDS-bond basis, it means that its bond spread over Germany is larger than
its CDS differential vis-à-vis Germany, which may be an indication, if persistent, of government
bond market impairment. For instance, the "adjusted" CDS-bond basis for France has hovered
around zero over the past few years, suggesting no significant impairment of the French
government bond market. By contrast, the "adjusted" CDS-bond basis of Italy and Spain turned
significantly negative in the second quarter of 2011, when the liquidity in those government
bond markets decreased (see Chart B).

The Greek government bond market was the first in the euro area to display a significantly
negative "adjusted" CDS-bond basis in the first half of 2010. Following the launch of the
SMP on 10 May 2010, the Greek "adjusted" CDS-bond basis immediately rose towards zero
(see Chart C). However, amid heightened market concerns about the sustainability of the Greek
public debt, the "adjusted" CDS-bond basis returned to negative territory in most of the second
half of 2010 and in the first half of 2011 (see Chart C). With the introduction of the concept of
"private sector involvement" (PSI) and its application to Greece, as decided by the Heads of
State and Government on 21 July 2011, the CDSs on Greece sovereign debt were perceived by
investors to have lost much of their hedging power and trading almost stopped as the Greek CDS
premium widened significantly – causing the "adjusted" CDS-bond basis to lose its relevance.
Meanwhile, the "adjusted" CDS-bond bases for Ireland and Portugal were negative for most
of 2011, suggesting a persistent malfunctioning of those government bond markets as well
(see Chart C). The agreement of 21 July by euro area Heads of State or Government, excluding
any PSI for all countries except Greece, and the statement by the ECB of 7 August 2011 that

it would actively implement the SMP, while emphasising the importance of new measures and reforms in the areas of fiscal and structural policies by the governments of Italy and Spain, seemed to contribute to bringing the "adjusted" CDS-bond bases for both countries closer to zero, from very negative levels (see Chart D). Later, however, the reduced liquidity and extreme volatility in these government bond markets pushed the "adjusted" CDS-bond bases deep into negative territory.

All in all, the "adjusted" CDS-bond basis for euro area countries has provided a useful indicator for the analysis of impairments of the government bond market. Caution is nonetheless warranted in its interpretation. An important caveat is inherent in its construction and its implicit assumption that robust signals are given by the sovereign CDS market, which may itself by subject to some dysfunctional behaviour or exhibit large volatility and frequent illiquidity. This phenomenon may indeed have arisen from intermittent bouts of intense risk aversion in particular market segments, manifested also in safe haven flows. Furthermore, in the euro area context, sovereign CDS may be seen as less effective than initially thought as a hedging tool against sovereign debt restructurings. Further possible biases are related to differences between the maturities of the CDS and those of the benchmark bonds and to the fact that CDS contracts do not provide protection of accrued coupons.

Chart D "Adjusted" CDS-bond basis for Italy and Spain, and outstanding amounts in the SMP

(Jan. 2010 – Nov. 2011)

SMP outstanding (EUR billions; right-hand scale)
Italy (basis points; left-hand scale)
Spain (basis points; left-hand scale)
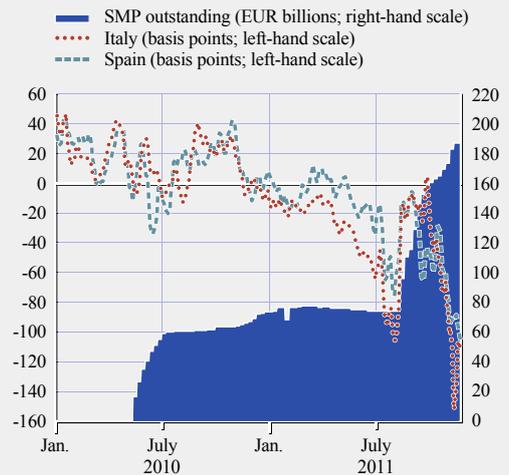
Sources: Bloomberg and ECB calculations.
Note: The SMP outstanding amount is approximated by the amount targeted by the ECB in its weekly absorbing operation.

## THE EURO AREA GOVERNMENT DEBT SECURITIES LENDING MARKET

Owing to the lack of publicly available quantitative information, relatively little is known about the euro area government debt securities lending market. The same holds true, albeit to a much lesser extent, for securities lending in general. This is more relevant and cause for concern in view of the fact that securities lending represents an important part of the global shadow banking system. Against this background, the purpose of this box is to introduce securities lending activity and to provide some information on the euro area government debt securities lending market, with an additional focus on three euro area countries covered by EU/IMF financial support programmes.

Securities lending involves a temporary transfer of securities to a borrower, who will usually have to provide the lender with collateral in the form of cash or other securities.[1] Although securities loans that are collateralised against cash are economically equivalent to repurchase agreements (repos), they are usually motivated by a demand to borrow a security, rather than to lend cash.

1   In the United States, securities loans are collateralised predominantly by cash, whereas in Europe securities, such as bonds or equities, are reportedly more common.

**Chart A Euro area government debt securities lending market**

(Jan. 2007 – Nov. 2011)

- securities available for lending (EUR billions; left-hand scale)
- securities on loan (EUR billions; left-hand scale)
- utilisation (percentages; right-hand scale)
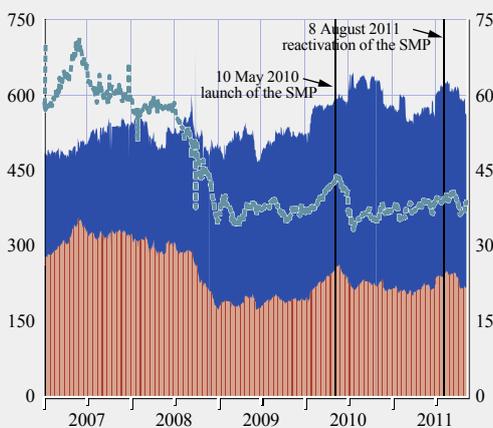
Sources: Data Explorers and ECB calculations.
Notes: Utilisation is the ratio of borrowed securities to securities that were made available for lending. Securities on loan also include securities borrowed from sources other than those captured in the value of securities available for lending. In addition to changes in the quantity of securities, the value of lendable and borrowed securities is affected by changes in the price of those securities. "SMP" stands for the ECB's Securities Markets Programme.

Chart B Euro area government debt securities lending market by sovereign issuer

(as of 16 Nov. 2011)

- securities available for lending (EUR billions; left-hand scale)
- securities on loan (EUR billions; left-hand scale)
- utilisation (percentages; right-hand scale)
- securities on loan (proportion of securities outstanding, in percentages; right-hand scale)
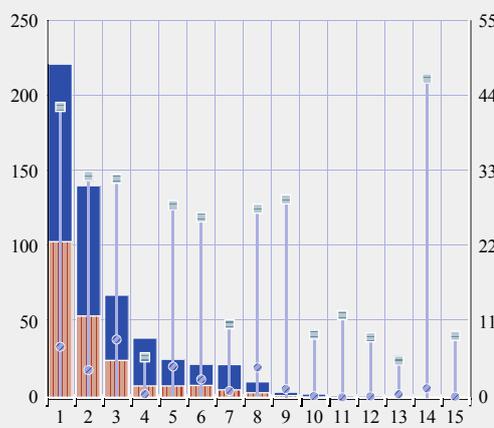
1 Germany	5 Austria	9 Ireland	13 Luxembourg
2 France	6 Belgium	10 Portugal	14 Slovenia
3 Netherlands	7 Spain	11 Greece	15 Cyprus
4 Italy	8 Finland	12 Slovakia	

Sources: Data Explorers, ECB and ECB calculations.
Notes: See notes to Chart A. Sovereign debt securities outstanding refer to the nominal value of such securities at the end of 2010. There was no information on the lending of Estonian and Maltese government debt securities.

Securities lending is very important for a smooth functioning of markets, since it facilitates, among other things, trade settlement, market-making and short-selling. In so doing, it can improve market liquidity. Moreover, it expands funding options. In a collateral upgrade or swap trade, less liquid and lower-quality securities are swapped for more liquid and higher-quality securities that can subsequently be used as collateral in the repo market or at a central bank. The benefits of securities lending, however, do not come without risks to financial stability, as these transactions increase interconnectedness amid limited transparency in the securities lending market.[2] In addition, the market is vulnerable to the pro-cyclicality of margining practices.[3]

According to Data Explorers, a securities lending data provider, at least €1.4 trillion of securities were on loan across the globe in mid-November 2011, which is more than 15% of at least €8.8 trillion of lendable securities, i.e. securities that were made available for lending. The market is continuing to grow, but has not yet again reached pre-crisis heights.

2 See Bank of England, "Developments in the global securities lending market", *Quarterly Bulletin*, third quarter, 2011.
3 See Committee on the Global Financial System, "The role of margin requirements and haircuts in pro-cyclicality", *CGFS Papers*, No 36, March 2010.

The value of lendable and borrowed euro area government debt securities was at least €561 and €218 billion respectively, or around 9.1% and 3.5% respectively, of all euro area government debt securities outstanding at the end of 2010 (see Charts A and B). Larger euro area sovereign debt markets tended to have larger amounts of securities on loan, as well as higher utilisation, i.e. a higher ratio of borrowed to lendable securities (see Chart B).

It would be misleading to attribute all government debt securities on loan to directional short-selling, since such securities are used extensively for repo transactions and collateral swaps (upgrades), as well as for arbitraging, hedging and relative value trading. Nevertheless, the increases in government debt securities on loan before the adoption of key crisis-related policy measures could be viewed as suggestive of higher short-selling activity before those dates (see Charts A and C).

By contrast, the interpretation of changes in lendable securities is more straightforward, as they should reflect fluctuations in the institutional ownership of those securities. Thus, a decrease in securities available for loan would, ceteris paribus, indicate that institutional securities lenders are withdrawing their securities from the lending market, most likely because they plan to sell them. It is important to note, however, that changes in the value of lendable and borrowed securities could be also be due to changes in the market price, rather than to the quantity of securities.

Bearing this important caveat in mind, it is nonetheless noteworthy that developments in the government debt securities lending markets of three euro area sovereign issuers with EU/IMF financial support programmes had certain supply and demand patterns in common (see Chart C). First, the value of government debt securities available for lending had started to decline well before the dates on which the respective countries requested EU/IMF financial assistance. Second, shortly before the aforementioned dates, securities borrowing had also increased in the case of Greece and Ireland, probably on account of higher short-selling as prices of debt

Chart C Developments in the Greek, Irish and Portuguese government securities lending markets

(Jan. 2007 – Nov. 2011; EUR billions)

■ securities available for lending
▬ securities on loan
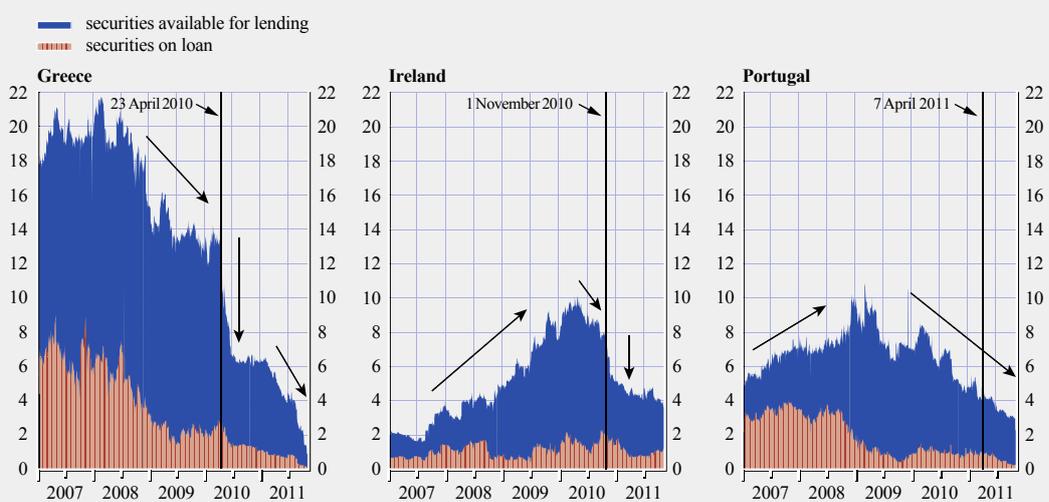
Source: Data Explorers.
Notes: Securities on loan also include securities borrowed from sources other than those captured in the value of securities available for lending. In addition to changes in the quantity of securities, the value of lendable and borrowed securities is affected by changes in the price of those securities. The vertical lines indicate the dates on which the respective countries requested EU/IMF financial assistance.

securities were falling and borrowed quantities must, therefore, have been increasing. Third, the value of Greek and Irish government debt securities available for lending dropped significantly immediately after the respective requests for EU/IMF financial support. Finally, after the requests for financial assistance, both the lendable and the borrowed amounts of Greek, Irish and Portuguese government debt securities have generally continued to decline.

All in all, the euro area government debt securities lending market is a large and important segment of the global securities lending market, which itself represents a substantial part of the global shadow banking system. Given the scarcity of publicly available information, relatively little is known about the prices, activity levels and risk exposures in this market. However, a more widespread use of central counterparties and trade depositories could lead to both better transparency and lower potential risks to financial stability. Moreover, some aspects of the market are rather unique, so that, as has been explained in this box, due care should be exercised when interpreting even basic supply and demand indicators of this particular market.

CREDIT MARKETS

Corporate credit spreads widened after the finalisation of the previous FSR, with the most pronounced increase taking place within the high-yield segment, on account of investors' higher risk aversion (see Charts S48 and S68). The largest increases were observed during the week following the downgrading of US sovereign debt, when market uncertainty increased and investors' sentiment worsened substantially and reduced the latter's appetite for riskier assets.

The sovereign debt strains within the euro area also spilled over to corporate issuers and resulted in a more pronounced widening of spreads in the euro area than in, for example, the United States (see Chart 3.8). Spreads widened to above the levels seen during the financial market turmoil in May 2010, but they remained well below the levels observed towards the end of 2008 and in early 2009.

The widening of spreads was rather broad-based across regions, sectors and rating classes, but driven mainly by significantly wider spreads on bank debt (see Chart 3.9). These developments reflected the greater sensitivity of the banking sector to the increased turbulence.

Despite wider corporate bond spreads, overall issuance activity by non-financial corporations remained at levels comparable to previous

years (see Chart 3.10). However, issuance of high-yield bonds in the euro area was lower than during the same period in 2010, although it remained higher than in 2008.

Looking ahead, conditions in corporate credit markets are likely to remain volatile in the near future, given the uncertainty surrounding the macroeconomic environment and the continued tensions related to the euro area sovereign

**Chart 3.8 Corporate bond spreads in the euro area and the United States**

(Jan. 2007 – Nov. 2011; basis points)

euro area A-rated
euro area speculative-grade-rated
US A-rated
US speculative-grade-rated
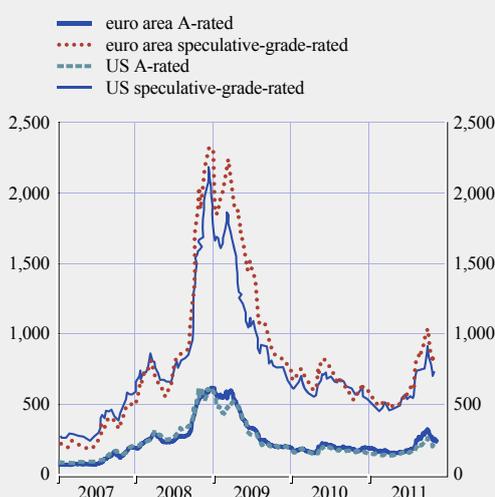
Source: Bank of America Merrill Lynch.
Note: Options-adjusted spreads of corporate bond indices (average maturity of six to ten years).

**Chart 3.9 Corporate bond spreads for selected sectors in the euro area**

(Jan. 2007 – Nov. 2011; basis points)

— banks
····· construction
- - - industrial
— telecommunications
····· utilities
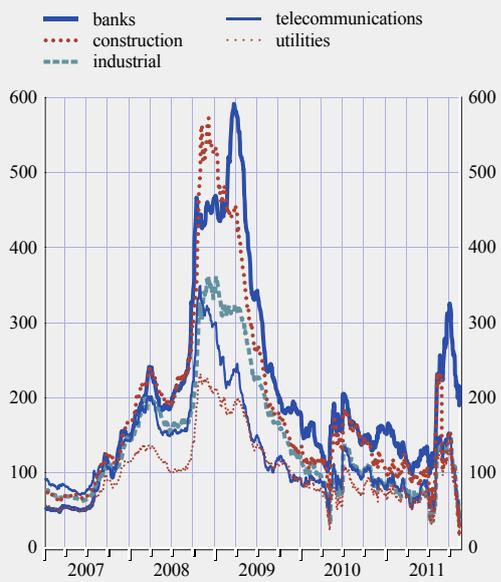
Source: iBoxx.

Chart 3.10 Bond issuance by non-financial corporations (all rating classes)

(Jan. 2006 – Nov. 2011; issuance in EUR billions and the number of deals)

■ rest of year (left-hand scale)
▥ first 11 months (left-hand scale)
- - - number of deals (right-hand scale)

1 2006   3 2008   5 2010
2 2007   4 2009   6 2011
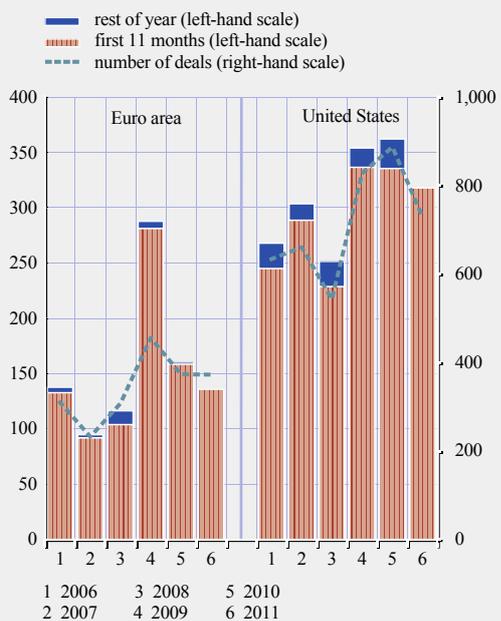
Sources: Dealogic and ECB calculations.

debt crisis, with an associated heightened risk aversion among investors. This poses challenges, especially for lower-rated bond issuers. Nevertheless, issuers are currently in a better position to withstand corporate credit market challenges than at the outbreak of the financial crisis in 2007, as leverage has been reduced and balance sheets have been strengthened (see Section 2.2).

EQUITY MARKETS

After the June FSR, equity markets in advanced economies declined and volatility increased in response to the uncertainty surrounding the sovereign debt crisis, the downward revision of the outlook for economic growth and the risks confronting the banking system. In particular, investors' confidence was severely undermined by the uncertainty about further support for Greece, as well as by the discussions on the government debt ceiling in the United States – which culminated in a sovereign downgrade by a major rating agency in the summer. As a result, cyclically adjusted price/earnings ratios declined slightly, remaining well below historical averages, so that they did not point to an overvaluation of equity prices (see Charts S45 and S63).

The increased stock market uncertainty resulted in higher implied volatility, both in the euro area and in the United States (see Charts S43 and S61). Implied volatility remained significantly lower, however, than during the period following the bankruptcy of Lehman Brothers. Implied probability distributions of equity indices also show that the euro area stock markets are subject to extensive uncertainty. Tail risks are currently higher than those observed after the collapse of Lehman Brothers.

While stock prices decreased markedly across all sectors, the drop in equity prices of financial firms was particularly marked, above all in the euro area (see Chart 3.11). Bank equity prices, in particular, declined as a result of market participants' concerns about spillover effects from the sovereign debt crisis and a subdued outlook for profitability in the banking sector.

Chart 3.11 Equity price developments for financial and non-financial stocks in the euro area and the United States

(Jan. 2011 – Nov. 2011; index: 3 Jan. 2011 = 100)

- euro area financials
- US financials
- euro area non-financials
- US non-financials
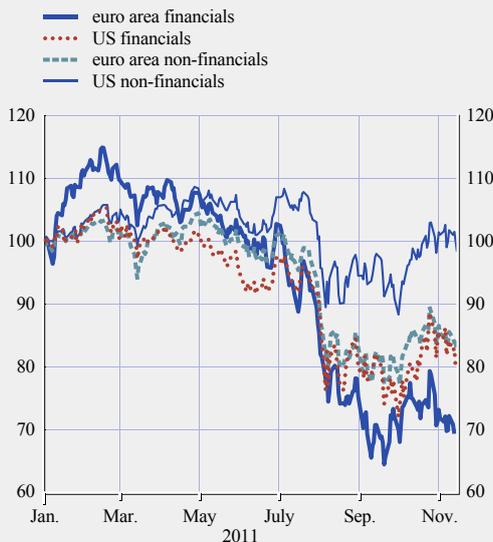
Source: Thomson Reuters Datastream.

Equity issuance volumes fell in both the euro area and the United States over the past few months (see Charts S33 and S80). The decline was visible both in the amounts of initial public offerings and in secondary public offerings. Compared with pre-crisis levels, the level of initial public offerings remained low, while secondary public offerings remained at comparable levels even after the recent decrease.

3.2 PROFITABILITY OF GLOBAL BANKS DECLINED, WHILE HEDGE FUNDS SUFFERED SIGNIFICANT LOSSES

GLOBAL LARGE AND COMPLEX BANKING GROUPS

Since the finalisation of the June FSR, the operating environment for global large and complex banking groups (LCBGs)[1] – which includes banks in the United States, the United Kingdom and Switzerland – has become more challenging. This development was caused by a combination of weakening global economic activity, fiscal challenges in key advanced economies and large cumulative asset price declines in conjunction with significant financial market volatility. These challenges are likely

to persist for some time, with the potential to dent profitability. The uncertainty surrounding the outlook for global LCBGs' performance therefore remains elevated. In addition, ongoing regulatory reforms, while welcome, might create some short-term challenges for LCBGs.

Financial soundness of global large and complex banking groups

The distribution of individual global LCBG profitability shifted significantly downward in the second quarter of 2011, after a strong showing in the first quarter (see Chart 3.12). While the average return on equity (ROE) declined to 1.5%, from 7% in the first quarter, for the sample of banks for which quarterly data was available (see Chart 3.12), this outturn was significantly affected by the losses incurred by one large US bank as a result of some settled mortgage claims. Excluding this outlier, the average decline in the ROE of global LCBGs was much smaller, and the median of the distribution even increased somewhat. In the third quarter, the weighted average continued the positive trend observed in previous quarters, while the median remained more or less unchanged.

Consistent with the decline in profitability in the second quarter, overall net income decreased as well, with all main components contributing to the decline (see Chart 3.13). Net income stabilised in the third quarter, despite a further reduction in trading income.

The net interest income of some banks remained under pressure, given persistently low short-term interest rates, the expiration of longer-term fixed interest loans and generally weak loan growth.

Net trading income – which improved significantly in the first quarter of 2011 – decreased on account of higher market volatility, declining asset prices

1 For a discussion on how global LCBGs are identified, see Box 10 in ECB, *Financial Stability Review*, December 2007. The institutions included in the analysis presented here are Bank of America, Bank of New York Mellon, Barclays, Citigroup, Credit Suisse, Goldman Sachs, HSBC, JP Morgan Chase & Co., Lloyds Banking Group, Morgan Stanley, Royal Bank of Scotland, State Street and UBS. However, not all figures were available for all companies.

**Chart 3.12 Return on shareholders' equity for global large and complex banking groups**

(Q3 2010 – Q3 2011; percentages)

- interquartile range
- minimum-maximum
- weighted average
- median
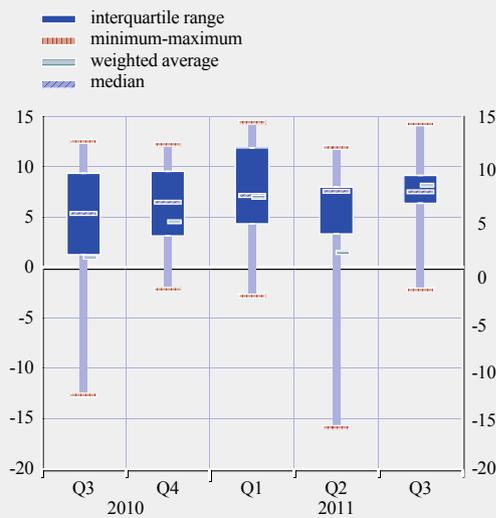
Sources: Individual banks' reports and ECB calculations.
Notes: Quarterly ratios are based on available data for a sub-sample of LCBGs for which results for all quarters are available. Quarterly results have been annualised.

Chart 3.13 Decomposition of the operating income and loan loss provisions for global large and complex banking groups

(Q3 2010 – Q3 2011; percentage of total assets, weighted average)
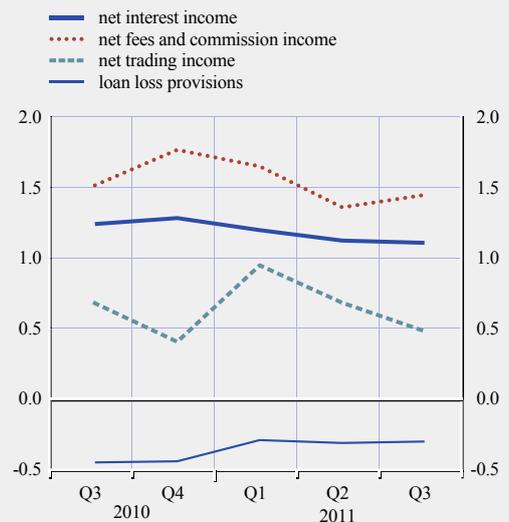
- net interest income
- net fees and commission income
- net trading income
- loan loss provisions

Sources: Individual banks' reports and ECB calculations.
Notes: Figures are based on data for the sub-sample of global LCBGs for which results for all quarters are available. Quarterly results have been annualised.

and a sharp decrease in trading volumes in the second and third quarters (see Chart 3.13). In part, this decline was related to the typically strong first-quarter trading performance.

Net fee and commission income, which contributed most to the operating income of global LCBGs in recent years, declined in 2011 and remained lower than in 2010 also in the third quarter, albeit increasing somewhat in comparison with the second quarter. In their reports, banks generally cited lower activity in mergers and acquisitions, lower transaction volumes and lower levels of client activities as the predominant factors behind the reduced fee and commission income.

Following a reduction of loan loss provisions and the associated increase in the net income of global LCBGs last year, loan loss provisions rose slightly in the second quarter of 2011, and remained at about the same level in the third quarter (see Chart 3.13). However, the level of the weighted average in the second and third quarters

was still below that seen in previous years. In the longer run, the moderation of the global economic outlook (see Section 1.1) may force banks to hold higher buffers, i.e. to increase their loan loss provisions substantially, in order to absorb possible losses stemming from lower credit quality.

Regarding the development of global LCBG capital buffers, the average Tier 1 capital ratio remained broadly stable in the second and third quarters of 2011, at 13.4% and 13.3% respectively (see Chart 3.14). Swiss banks featured among those with the highest capital ratios, which was probably linked to higher regulatory requirements in comparison with those of other LCBGs.

For the third quarter in a row, the leverage ratio of global LCBGs, measured as total assets divided by shareholders' equity, remained broadly stable at around 54 in the second quarter of 2011 and increased slightly to 55 in the third quarter. Notwithstanding this sign that the deleveraging process had come to a halt at that

Chart 3.14 Tier 1 capital and leverage ratios of global large and complex banking groups

(Q3 2010 – Q3 2011; percentage)

- interquartile range
- minimum-maximum
- weighted average
- median

Tier 1 ratio

Leverage ratio
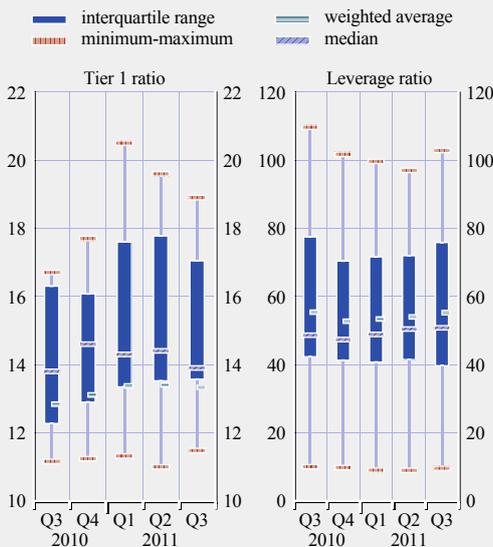
Sources: Individual banks' reports and ECB calculations.
Note: Figures are based on data for the sub-sample of global LCBGs for which results for all quarters are available.

## Chart 3.15 The share of main liability items in global LCBGs' total liabilities

(2008 – H1 2011: maximum, minimum, inter-quartile range and median; percentage of total liabilities and equity)
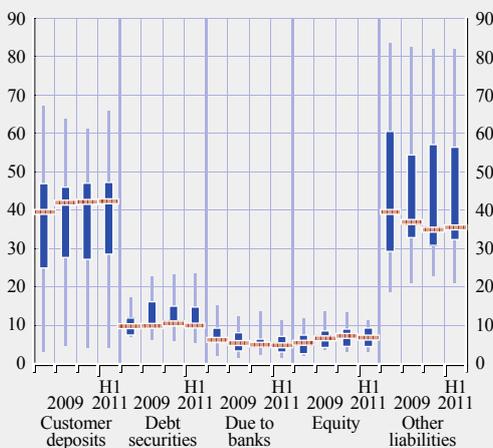
Customer deposits | Debt securities | Due to banks | Equity | Other liabilities

Sources: Individual banks' reports and ECB calculations.
Notes: Figures are based on data for the sub-sample of global LCBGs for which results were available. For some banks, the share of customer deposits may be understated due to the lack of full disclosure.

stage, further deleveraging cannot be excluded in the future, given new regulatory requirements in conjunction with market-related pressures.

LCBGs' funding structures have changed since the beginning of the crisis in 2008, which was reflected in a further shift towards retail deposits (see Chart 3.15) – the median share of customer deposits in global LCBGs' total liabilities increased to 42.3%, from 39.6% at the end of 2008. At the same time, the share of interbank liabilities decreased by 1.4 percentage points to 4.8%.

Outlook for global large and complex banking groups on the basis of market indicators

The deteriorating outlook for global LCBGs after the finalisation of the June FSR was also visible in the development of market-based indicators over the past six months.

Banks' stock prices declined considerably, also relative to overall stock market indices, and CDS spreads widened (see Chart 3.16).

Chart 3.16 Stock prices and credit default swap spreads for a sample of global large and complex banking groups

(Jan. 2011 – Nov. 2011)

- minimum-maximum range
- median

Stock prices
(index: Jan. 2011 = 100)

CDS spreads
(basis points)

Sources: Bloomberg and ECB calculations.

At the same time, measures of expected default frequencies and distance to default deteriorated (see Charts S77 and S78).

A moderating economic environment also affected banks' trading results and the demand for loans, thus contributing to the decline in market indicators. Furthermore, developments were affected by higher litigation risks for banks operating in the United States and by concerns about global LCBGs' sovereign debt exposures to some fiscally vulnerable countries. Looking ahead, market-based measures for global LCBGs are likely to continue to signal elevated uncertainty regarding banks' prospects. Increased competition between banks and sovereigns in capital and debt markets might contribute further to these developments, as might the need to raise equity and issue long-term debt in order to comply with the new Basel III framework, national capital requirements and potentially higher capital requirements for systemically important financial institutions.

HEDGE FUNDS

After the finalisation of the June FSR in late May 2011, the global hedge fund sector suffered investment losses that, although significant, were not as large as those following the failure of Lehman Brothers in September 2008. Moreover, in comparison with this earlier period, the sector was less leveraged, and this helped to alleviate funding liquidity pressures stemming from prime brokers' margin calls. Nonetheless, given the size of investment losses, the funding liquidity risk associated with large investor redemptions remains high, despite little indication of increased redemption notifications thus far and generally strong investor appetite for hedge fund investments against the background of low nominal interest rates. Furthermore, the possible crowding of hedge fund trades might also adversely impact both hedge funds themselves and the affected financial markets.

Investment performance and exposures

Since May 2011, the hedge fund sector has not, on aggregate, been successful in navigating through the high volatility of asset prices in

global capital markets, and the investment return indices of many broad hedge fund investment strategies declined significantly (see Chart 3.17). Only managed futures (CTA Global) and short-selling investment strategies weathered the financial market turbulence of August and September 2011 relatively unscathed, or even posted positive average investment results – both strategies tend to benefit from higher or increasing volatility (often amid rapidly falling prices). Given the magnitude of the investment losses, it is quite probable that some hedge fund investment strategies, and possibly also the hedge fund sector as a whole, may fail to achieve positive annual investment results for 2011.

The similarity of hedge funds' investment positioning within some broadly defined investment strategies, and thus the associated risk of simultaneous and disorderly collective exits from crowded trades, appeared to remain higher than usual. At the end of October 2011, the moving median pair-wise correlation

Chart 3.17 Global hedge fund returns

(Jan. 2010 – Oct. 2011; percentage returns, net of all fees, in USD)

Legend:
- May 2011
- June 2011
- July 2011
- August 2011
- September 2011
- October 2011
- January-October 2010
- January-October 2011
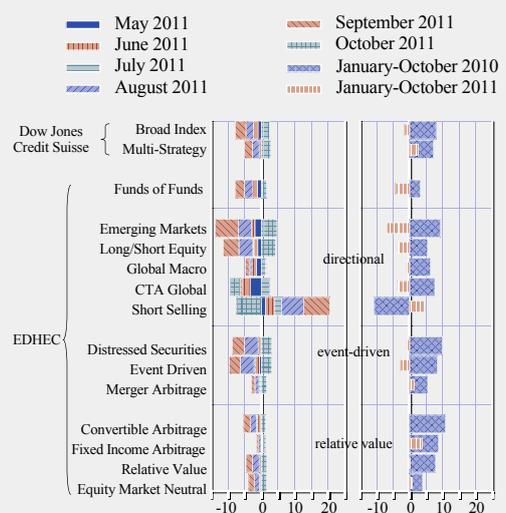
Sources: Bloomberg, EDHEC Risk and Asset Management Research Centre and ECB calculations.
Notes: EDHEC indices represent the first component of a principal component analysis of similar indices from major hedge fund return index families. "CTA Global" stands for "Commodity Trading Advisors"; this investment strategy is often also referred to as managed futures.

Chart 3.18 Medians of pair-wise correlation coefficients of monthly global hedge fund returns within strategies

(Jan. 1995 – Oct. 2011; Kendall's τ_b correlation coefficient; percentage monthly returns, net of all fees, in USD; moving 12-month window)

- managed futures
- long/short equity hedge
- global macro
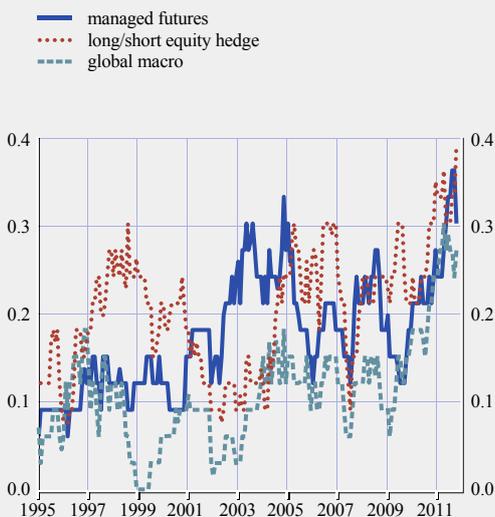
Sources: Lipper TASS database and ECB calculations.

Chart 3.19 Near-term redemption pressures

(Jan. 2008 – Nov. 2011; percentage of hedge fund assets under administration investors plan to withdraw, segmented by redemption period)

- ≤1 month
- 1-2 months
- 2-3 months
- >3 months
- GlobeOp forward redemption indicator
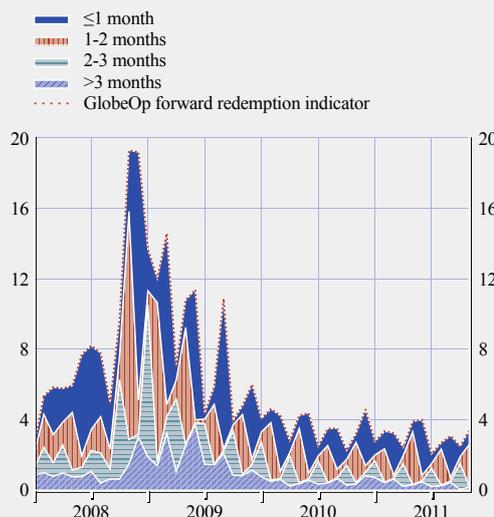
Source: GlobeOp.
Notes: Assets under administration refer to the sum of the net asset value (capital under management) of all hedge funds administered by GlobeOp. Data are based on actual redemption notices received by the 12th business day of the month. Investors may, and sometimes do, cancel redemption notices. Unlike subscriptions, redemption notifications are typically received 30 to 90 days in advance of the redemption date, depending on individual fund redemption notice requirements. In addition, the establishment and enforcement of redemption notification deadlines may vary from fund to fund.

coefficients of the investment returns of hedge funds within investment strategies – a measure of the possible crowding of hedge fund trades – reached, or remained close to, their respective all-time highs for most hedge fund investment strategies, as shown for selected strategies in Chart 3.18.

Funding liquidity risk and leverage
Various estimates of net flows into the hedge fund sector indicate that some investors reacted to investment losses by increasing their redemptions, with views varying on how large these withdrawals may ultimately become. In mid-November 2011, however, the forward redemption indicator created by a hedge fund administrator[2] had continued to suggest limited investor redemption pressures in the near term (see Chart 3.19). According to this indicator, forward redemption notifications received from

investors for administered hedge funds, measured as a percentage of the total capital under management of administered hedge funds, have remained below the historical average since January 2008.

By contrast, amid generally moderate leverage levels,[3] the possible funding liquidity pressures associated with unexpected cuts in the short-term financing provided by banks did not seem to represent a material risk. Moreover, the Federal

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2 Administrators provide a variety of services to hedge fund clients, including the processing of investor subscriptions and redemptions, valuations, calculation of fund's net asset value (NAV), middle and back office services.
3 The Federal Reserve System's June 2011 survey had revealed that the leverage of hedge fund clients was roughly in the middle of the range between the pre-crisis peak in late 2006 and post-crisis trough in late 2009. See the Special Question No 52 in Federal Reserve Board, "Senior Credit Officer Opinion Survey on Dealer Financing Terms", June 2011.

Chart 3.20 Hedge fund leverage

(June 2006 – Nov. 2011; percentage of responses and weighted average leverage)

- don't know/not available
- less than one time
- between 1 and 2 times
- between 2 and 3 times
- between 3 and 4 times
- more than 4 times
- weighted average (right-hand scale)
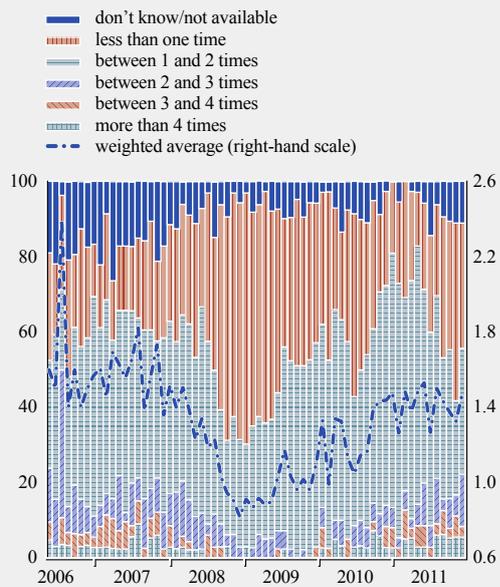
Source: Bank of America Merrill Lynch, "Global Fund Manager Survey".
Notes: Leverage is defined as a ratio of gross assets to capital. In 2010 and 2011 the number of responses varied between 30 and 41.

Reserve System's September 2011 survey on dealer financing terms revealed that non-price counterparty credit terms continued to ease for US dollar-denominated securities financing and OTC derivatives transactions with hedge fund clients (see also the sub-section on counterparty credit risk in Section 4.2). The same Federal Reserve survey had also disclosed that, under the terms of existing agreements, the availability of additional (and currently unutilised) financial leverage remained basically unchanged for hedge fund clients. Following investment losses, average hedge fund leverage levels did not seem to decline much, and thus the ongoing releveraging of the hedge fund sector needs to be monitored closely (see Chart 3.20).

4 EURO AREA FINANCIAL INSTITUTIONS

4.1 OVERALL ASSESSMENT

The **financial performance** of euro area *large and complex banking groups* deteriorated in the second and third quarters of 2011. This deterioration reflected the more challenging conditions faced by banks, notably adverse developments in funding and trading markets combined with a weaker than expected global economic environment. At the same time, banks' efforts to raise capital contributed to an increase in their regulatory capital ratios, although improvements in balance sheet equity ratios were less pronounced. The financial soundness of *large insurers* in the euro area remained broadly stable in the second and third quarters of 2011, which was in line with the expectations in the June 2011 Financial Stability Review (FSR). In particular, the profitability of large euro area reinsurers rebounded from the catastrophe-laden first quarter. All in all, the capital buffer of the sector seems to have been adequate and withstood the difficult times during the first half of 2011 rather well.

Looking forward, the **earnings outlook** for *euro area banks* has deteriorated in recent months. The prospects for growth in net interest income are likely to be negatively affected by higher funding costs, which could put pressure on margins, while credit growth remains moderate. Regarding risks to non-interest income, capital market-related revenues are likely to be adversely impacted by lower trading volumes, equity issuance and M&A activity. In addition, the positive contribution from the gradual decrease in banks' loan loss provisions may diminish in the future amid signs of a slowdown in the economic recovery in several euro area countries.

Turning to the **main risks** confronting the euro area *banking sector*, funding risks are key and have increased given an abrupt rise in medium-term funding costs and the reduced availability of funding for banks in several euro area countries. Risks stemming from vulnerabilities in medium-term funding include the possibility that funding costs remain elevated for a prolonged period, which could have negative implications for banks' earnings. Under a more adverse scenario, there is a risk that impaired access to wholesale funding markets forces banks to deleverage their balance sheets, or accelerate already ongoing deleveraging processes, with possible negative implications for credit growth. In addition, risks stemming from the heavy reliance of some large euro area banks on short-term and volatile USD funding remain, though these have been alleviated by the implementation of USD foreign exchange swap lines among major central banks.

The level of household and non-financial corporate credit risk in the euro area banking sector increased, on average, after the finalisation of the June FSR, although credit risks differ greatly across countries and individual banks due to banks' different geographical and sectoral credit risk exposures. The outlook for credit risk is, in particular, adversely affected by the prospect of a significant slowdown in economic activity, which would weaken households' and firms' debt servicing capabilities. Furthermore, credit risks could be further exacerbated by the possibility of an adverse feedback loop, whereby a restriction in credit availability would prompt a deterioration in the economic outlook and in the quality of banks' assets that, in turn, would spur additional tightening in credit conditions. Moreover, credit risks associated with property market fragilities remain a significant source of concern, at least in some parts of the euro area. A further credit risk concerns some euro area banking groups that have extended residential mortgages denominated in a foreign currency (notably in Swiss francs). In the light of the recent pronounced appreciation of the Swiss franc, local currency loan-to-value ratios have increased considerably and the risk of households being unable to service debt payments has increased.

The outlook for the *insurance sector* will be highly influenced by the slowing pace of global economic activity. In particular, weaker economic activity could negatively impact the investment income of insurers via stock and bond market developments, and also increase insurers' exposure to credit risk. However, a selected quantification of investment risks shows that, although material for bond markets in particular, these risks appear manageable on aggregate. An economic slowdown could nevertheless, in addition, negatively impact the demand for insurance and the room for premium rate increases in the underwriting business next year.

To sum up, the most significant risks that *euro area banks* currently face include:

⬆ contagion and negative feedback between the vulnerability of public finances, the financial sector and economic growth;

⬆ funding strains in the euro area banking sector; and

⬆ weakening economic activity, credit risks for banks, and possible second-round effects on the economy through reduced credit availability.

The most significant risks that *euro area insurers* currently face include:

➡ a prolonged period of low yields on AAA-rated government bonds, which would diminish the profitability of guaranteed life insurance products and weaken investment income in general;

⬆ a market-driven high volatility in long-term interest rates, which could trigger nominal investment losses in balance sheets;

⬆ credit investment risks in relation to the substantial exposures to bond markets; and

➡ higher than estimated losses from catastrophic events, along with a potentially

difficult pricing period following the expected slowdown in the economic recovery.

⬆ *Increased since the June 2011 FSR*
➡ *Unchanged since the June 2011 FSR*
⬇ *Decreased since the June 2011 FSR*

The measures announced by the European Council and euro area Heads of State or Government as well as the ECB's recent enhanced credit support measures (see Overview chapter for details) should help mitigate the risks highlighted above. In particular, bank recapitalisation, combined with the facilitation of access to term funding as a coordinated approach, should contribute to strengthening the euro area financial system. At the same time, it is also important that banks' recapitalisation plans do not lead mainly to an unwelcome pro-cyclical deleveraging involving significant constraints on the flow of credit to the real economy. Furthermore, the ECB's additional credit support measures, including two three-year refinancing operations, the broadening of the pool of collateral available to euro area banks and the reduction of reserve requirements, should help banks overcome problems in term funding, and should thus also help reduce deleveraging pressures on banks.

4.2 BANKS FACE INCREASED PRESSURE TO DELEVERAGE AMID CONTINUED FUNDING STRAINS[1]

4.2.1 FINANCIAL SOUNDNESS OF LARGE AND COMPLEX BANKING GROUPS

The financial performance of large and complex banking groups (LCBGs) in the euro area deteriorated in the second and third quarters of 2011. LCBGs' financial results were weighed down by weaker revenue growth and an increase

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1 The sample used for the majority of the analysis carried out in this section includes 18 euro area banks. The criteria for identifying them are described in ECB, "Identifying large and complex banking groups for financial system stability assessment", *Financial Stability Review,* December 2006. However, at the time of writing, not all quarterly figures were available for all banks.

in loan loss provisions and, as a consequence, the earnings recovery that had continued throughout 2010 and the first quarter of this year reversed in the second and third quarters. While banks' financial performance was supported by the continued strength of net interest income and net fee and commission income, even if to a lesser extent than six months earlier, recent developments suggest that these factors were outweighed by a need for higher loan loss provisions and a significant drop in trading income. Diversification of activities across geographical regions helped some LCBGs to maintain their profitability, despite the difficulties they faced in their domestic markets. At the same time, banks were negatively affected by higher funding costs. Banks' efforts to raise capital contributed to improvements in their solvency indicators.

PROFITABILITY

Developments in the profitability of LCBGs, as measured by the return on equity (ROE) and return on assets (ROA), were mixed in the first nine months of 2011 (see Chart 4.1). After a typically strong first-quarter performance, institutions faced more challenging conditions in the subsequent quarters, given the adverse developments in funding and trading markets and a weaker than expected global economic environment. Furthermore, the continuing deleveraging and de-risking of balance sheets has also contributed to the lower levels of profitability indicators. Second and third-quarter results showed an overall deterioration in profitability, as illustrated by the downward shift of the entire distribution of ROE and ROA values compared with the previous quarters.

The deterioration in LCBGs' financial performance in the second and third quarters of this year was mainly due to higher loan loss provisions, including impairment charges on Greek sovereign debt, and a pronounced deterioration in trading income. In the third quarter, the results for those euro area LCBGs that had published their financial statements

Chart 4.1 Euro area LCBGs' return on equity and return on assets

(2006 – Q3 2011; maximum, minimum and interquartile distribution; percentages)
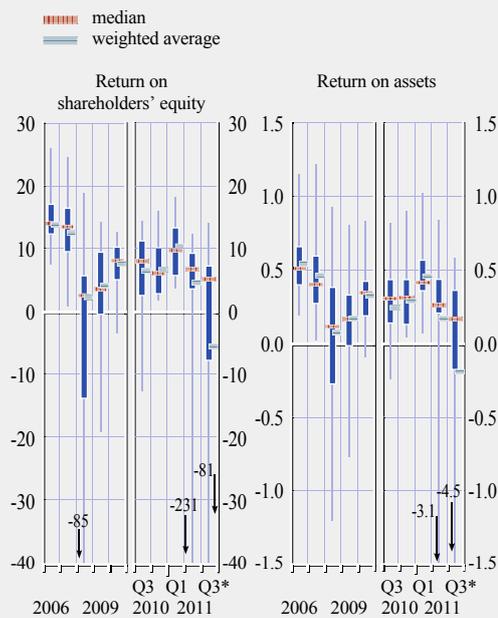
median
weighted average


Sources: Individual institutions' financial reports and ECB calculations.
Notes: The figures for the third quarter of 2011 are based on data for a sub-sample of LCBGs for which results were available. The quarterly figures have been annualised.

by the time of writing were affected by further mark-to-market losses on Greek sovereign debt. The operating income of most euro area LCBGs was supported by stable net interest income and income from fees and commissions, although the latter declined to some extent. In contrast, after a gradual improvement in the second half of 2010 and the first quarter of this year, the trend in trading income reversed in the subsequent quarters as a consequence of increased financial market volatility and low trading activity.

Loan loss provisions, which decreased markedly in 2010, increased considerably in the second, and in particular, the third quarter of 2011, against the background of a deteriorating economic situation in some euro area countries. LCBGs' profits in the second and third quarters were also negatively affected by the impairment charges on Greek sovereign debt.

net interest income
net fee and
commission income
net trading income
loan loss provisions

median
weighted average

Income sources (median)

Loan loss provisions

Q3 Q1 Q3
2006   2009   2010   2011

Q3 Q1 Q3
2006   2009   2010   2011
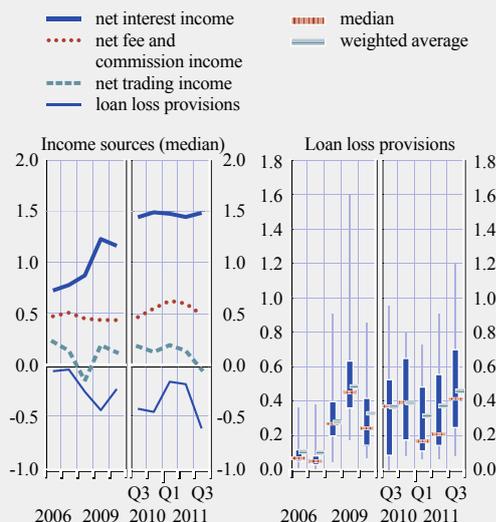
Sources: Individual institutions' financial reports and ECB
calculations.
Notes: The figures for the third quarter of 2011 are based on data
for a sub-sample of LCBGs for which results were available. The
quarterly figures have been annualised. The income sources are
median values across the sample.

**Chart 4.3 Euro area LCBGs' Tier 1 capital
ratios and the contribution of components to
changes in the aggregate Tier 1 capital ratio**

(2006 – Q3 2011)
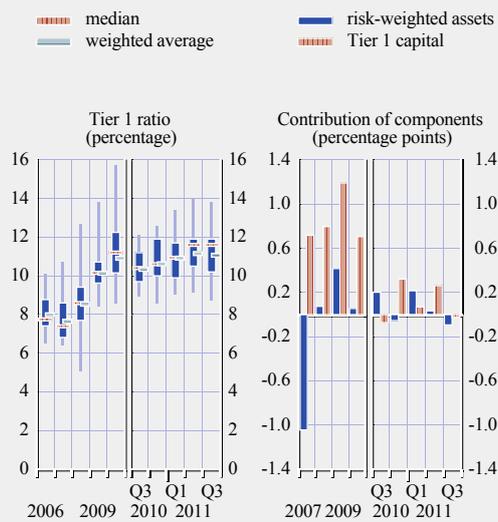
median
weighted average

risk-weighted assets
Tier 1 capital

Tier 1 ratio
(percentage)

Contribution of components
(percentage points)

Q3 Q1 Q3
2006   2009   2010   2011

Q3 Q1 Q3
2007 2009   2010   2011

Sources: Individual institutions' financial reports and ECB
calculations.
Notes: The quarterly figures are based on data for a sub-sample
of LCBGs for which results were available for all presented
quarters. In the right-hand panel, the contribution of components
to changes in the aggregate Tier 1 capital ratio is shown with a
sign to indicate whether they resulted in a positive or negative
change (e.g. the increase in risk-weighted assets is shown with
a negative sign).

SOLVENCY

Regulatory capital ratios of euro area LCBGs
improved across the board in the second
quarter of 2011 (see Chart 4.3). The increase in
Tier 1 capital ratios was supported by retained
earnings and banks' efforts to raise capital, as
well as a further decrease in risk-weighted
assets. In contrast, Tier 1 ratios of some LCBGs
deteriorated slightly in the third quarter due to
a loss incurred by these institutions during this
period.

Ahead of this year's EU-wide stress test
conducted by the European Banking Authority
(EBA) and in preparation for the new, stricter,
capital regulation, banks have been making
efforts to improve the quality of their regulatory
capital by issuing common equity. As a result of
the capital increases and the further deleveraging
of balance sheets by some institutions, most
euro area LCBGs' core capital ratios, according
to current definitions, continued to improve

significantly in the first quarter of 2011 and
stabilised thereafter (see Chart 4.4).

Nevertheless, for some banks further progress is
needed in improving the quality of their capital
and reducing their leverage, also to comply with
the measures approved by the EU Heads of
State or Government on 26 October. However,
currently low valuation levels of bank equity
considerably increased the cost of new capital,
making it highly expensive for some institutions
to raise capital in the current market conditions.

Due to the deleveraging process and equity
issuances, the ratio of equity to total assets
increased for virtually all euro area LCBGs.
However, if compared with Tier 1 ratios, the
improvement in the latter ratio was relatively
more pronounced due to a more rapid decrease
in risk-weighted assets than in total assets
(see Chart 4.5). Furthermore, the relative
improvements in the two ratios are not equal

Chart 4.4 Euro area LCBGs' core capital ratios and leverage multiples

(2006 – Q3 2011; maximum, minimum and interquartile distribution)
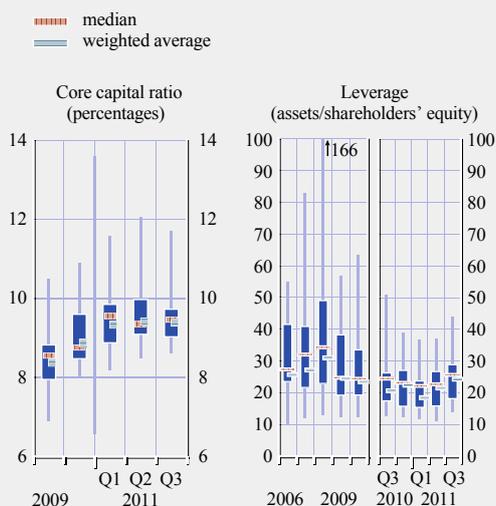
median
weighted average

Core capital ratio (percentages)

Leverage (assets/shareholders' equity)

Sources: Individual institutions' financial reports and ECB calculations.
Notes: The quarterly figures are based on data for a sub-sample of LCBGs for which results for all presented quarters were available. Core capital ratios, as reported by institutions in public disclosures, are presented for a sub-sample of LCBGs. Therefore, core capital definitions may differ across banks in the sample and are not necessarily in line with the EBA definition.

Chart 4.5 Balance sheet equity ratios and risk-weighted capital ratios of euro area LCBGs

(percentages)

x-axis: equity/assets
y-axis: Tier 1 capital ratio

end-2008
Q2 2011
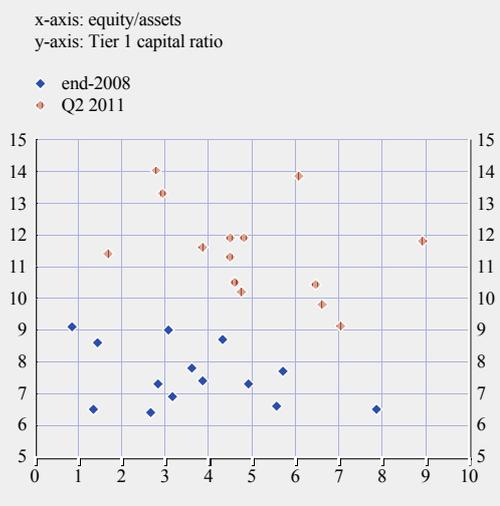
Sources: Individual institutions' financial reports and ECB calculations.
Note: The figures are based on data for a sub-sample of LCBGs for which results for all presented data points were available.

across banks due to different business models employed by euro area LCBGs. In particular, banks with more traditional and retail-oriented business models tend to have higher equity-to-assets ratios and a smaller difference between the two ratios.

Measures unveiled by the EU Heads of State or Government on 26 October 2011 to strengthen the capital and address funding needs of European banks should contribute to strengthening the resilience of the euro area banking sector. Banks are required to strengthen their capital positions by building up a temporary capital buffer against sovereign debt exposures to reflect current market prices. In addition, banks are required to establish a buffer such that their core Tier 1 (CT1) capital ratio reaches 9% under the so-called "Basel 2.5" rules. Banks will be expected to build these buffers by the end of June 2012 (see breakdown of estimated capital shortfalls by country in Table 4.1).

Table 4.1 Breakdown by country of capital shortfall in the euro area banking sector

(EUR millions)

Country	Overall shortfall after including sovereign capital buffer
Austria	3,923
Belgium	6,313
Cyprus	3,531
Germany	13,107
Spain	26,170
Finland	0
France	7,324
Greece	30,000
Ireland	0
Italy	15,366
Luxembourg	0
Malta	0
Netherlands	159
Portugal	6,950
Slovenia	320
Total	**113,163**

Source: European Banking Authority.
Notes: The table shows final figures as disclosed by the EBA on 8 December 2011, based on end-September capital positions, sovereign exposures and sovereign bond yields.

LIQUIDITY

The liquidity conditions in euro area funding markets have deteriorated since the finalisation of the June 2011 FSR. Market segmentation increased significantly, with banks in some countries facing increasing difficulties in terms of both the availability and the cost of funds (see Section 3.1).

Higher uncertainty in the unsecured funding markets and preparations for new regulatory requirements regarding liquidity and funding resulted in further changes in banks' funding strategies and liability structures in the first half of 2011, which are reflected in a further shift towards retail deposits (see Chart 4.6); the median share of customer deposits in total liabilities for euro area LCBGs increased to 36%.

While the share of interbank liabilities generally decreased further in the first half of 2011, it remained high for some banks. The increasing

Chart 4.6 Share of main liability items in euro area LCBGs' total liabilities

(2008 – H1 2011; percentage of total assets; maximum, minimum, interquartile range and median)

1 2008   2 2009   3 2010   4 H1 2011

Sources: Individual institutions' financial reports and ECB calculations.
Notes: The figures are based on available data for a sub-sample of LCBGs for which results for all presented data points were available. For some banks, the share of customer deposits may be understated due to a lack of full disclosures.

retail deposit share was offset by a relative decrease in other liabilities, such as derivatives and liabilities at fair value. The share of common equity in total liabilities continued to increase, as most banks issued new equity in the first half of 2011. As debt investors are becoming more risk averse towards highly leveraged institutions, those banks that have a larger share of common equity on their balance sheets are better positioned in the funding markets relative to their peers with a similar asset structure.

4.2.2 BANKING SECTOR OUTLOOK AND RISKS

EARNINGS OUTLOOK
Looking forward, the outlook for euro area banks' earnings deteriorated in recent months as ongoing concerns about banks' sovereign exposures and funding vulnerabilities, as well as a deterioration in the growth outlook, all added to the uncertainty about banks' future earnings path. Banks are likely to find it increasingly challenging to boost their income as further improvement in net interest income – one of the main drivers of the increase in LCBGs' profitability until the first quarter of 2011 – may be difficult in the period ahead due to higher funding costs and the likelihood that capital market-related revenues will remain under pressure in late 2011 and beyond. In addition, the positive contribution from the gradual decrease in banks' loan loss provisions may diminish in the future amid signs of a slowdown in the economic recovery in several euro area countries.

Regarding the prospects for net interest income, the growth of interest income is likely to be restrained by moderate credit expansion in the period ahead. While the moderate growth in lending to households and, to a lesser extent, corporates (see Chart S89) will continue to provide some support for interest income, downside risks to credit growth may increase in the period ahead, given the worsening growth outlook as well as the increase in banks' cost of funds and balance sheet constraints. In addition, higher funding costs will likely put upward pressure on interest expenses, thus adversely
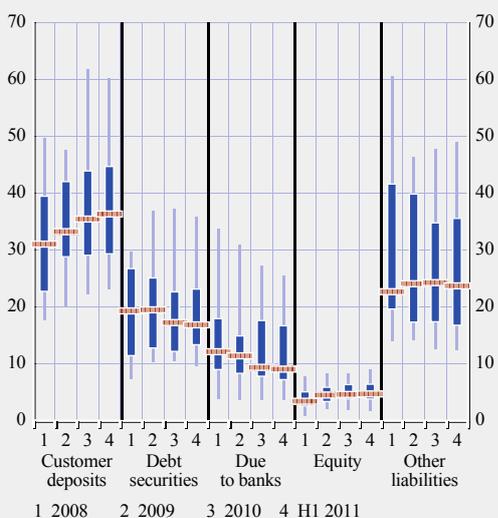
affecting net interest income for an increasing number of banks, as already indicated by the decrease in the median net interest income for LCBGs, as a percentage of total assets, in the third quarter of 2011 (see Chart 4.2).

As for banks' non-interest income, LCBGs' trading results proved to be rather volatile in recent quarters, with a strong first-quarter performance followed by significantly weaker results in the second and third quarters of 2011. Looking ahead, the near-term outlook for banks' capital market-related revenues remains rather challenging, with analysts expecting a year-on-year decline in revenues in the fourth quarter of the year.

With regard to loan loss provisions, a growing number of LCBGs may see their provisioning costs rise in the coming quarters as loan quality is likely to deteriorate against the background of the expected slowdown in economic growth. Regarding the broader euro area banking sector, future developments in loan loss provisions are likely to diverge across euro area countries in line with the differences in the country-specific macroeconomic outlooks.

Overall, the above factors, some of which had already affected LCBGs' second and third-quarter results, point to a further moderation in earnings growth for banks in the period ahead. This is also reflected in analysts' earnings forecasts for listed euro area LCBGs, which were revised downwards compared with six months earlier (see Chart S105).

Outlook for the banking sector on the basis of market indicators
After the finalisation of the last FSR, market indicators pointed to a significant deterioration in the risk outlook for both euro area and global LCBGs (see also Section 3.2). Bank sector equity indices in Europe and the United States have considerably underperformed the overall indices (see Charts S60 and S106) and the period was characterised by high volatility amid concerns about the possible systemic consequences of increased sovereign risks, bank

funding vulnerabilities and the deterioration in the outlook for economic growth. The implied volatilities of bank indices (see Charts S61 and S107) have risen significantly and reached levels not far below the highs seen at the turn of 2008 and 2009, indicating that market participants became more uncertain about the outlook for banks than that for other sectors as the implied volatilities for the latter were lower. Market participants' worsening risk perceptions were also evidenced by the significant widening of credit default swap (CDS) spreads for both euro area LCBGs and their global peers (see Charts S104 and S80), which was accompanied by rising expected default frequency (EDF) metrics (see Charts S102 and S77). At the same time, the regional comparison of CDS spreads suggests a less favourable assessment of risk for the euro area LCBGs.

This can be mainly attributed to the differences in the perception of risks stemming from the interplay between vulnerabilities of public finances and the banking sector. In particular,

Chart 4.7 Actual and estimated price-to-book value ratios of euro area and global LCBGs

(Jan. 2007 – Nov. 2011; averages)
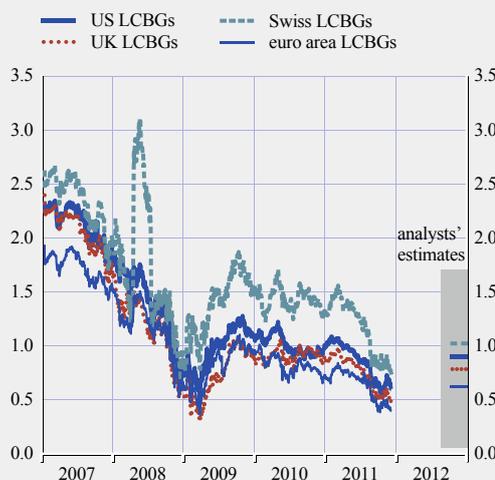
Sources: Bloomberg, Thomson Reuters and ECB calculations.
Note: The latest estimates were revised at the turn of October and November (for four banks) and in the period 11-17 November 2011 and refer to the estimated book values per share at the end of the next fiscal year and target prices covering a horizon up to 18 months, with a horizon of 6 to 12 months being the most widely used.

risk perceptions regarding euro area banks have been mainly affected by concerns about the further adverse feedback between large fiscal imbalances, downside risks to economic growth and banks' funding and capital positions in a changing regulatory regime.

Looking forward, analysts' estimates of price-to-book value ratios, derived from estimates of book value per share and target prices, suggest that market participants expect some recovery in stock valuations of euro area and global LCBGs in the fiscal year ahead. However, the average estimated increases in LCBGs' price-to-book value ratios are foreseen to be moderate, albeit with differences across regions, if compared with their pre-crisis levels (see Chart 4.7).

HOW DO BANK RISK AND SOVEREIGN RISK INTERACT? A CDS MARKET-BASED ANALYSIS

The sovereign crisis afflicting parts of the euro area has unfortunately provided a vibrant illustration of the vulnerability of a banking sector when combined with high sovereign risk. Many metrics, of course, exist to gauge the strength of the close relationship between the risks in the sovereign bond markets and the banking sector. One approach is to use credit default swap (CDS) markets to analyse the multitude of transmission channels which may exist. First, the direct exposure of the banking sector to sovereign bonds implies a transfer of risk from the sovereign CDS to the banking CDS. Second, the "fiscal cost" of banking crisis resolution implies a risk transfer from the bank CDS market to the sovereign CDS. Third, the cross-border links between financial institutions can be qualified as the banking channel of sovereign risk. Even if the analysis of market prices is not a panacea for a complete assessment of these transmission channels, it allows for a daily monitoring of market participants' expectations concerning the potential risk spillovers between banking risk and sovereign risk.

In this box, the sovereign five-year CDS spreads for the four largest euro area countries (Germany, France, Italy and Spain) are considered, with a synthetic five-year CDS constructed as the average premium for the main banks in each country. While in normal times the bank CDS spread is always higher than the sovereign CDS spread, some convergence between the two premia is observed during crisis episodes, especially during the most recent period. Moreover, the euro area crisis has been characterised by an increase in correlations between these two CDS market segments. However, measuring risk spillovers only with correlations is partial since this indicator is symmetric by definition, thereby preventing any interpretation on the direction of contagion.

To consider the transmission channels between these two risks, an expected shortfall indicator[1] may contribute to a better understanding of the rationale for the two premia being interconnected. More precisely, the expected shortfall for CDS A conditional on CDS B is computed as $ES_{AB} = E\left(r_A \mid r_B > Q_B^\alpha\right)$ with a tail risk α of 0.95; a tail event is considered as an increase in the CDS premium above its 95% quantile (denoted Q^α). This indicator gives the increase in basis points of CDS A conditional on a tail event for CDS B. Moreover, two sub-samples before and after 1 January 2010 are considered to observe the changes in CDS market interdependencies.

1 For more information on the general properties of such indicators, see ECB, "New quantitative measures of systemic risk", *Financial Stability Review*, December 2010.

**Chart A Historical expected shortfalls for sovereign CDS markets before the euro area debt crisis**
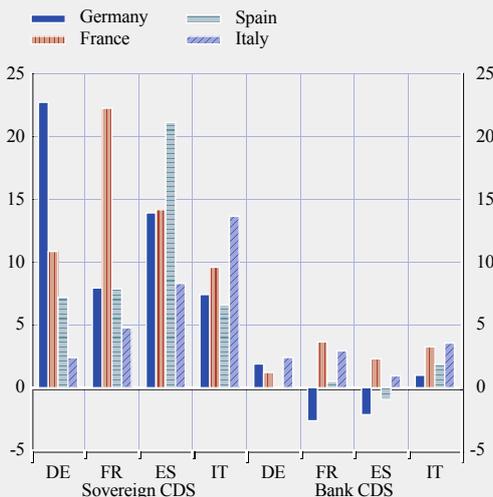
(Nov. 2007 – Jan. 2010; basis points)

- Germany
- France
- Spain
- Italy

Sources: Bloomberg and ECB calculations.
Note: This chart should be read as a tail event in which the asset mentioned on the x-axis impacts by N basis points the sovereign CDS of the country mentioned.

Chart B Historical expected shortfalls for bank CDS markets before the euro area debt crisis
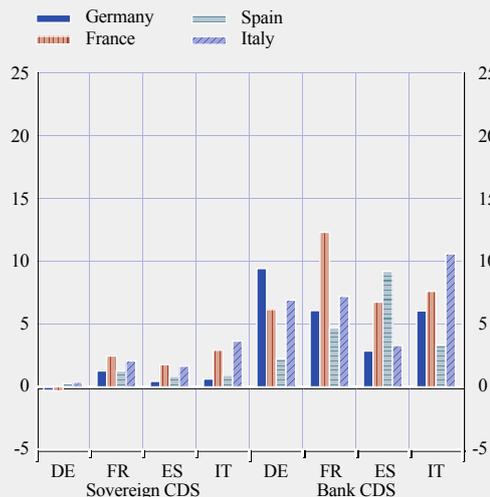
(Nov. 2007 – Jan. 2010; basis points)

- Germany
- France
- Spain
- Italy

Sources: Bloomberg and ECB calculations.
Note: This chart should be read as a tail event in which the asset mentioned on the x-axis impacts by N basis points the bank CDS of the country mentioned.

By considering the main banks for each country for which CDS data are available, any metrics of interdependence based on bank CDSs should be perceived as a "floor" indicator since smaller banks may be highly interconnected to sovereign risk given their less diversified portfolios.

Prior to January 2010, as shown in Chart A, the expected shortfalls are segmented: sovereign CDSs are mainly sensitive to tail events in other sovereign CDSs and quite immune to the bank CDS market. Reciprocally, a tail event in the bank CDS segment is mainly transmitted to other bank CDSs, while any tail event in the sovereign CDS does not transmit to the bank CDS segment (see Chart B). Even if a transmission from the bank CDSs to the sovereign during the 2008 financial crisis episodes could have been feared, given the fiscal cost of the crisis resolution, the market was not pricing in any risk spillover in this direction.

After January 2010 (see Charts C and D), if the expected shortfalls do not show any modification of the bank-to-bank vulnerability, the transmission channels among sovereign CDSs have changed and are now more heterogenous: for example, a shock to the French sovereign CDS currently impacts

Chart C Historical expected shortfalls for sovereign CDS markets during the euro area debt crisis
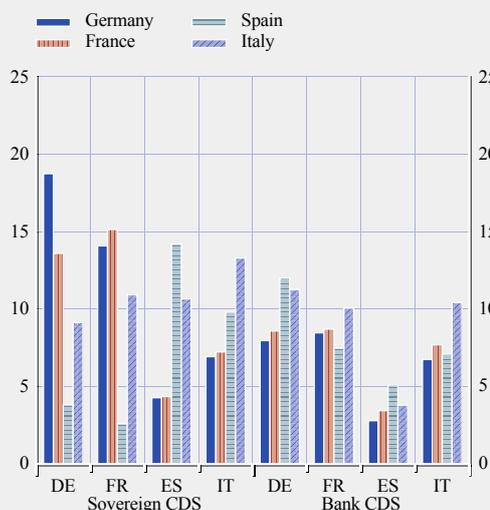
(Jan. 2010 – Nov. 2011; basis points)

- Germany
- France
- Spain
- Italy

Sources: Bloomberg and ECB calculations.
Note: This chart should be read as a tail event in which the asset mentioned on the x-axis impacts by N basis points the sovereign CDS of the country mentioned.

the German CDS by 14 basis points, against only 7 basis points before January 2010, while a shock to the Spanish sovereign CDS now impacts the French and German CDSs only by 4 basis points, against 14 basis points before 2010.

Another crucial modification after January 2010 is that the cross-segment transmission channels are stronger. For example, Chart C shows that a tail event for the Italian bank CDS, which corresponds to an increase above 10 basis points over a day, implies on average an increase of the sovereign CDS by 7 basis points for France, Germany and Spain and 11 basis points for Italy; or a tail event for the German bank CDS (daily variation above 7 basis points) implies an increase in the sovereign CDS by about 8 basis points for France and Germany, 13 basis points for Spain and 12 basis points for Italy.

Chart D Historical expected shortfalls for bank CDS markets during the euro area debt crisis
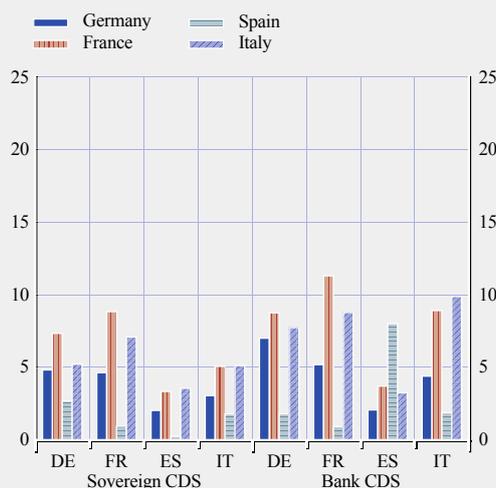
(Jan. 2010 – Nov. 2011; basis points)

Sources: Bloomberg and ECB calculations.
Note: This chart should be read as a tail event in which the asset mentioned on the x-axis impacts by N basis points the bank CDS of the mentioned country.

From the sovereign to the banks, Chart D shows that the sensitivity is also stronger than before, but overall lower than from the bank CDS to the sovereign; for example, a tail event for the French sovereign CDS (daily variation above 15 basis points) increases the bank CDS by about 9 basis points in France, 7 basis points in Italy, 5 basis points in Germany and 3 basis points in Spain.

To conclude, the current high correlations between bank and sovereign CDS spreads and the conditional expected shortfall approach suggest feedback loops exist between the two segments. Since the tensions on sovereign debt and banks' pricing cannot be disentangled, focusing on recapitalisation of banks may not be enough to stabilise banking system soundness.

CREDIT RISK

Non-financial corporate and household credit risk
The level of credit risk in the euro area banking sector increased, on average, after the finalisation of the June FSR. However, credit risks confronting euro area banks differ greatly across countries and across individual banks due to banks' different geographical and sectoral credit risk exposures.

Further credit losses for banks could be triggered by, in particular: (i) a sharper than expected decline in economic activity creating challenges for debt servicing through worsened income

and earnings prospects; (ii) an abrupt increase in households' and firms' debt servicing costs through higher interest rates due to tighter lending standards and availability of credit, or due to long-lasting or continued appreciation of currencies in which foreign currency loans have been taken out; and (iii) substantial volatility, declines or persistently subdued levels in the collateral values of households' or non-financial corporations' financial or real assets that could further weaken their balance sheets as well as their borrowing and debt servicing ability.

Data for the large and complex banking groups considered in this section collected

by the European Banking Authority (EBA) show that credit risk exposures are, on average, roughly equally distributed among non-financial corporations (when corporate, SME and commercial property exposures are combined), residential mortgages and financial institutions (mainly banks). However, the shares vary significantly across banks due to their different specialisations and regional focuses (see Chart 4.8).

Regarding credit exposures to households for the whole euro area banking sector, total lending to households continued to expand after the finalisation of the June FSR (see Chart S19). Growth in lending for house purchase – which accounts for 72% of total household borrowing from monetary financial institutions (MFIs) – decelerated somewhat from June to September to below 4%, year on year, which could be attributed to the deceleration of house price growth witnessed earlier in 2011 (see Chart 4.9).

Write-offs on housing loans extended by euro area MFIs remained broadly stable at low levels during the past six months (see Chart S92). However, euro area banks' credit risk exposures that arise from mortgage lending vary significantly across countries. In particular, credit risk from exposures to household lending remains significant for banks in some euro area countries with high household indebtedness, subdued household income prospects and/or where there is potential for a decline in residential property prices (see Sections 2.1 and 2.3).

A further credit risk mainly stemming from the household sector concerns euro area banks, and in particular their subsidiaries outside the euro area that have extended residential mortgages denominated in a foreign currency. For instance, in Hungary, Austria, Poland and Romania, a considerable share of loans is denominated in Swiss francs. In the light of recent pronounced appreciations of the Swiss

Chart 4.8 Credit risk exposures of euro area large and complex banking groups

(end-2010; percentage of total exposures; maximum, minimum, interquartile distribution and weighted average)

1 Residential mortgages
2 Financial institutions
3 Corporates
4 Other retail exposures
5 SMEs
6 Commercial property
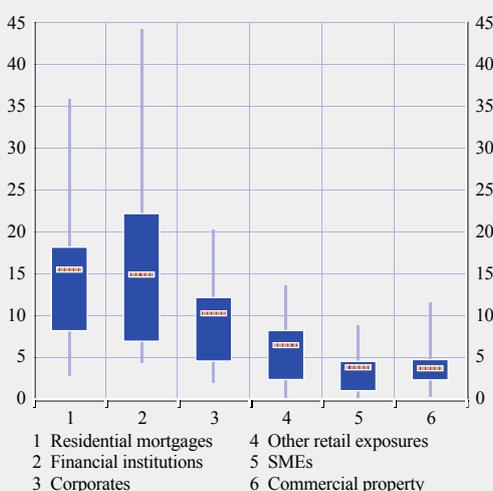
Source: European Banking Authority.
Notes: The data are exposures at default as defined in Basel II guidelines. SME denotes small and medium-sized enterprises.

Chart 4.9 Loans for house purchase and house prices in the euro area

(Jan. 2000 – Sep. 2011; percentage change per annum)

loans for house purchase
house prices
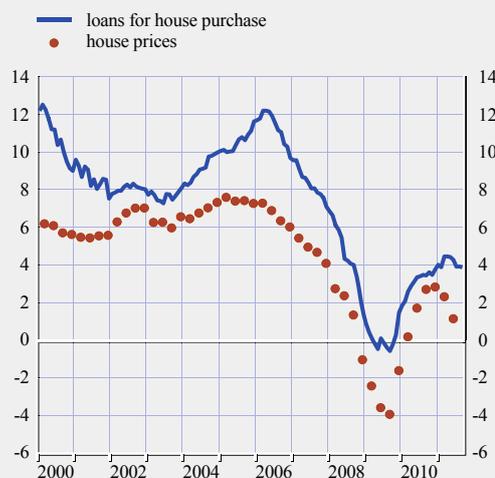
Source: ECB.

franc, local currency loan-to-value ratios have increased considerably and the risk that households are unable to service debt payments has increased.

Despite the risks and vulnerabilities mentioned above, there were however some indications of improvement in the credit quality of household loans during the past six months, as write-offs on both consumer credit and other lending to households (which account for 12% and 16% of total household borrowing, respectively) declined after the peaks reached during 2010 (see Chart S92).

Euro area MFIs' lending to non-financial corporates, which had witnessed negative annual growth rates during 16 consecutive months up until end-2010, continued to expand by some 1.5%, year on year, after the finalisation of the June FSR (see Chart S5). Lending to construction and real estate companies continued to dominate overall lending to the sector for the euro area as a whole, although exposures differ greatly across euro area countries and across banks.

Continued improvements in firms' profitability and still relatively low costs of debt financing contributed to containing risks in the sector as a whole, although vulnerabilities remain in some countries and sectors (see Section 2.2). These overall positive developments in the non-financial corporate sector contributed to steadily declining write-offs on euro area banks' corporate loans throughout 2011 (see Chart S92).

Within the non-financial corporate segment, commercial property exposures continue to be the main source of credit risk confronting euro area banks. However, commercial property exposures vary widely across banks and although some euro area LCBGs have significant commercial property lending exposures, the greatest vulnerabilities continue to be found among the more specialised commercial property lenders.

Most euro area countries have witnessed continued improvement in commercial property markets in recent quarters, but values remain subdued in comparison with previous years, and conditions in some countries and in the non-prime property segment remain very challenging (see Section 2.3).

Around a third of commercial property mortgages in the euro area are due to mature by 2013 according to market participants. Many of these mortgages were originated or refinanced when commercial property prices peaked in 2006-07. Some banks have, according to market participants, mitigated the immediate refinancing problems of some of their commercial property borrowers by restructuring and/or rolling over loans for one or a few years. Such practices could reduce ultimate losses for banks and have helped financing conditions in commercial property markets, but there is a risk that credit losses are merely being delayed if property values do not recover enough.

Pockets of vulnerability within the non-financial corporate sector also remain in the SME segment (see Section 2.2). In addition, credit risks stemming from exposures to non-financial firms also vary across countries depending on their fiscal and macroeconomic prospects. Therefore, the outlook for the credit quality of corporate loans remains unfavourable for banks with significant exposures to the SME sector and for (domestically oriented) banks in euro area countries with fiscal vulnerabilities and weak growth prospects.

Euro area banks have, according to the Eurosystem's October 2011 bank lending survey, responded to the continued elevated levels of credit risk, as well as higher funding costs and balance sheet constraints, by continuing to tighten lending standards (see Chart 4.10). Looking forward, euro area banks expect a further increase in the net tightening of credit standards for enterprises in the fourth quarter of 2011 and a small decline in the net tightening for housing loans. Although more prudent

Chart 4.10 Changes in euro area banks' expected credit standards on loans or credit lines and the three-month EURIBOR/OIS spread

(Q1 2007 – Q4 2011)

— change in credit standards on loans to corporates
(net percentage; left-hand scale)
····· change in credit standards on house purchase loans
(net percentage; left-hand scale)
---- EURIBOR/OIS spread (basis points; right-hand scale)
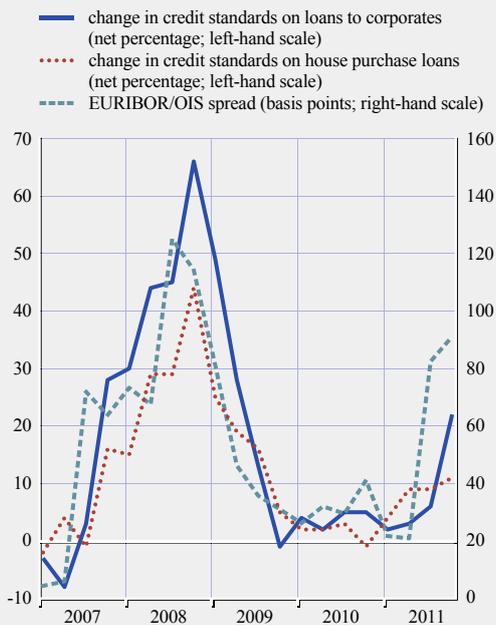
Sources: ECB and Bloomberg.

Chart 4.11 CDS spreads of euro area and global LCBGs

(Jan. 2007 – Nov. 2011; basis points; senior debt; five-year maturity)

— minimum-maximum range of euro area LCBGs
····· median of euro area LCBGs
---- median of US, UK and Swiss LCBGs
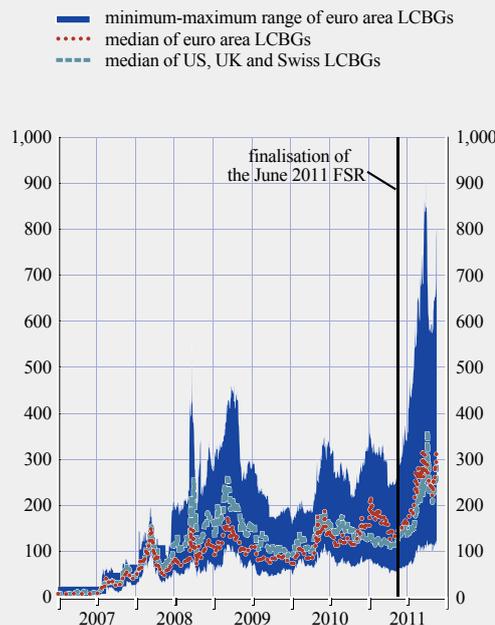
Sources: Bloomberg and ECB calculations.

and/or a reduction in bank lending can help to mitigate the increased credit risks, it could also lead to negative second-round effects on the economy through reduced credit availability (see Section 2).

Counterparty credit risk

The median cost of protection against the default of a euro area LCBG, as reflected by CDS spreads, had increased significantly by late November 2011 and was substantially higher than in the aftermath of the collapse of Lehman Brothers in mid-September 2008 (see Chart 4.11). In addition to higher counterparty credit risk concerns, largely on account of exposures to euro area sovereign credit risk, the increased hedging of counterparty credit exposures to euro area LCBGs has also contributed to higher CDS spreads.

In some cases, unsecured counterparty credit risk limits for euro area LCBGs and other

banks were significantly reduced or cancelled altogether, thereby further aggravating US dollar and euro funding difficulties. Moreover, some counterparties' concerns about the creditworthiness of euro area banks were so high that reportedly even secured funding against best-quality collateral was denied in order to avoid the possibility of going through the cumbersome process of seizing and liquidating the posted collateral.

The easing of counterparty credit terms applied to non-banks has also come to a halt. The latest quarterly Fed survey on dealer financing terms pointed to small changes in price and non-price credit terms for US dollar-denominated securities financing and OTC derivatives transactions across major classes of non-dealer counterparties with no clear overall bias (see Chart 4.12).[2]

2 Federal Reserve Board, "Senior Credit Officer Opinion Survey on Dealer Financing Terms", September 2011.

Chart 4.12 Changes in credit terms by major dealers for US dollar-denominated securities financing and OTC derivatives transactions with non-dealers

(Q2 2010 – Q3 2011; net balance of realised changes as a percentage share of reporting dealers)

— realised changes in price credit terms
····· realised changes in non-price credit terms
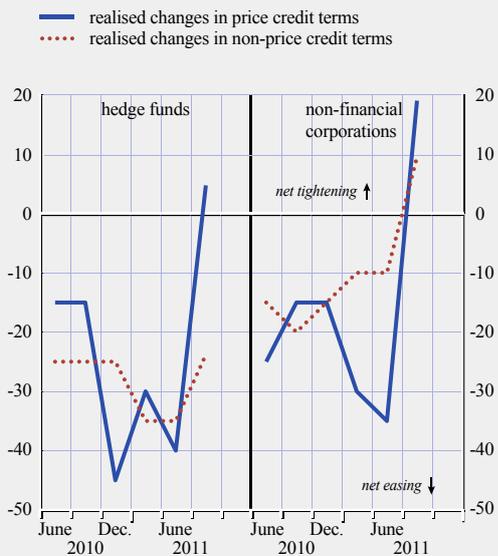
Sources: Federal Reserve Board and ECB calculations.
Notes: The net balance is calculated as the difference between the number of respondents reporting "tightened considerably" or "tightened somewhat" and those reporting "eased somewhat" or "eased considerably". The latest survey included 21 financial institutions, the majority of which were primary dealers in US government securities. These institutions accounted for almost all of the dealer financing of US dollar-denominated securities provided to non-dealers and were also the most active intermediaries in OTC derivatives markets.

Chart 4.13 Estimated proportion of hedge funds breaching triggers of cumulative total NAV decline

(Jan. 1994 – Oct. 2011; percentage of total reported NAV)

■ -15% on a monthly basis
▥ -25% on a rolling three-month basis
▤ -40% on a rolling 12-month basis
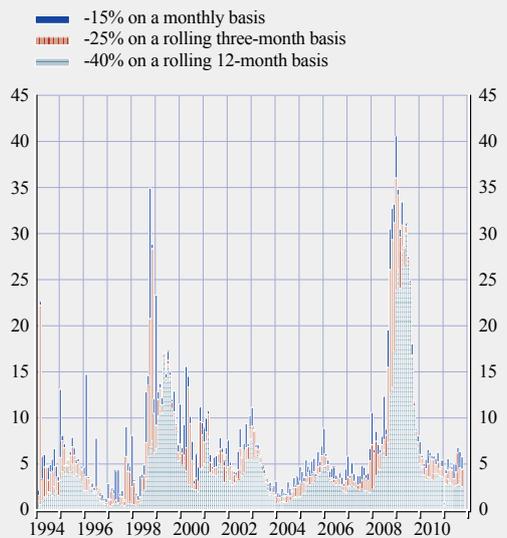
Sources: Lipper TASS database and ECB calculations.
Notes: Excluding funds of hedge funds. Net asset value (NAV) is the total value of a fund's investments less liabilities, also referred to as capital under management. For each point in time, estimated proportions are based only on hedge funds that reported respective NAV data and for which NAV change could thus be computed. If several typical total NAV decline triggers were breached, then the fund in question was only included in the group with the longest rolling period. If, instead of one fund or sub-fund, several sub-fund structures were listed in the database, each of them was analysed independently. The most recent data are subject to incomplete reporting.

Surveyed dealers, some of which were euro area LCBGs, reported that the intensity of efforts by non-dealer counterparties to negotiate more favourable credit terms had been continuing to increase and that more aggressive competition from other institutions was an important reason for the easing of credit terms, especially for transactions with hedge funds.

At the end of October 2011 the estimated proportion of hedge funds breaching triggers of cumulative total decline in net asset value (NAV)[3] was only slightly above its longer-term median, suggesting moderate counterparty credit risk associated with banks' exposures to these important and usually very active leveraged non-bank counterparties (see Chart 4.13) despite significant investment losses in August and September 2011.

FUNDING LIQUIDITY RISK

The severity of funding risk has increased given an abrupt rise in medium-term funding costs and the reduced availability of funding for banks in several euro area countries. While funding needs for the euro area banking sector as a whole have largely been covered for 2011, the situation could prove more difficult in the period ahead, particularly if headline risk and market volatility associated with the fiscal-financial strains in the euro area persist. Risks stemming from bank funding vulnerabilities include the possibility that funding costs remain

3   NAV triggers can be based on a cumulative decline in either total NAV or NAV per share, and allow creditor banks to terminate transactions with a particular hedge fund client and seize the collateral held. As opposed to NAV per share, a cumulative decline in total NAV incorporates the joint impact of both negative returns and investor redemptions.

elevated for a prolonged period of time, which could have negative implications for banks' earnings or, under a more adverse scenario, the possibility that impaired access to wholesale funding markets forces banks to deleverage their balance sheets, or accelerate already ongoing deleveraging processes, with possible negative implications for credit growth.

Since the finalisation of the June 2011 FSR, renewed tensions in the euro area sovereign debt market and heightened concerns about possible further adverse feedback between large fiscal imbalances and banking sector risks have increasingly affected most segments of bank funding markets. Tensions in euro money markets were evidenced by the significant increase in euro area banks' recourse to the ECB's deposit facility in recent months and a decline in EONIA trading volumes, which in turn indicate reduced lending activity in interbank markets (see Section 3.1). As a response to increased bank funding pressures, in early October the ECB announced two additional longer-term refinancing operations (LTROs) with 12 to 13-month maturities, as well as the continuation of its main refinancing operations as fixed rate tender procedures with full allotment at least until mid-2012. Furthermore, on 8 December 2011 the ECB decided to conduct two three-year LTROs, with the option of early redemption after one year, and to broaden the pool of eligible collateral available to euro area banks.

In medium-to-long-term funding markets, euro area banks' issuance of longer-term debt has fallen to historically low levels since June 2011, with senior unsecured debt issuance being particularly affected by the sharp increase in risk aversion towards euro area banks (see Chart 4.14). In the period from July to late November, the gross issuance of senior unsecured debt and covered bonds dropped by 65% and 22%, respectively, compared with the same period last year.

In addition to the general decline in bank debt issuance since June 2011, debt issuance

patterns continued to diverge across countries and banks of different sizes. In particular, net issuance of medium and long-term debt in some countries has been negative in 2011 so far. However, negative net issuance, in part, can be also attributed to the ongoing deleveraging process in some countries, which contributes to reducing wholesale funding needs. Furthermore, by late November 2011 LCBGs, on average, had been able to refinance 96% of their debt maturing in 2011, but funding progress by other (mainly medium-sized and smaller) banks lagged well behind, with debt issued year-to-date covering only 69% of total debt maturing in 2011.

Looking forward, should access to unsecured debt markets remain difficult for many banks in the near future, this could lead some banks to adjust their funding and business plans for next year. While banks could, to some extent, replace debt market funding using alternative funding sources, for instance deposits from or bonds sold to retail customers, this may be a limited option for the banking sector as a

Chart 4.14 Monthly issuance of medium and long-term debt by euro area banks

(Jan. 2009 – Nov. 2011; EUR billions)

- subordinated debt
- covered bonds
- senior unsecured (non-guaranteed) debt
- government-guaranteed debt
- average 2006-10 (total)
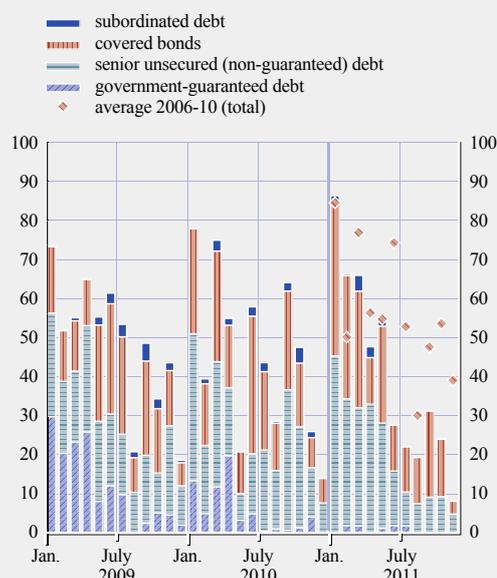
Source: Dealogic.

whole. Under a more adverse scenario, banks could reduce their funding needs by (further) deleveraging their balance sheets, which could lead them to scale down some of their business activities, in particular those reliant on volatile wholesale funding.

Regarding funding costs, persisting fiscal sustainability concerns in some countries have had a significant negative impact on banks' ability to raise funds at a reasonable cost via covered bond issuance in several euro area countries, including those most affected by contagion between sovereign bond markets, as indicated by the elevated spreads between covered bond yields and euro interest rate swap rates (see Chart 4.15).

Should higher spreads in these countries persist, this could lead to funding difficulties, in particular for those issuers that had previously been able to refinance themselves through covered bond markets until May 2011. Persistent high funding costs could also have a negative effect on bank earnings, or could induce banks

to deleverage their balance sheets further in order to reduce their funding needs.

Looking ahead, challenges related to euro area banks' sizeable refinancing needs over the next few years, and in particular in 2012, remain. In some cases, the expiry of government-guaranteed bonds issued in early 2009 adds to banks' rollover needs in the first half of 2012 (see Chart 4.16). Moreover, banks in at least some euro area countries will continue to compete for funds with the public sector, which could put further upward pressure on funding costs.

An important funding vulnerability in the short run stems from the heavy reliance of some large euro area banks on short-term and volatile USD funding, mainly through credit provided by US money market funds (MMFs). Concerns about some banks' exposure to troubled sovereigns and a general increase in risk aversion towards European banks following negative headlines on the euro area sovereign debt crisis have led MMFs to significantly reduce their exposure to euro area banks since May (see Chart 4.17).

Chart 4.15 Spreads between covered bond yields and euro interest rate swap rates

(Jan. 2010 – Nov. 2011; basis points)

- iBoxx EUR Covered
- France
- Germany
- Italy
- Ireland
- Spain
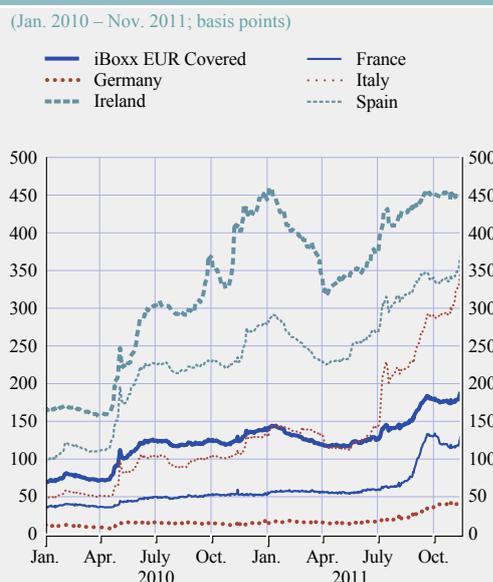
Source: Markit.

Chart 4.16 Debt maturity schedule for euro area banks

(Q1 2012 – Q4 2014; EUR billions)

- subordinated debt
- covered bonds
- senior unsecured (non-guaranteed) debt
- government-guaranteed debt
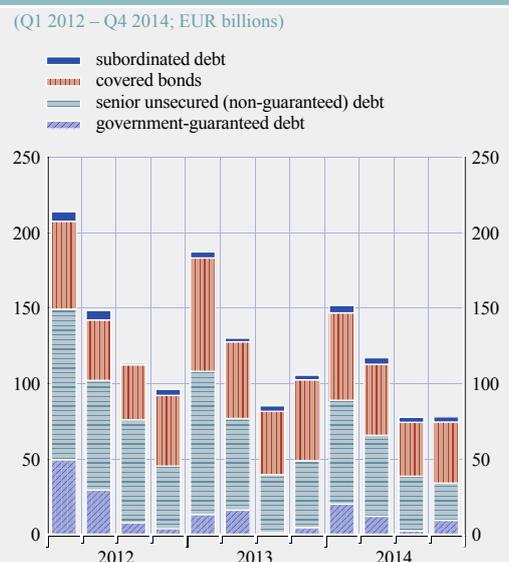
Source: Dealogic.

Chart 4.17 Changes in US prime money market funds' exposure to euro area and other banks

(May – Oct. 2011)

- ▬ changes in USD billions (left-hand scale)
- ◆ changes in percentages (right-hand scale)

1 euro area
2 non-euro area EU
3 other Europe
4 North America
5 Asia-Pacific
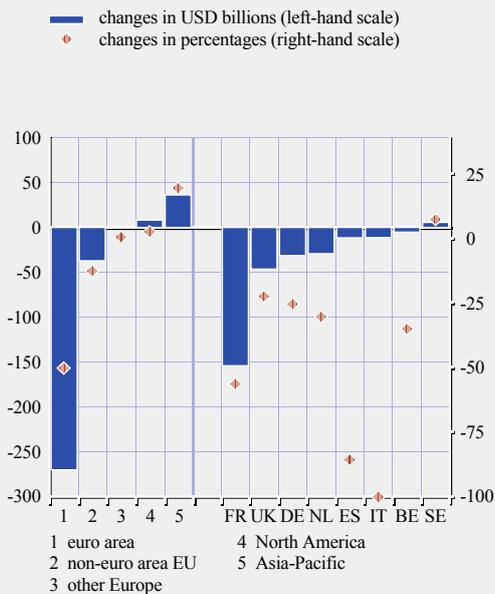
Sources: Securities and Exchange Commission and ECB calculations.

Chart 4.18 Euro area yield curve developments

(percentages)

- ▬ December 2009 FSR
- ····· June 2010 FSR
- ▬ ▬ December 2010 FSR
- ▬ June 2011 FSR
- ····· 17 November 2011
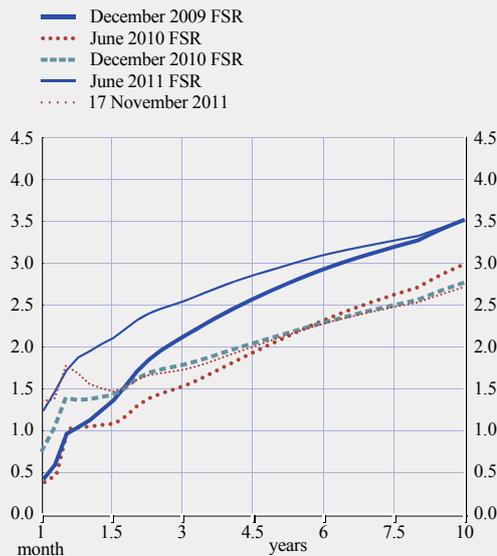
Source: ECB.
Note: The yield curve developments displayed are based on euro area swap rates.

In the same period, US MMFs also shortened the maturities of financing provided to banks in several euro area countries. While funds provided by US MMFs to euro area banks represent a relatively small portion of these banks' total liabilities, the absolute amounts remain significant and banks could find it more difficult or expensive to replace these funds with alternative market sources in a stressed environment. This vulnerability has been alleviated by the implementation of three-month USD liquidity-providing operations by major central banks (see Section 3.1). Nevertheless, the need to reduce short-term funding needs could lead some banks to deleverage their balance sheets in the future, as already indicated by the announcement of such plans by a few LCBGs.

MARKET-RELATED RISKS

Interest rate risk

LCBGs' interest rate risks remained at elevated levels after the finalisation of the June 2011 FSR. The uncertainty regarding the fiscal and banking sector situations in some euro area countries increased the risk perceptions at both the short and the long end of the euro area yield curve. By late November, heightened stresses in the euro area interbank market pushed short-term interest rate volatility to levels close to historical highs (see Chart S38) and the renewed and severe tensions in government bond markets increased long-term debt securities' volatility to historically high levels (see Chart S41).

The nominal yields of long-term German government bonds have declined to the lowest levels since the start of the current financial crisis owing to both flight-to-safety investor flows and increased concerns about the growth outlook (see Section 3.1). These developments have also had an impact on the slope of the euro area yield curve, which is currently at levels seen at the end of 2008. Overall, the slope of the euro area yield

curve still supports the revenues from banks' maturity transformation activities, although the recent gradual fl attening has made this a more challenging task.

Information on banks' risks related to their trading book exposures is typically scarce and difficult to compare across individual banks. Chart 4.19 depicts the individual LCBGs' reported information on interest rate value at risk (VaR) for a sample of selected LCBGs between 2007 and the second quarter of 2011. Overall, the median interest rate VaR for this sub-sample of LCBGs decreased from 2008 to the first quarter of 2011, but increased slightly in the second quarter. In addition to the slight increase in the median VaR measure, the dispersion across institutions increased considerably, indicating large differences in banks' exposure to interest rate risk.

At the time of writing, due to the elevated sovereign risk concerns, options markets were pricing in a significant increase in long-term interest rates. The mark-to-market losses on banks' sovereign bond portfolios in the trading book could potentially affect banks' profitability negatively during the forthcoming quarters,

should bond yields rise further. The impact of rising bond yields could be mitigated to the extent that the maturity for a part of trading book securities is relatively short.

Exchange rate and equity market risks
Overall, the direct exposure of euro area banks to exchange rate risk is contained, as the hedging of positions via off-balance-sheet derivative instruments keeps the net open foreign exchange positions at low levels. Available information on foreign exchange VaRs for a sub-sample of LCBGs suggests that foreign exchange risk slightly increased during the first half of 2011. Nevertheless, the direct foreign exchange exposures remained small as a share of Tier 1 capital (see Chart 4.20).

However, some indirect risks remain for euro area banks. The first risk stems from US dollar funding which, for some euro area banks, remains a significant concern (see section on funding liquidity risk). Also, the wide use by some euro area banks of foreign currency lending, including lending by their subsidiaries in central and eastern European countries, could make them vulnerable to adverse changes in exchange rates.

Chart 4.19 Distribution of interest rate value at risk for large and complex banking groups in the euro area

(2007 – Q2 2011; percentage of Tier 1 capital; maximum, minimum, interquartile distribution and median)
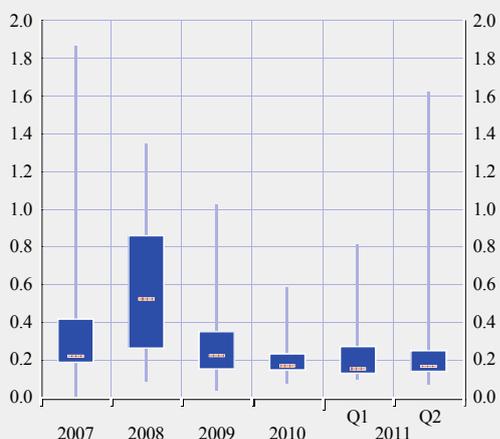
Sources: Individual institutions' financial reports and ECB calculations.

Chart 4.20 Distribution of exchange rate value at risk for large and complex banking groups in the euro area

(2007 – Q2 2011; percentage of Tier 1 capital; maximum, minimum, interquartile distribution and median)
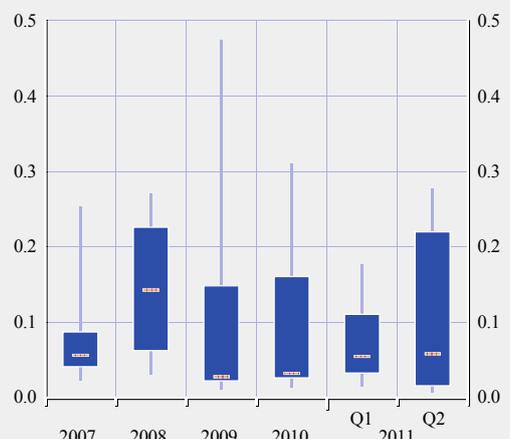
Sources: Individual institutions' financial reports and ECB calculations.

Compared with the developments that started to emerge in the third quarter of 2011, the situation in equity markets was relatively stable in the first half of 2011. As a result, the median equity VaR of euro area LCBGs remained broadly unchanged as a percentage of Tier 1 capital (see Chart 4.21). Additionally, the distribution of VaR measures started to become more compressed for two main reasons. First, the relatively low volatility in equity markets during the first half of the year reduced VaR. Second, according to MFI shareholding data, which cover the period until August 2011, euro area banks reduced their equity market exposures throughout the first eight months of 2011.

However, equity market risks for LCBGs became more pronounced from August 2011, on account of increased volatility. The implied volatility derived from options on the Dow Jones EURO STOXX 50 equity index (see Chart S43) reached levels seen in the second half of 2008 and the first half of 2009. In addition to increased volatility, stock price indices have dropped significantly. Reasons for these developments are multiple: concerns about sovereign debt strains, euro area bank funding vulnerabilities and deteriorated economic growth expectations. An additional factor which contributed to

Chart 4.21 Distribution of equity market value at risk for large and complex banking groups in the euro area

(2007 – Q2 2011; percentage of Tier 1 capital; maximum, minimum, interquartile distribution and median)
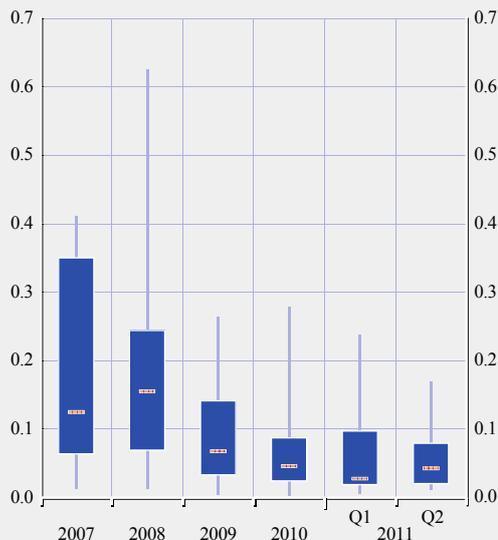
Sources: Individual institutions' financial reports and ECB calculations.

market uncertainty in the autumn of 2011 also related to a materialisation of operational risk in one large global LCBG – not dissimilar to some prominent cases in other large banks in previous years (see Box 12).

A REFLECTION ON RECENT DEVELOPMENTS IN THE OPERATIONAL RISK MANAGEMENT FRAMEWORKS IN THE BANKING INDUSTRY

Trading losses at UBS in September 2011 (estimated at around €2 billion) – with similarities to another loss at Société Générale in 2008 (€4.9 billion) – recall the events that led to the bankruptcy of Barings Bank more than fifteen years ago, after the fraudulent activities of one of its employees had resulted in a USD 1.3 billion loss. These recent events show that despite tighter regulation of the banking industry, the failures in operational risk management continue to represent a recurring problem. All three cases are classic large operational risk events that arose as a consequence of numerous control and governance failures. The distinguishing common feature in all these cases is a single rogue trader who manages to circumvent a series of internal controls and take advantage of weak governance to implement elaborate trading strategies resulting in losses, further exacerbated by adverse market movements. From a theoretical point

of view, the trading strategies in question did not involve a significant amount of risk *per se* as they were based on arbitrage, i.e. making bets on small price differences between related "plain vanilla" instruments: Asian stock index futures in Barings' case, European stock index futures at Société Générale and exchange-traded funds (ETFs) at UBS. Such strategies intend to capture micro-inefficiencies in market pricing that could be converted into low-risk profits with an overall low market risk exposure. The risk materialised, rather, from the traders' recurrent engagement in unauthorised activities, moving away from the authorised arbitrage strategy into directional bets with large risk exposures, the breach of risk limits and manipulation of trade data. In each case, the trader had not just control of the front-office functionalities, where trades were placed, but also in-depth knowledge of the middle and back-office systems for confirmation and settlement of trades that allowed the fraudulent activities to be concealed. Additional contributing factors arose from the lax governance framework, insufficient supervision, lack of appropriate control measures, and inadequate technology and procedures, coupled with senior management's complacency when profits resulted from the trading strategies. These facts highlight the importance of establishing an adequate operational risk management framework that goes beyond the mere implementation of regulatory directives and encompasses a deep understanding of the business model of the financial institution, its processes and procedures, as well as a sound implementation of governance and risk management policies.

As regards the development of the regulatory framework, several new aspects have come to the fore recently, in reaction to the marked increase in severity of operational risk events. In particular, it has been highlighted that the current framework fails to capture the fact that operational risk often arises in conjunction with other types of risk and that its size may be exacerbated by adverse market or credit risk events. In the cases described above, unauthorised activities were initiated with the objective of concealing trading losses due to adverse market price movements, and were further impacted by the increased market risk.[1] Hence, the development of an integrated risk management approach would be required so as to address the relationships between different risk categories. Moreover, although historically overshadowed by market and credit risk regulation,[2] operational risk capital modelling has also recently received significant attention from the supervisory authorities. In particular, modifications to the current operational risk capital calculation methods are being considered since, in light of the high severity of the recent operational risk events, the use of current multipliers under the standardised approach seems not to provide sufficient protection for the banks' actual operational risk exposure. To address this issue, in addition to the increases in the multipliers under the standardised approach, regulatory discussion is focusing on the creation of incentives to encourage banks to move towards more advanced measurement approaches (AMA). The obstacles to an effective AMA development stem from difficulties in estimating the loss distribution due to operational events, properly measuring the fatness and skewness of its tails, setting the appropriate confidence level and addressing the interrelations with market and credit risk.

Finally, a sound operational risk control framework should also focus on governance, providing robust policies and procedures to reduce the likelihood of operational risk events, and driving culture change to effectively implement these policies and procedures. In February 2003,

1 Similarly, events which include both credit and operational risk elements may also arise, e.g. if a trading counterparty defaults, and there is an operational error in securing adequate collateral, then the credit risk event is magnified by the operational risk event.
2 An initial report on "Operational Risk Management", which did not mention regulation, was published by the Basel Committee in September 1998. In the "New Capital Adequacy Framework" of June 1999 the Basel Committee called for capital charges for operational risk as a component of Pillar 1.

the Basel Committee provided an outline for the creation of an effective operational risk management framework by drawing up a list of sound operational risk principles.[3] Further improvement, based on the ongoing discussion among supervisory authorities and the banking industry, has been achieved recently by incorporating a full range of sound operational risk management principles covering governance, the risk management environment and the role of disclosure (see table).

The challenge remains as regards the incentives for banks to adopt these guidelines and their final interpretation. The recent events at UBS highlight the importance of applying effectively those principles not only to stem the effect of operational events in individual institutions,[4] but also to reduce the systemic implications of a large failure. After all, a one-in-a-hundred-year hurricane does not materialise necessarily only once every one hundred years.

Basel Committee's list of sound operational risk principles

1. The role of the board and senior management in the establishment of a strong risk management culture.
2. Development, implementation and maintenance of an operational risk management framework fully integrated in the bank's overall risk management processes.
3. The role of the board in the establishment, approval and review of the operational risk framework.
4. The role of the board in the approval and review of the bank's risk appetite.
5. The senior management's responsibility in the development, implementation and maintenance of a robust and transparent governance structure.
6. The senior management's responsibility for risk identification and assessment.
7. The senior management's responsibility for the full operational risk assessment for new products, activities, processes and systems.
8. The senior management's responsibility for risk monitoring and development of reporting mechanisms.
9. Development of strong risk control and mitigation strategies.
10. Development of business resiliency and continuity plans.
11. Role of public disclosure.

Source: Basel Committee on Banking Supervision, "Operational Risk – Supervisory Guidelines for the Advanced Measurement Approaches", June 2011.

3 Basel Committee on Banking Supervision, "Sound Practices for the Management and Supervision of Operational Risk", February 2003.
4 UBS is currently using an internal operational risk capital methodology which meets the regulatory capital standard under the Basel II advanced measurement approach (AMA).

4.2.3 ASSESSING THE RESILIENCE OF EURO AREA BANKS

OVERALL RISK ASSESSMENT
The overall assessment of prevailing systemic risks in the euro area emerging from the scenario-based analysis suggests that a deepening and widening of the euro area sovereign debt crisis entailing substantial contagion risks across countries and banks may lead to further pressure on the solvency position of the euro area banking sector. While a uniform shock scenario produces even more severe effects, also the scenario considering a worsening of the global macroeconomic outlook in 2012 and 2013 results in non-negligible effects on euro area banks' solvency positions. At the same time, under the baseline scenario the euro area average core Tier 1 ratio is projected to increase between end-2010 and end-2013, albeit with substantial cross-country heterogeneity.

This section provides a quantitative assessment of some of the most pertinent systemic risks identified in Sections 1 to 3. This assessment is based on a macro-prudential simulation exercise involving top-down stress-testing tools. However, the results of this analysis are not comparable to a micro-prudential stress test used for supervisory purposes with the aim to analyse the solvency of individual financial institutions. The first part of this section describes the macro-financial scenarios considered. Specifically, the assessment focuses on two prevalent systemic risks by analysing the effects of: (i) the contagion risks related to an intensification and widening of the euro area sovereign debt crisis – modelled by a prolonged period of abnormally high sovereign bond yields (in particular affecting Belgium, Spain and Italy) and related bank funding distress; and (ii) the risk of an unexpected slowdown in global demand – triggered by a confidence-

driven worsening of the macroeconomic outlook in the United States and the euro area, in particular in 2012 and 2013.

The second part of this section subsequently analyses the immediate impact of these two scenarios on the loss absorption capacity of the euro area banking sector. The results are derived using publicly available data based on euro area banks' financial reports and data disclosed following the EBA stress test, published in mid-July 2011. The effects on the banking sector are assessed using models of bank profitability and model-based estimates of credit-related losses and risk-weighted assets.

Finally, the third part of this section provides an overall summary assessment cutting across the two distinct macro-financial scenarios analysed.

CONTAGION SCENARIO: WIDENING AND INTENSIFICATION OF THE EURO AREA SOVEREIGN DEBT CRISIS

The contagion scenario is triggered by an assumed rise in euro area sovereign bond yields to abnormally high levels. The shock emanates from a spreading of concerns about sovereign creditworthiness from the three euro area countries under EU/IMF financial assistance programmes (i.e. Greece, Ireland and Portugal) to the countries currently perceived as being most vulnerable to contagion (namely, Belgium, Spain and Italy).

Two approaches have been applied to calibrate the sovereign bond yield shock sizes.

First, a non-parametric simulation method is employed to generate a joint forward distribution (with a 60-day horizon) of a large number of risk factors. They include, *inter alia*, daily compounded changes of ten-year government bond yields for 25 markets in Europe, the US and Japan, as well as prices from 37 stock markets with observations dating back to end-2010.[4] An unconditional probability of occurrence of the shocks to long-term rates in the three shock-originating countries of around 5% implies sizes of shocks to ten-year bond

yields of 186 basis points (up to 6.8%) for Belgium, 286 basis points (up to 9.4%) for Spain and 372 basis points (up to 10.6%) for Italy (all from the perspective of levels as at 17 November 2011). Apart from the three euro area countries under EU/IMF programmes, the corresponding impact on government bond yields in all other euro area countries is smaller, going up to a 144 basis point increase. The slope of national yield curves relative to the national ten-year benchmark yields (at the cut-off date of 17 November 2011) is used to transpose the simulated shock to maturities other than ten years. It is furthermore assumed that interest rates at all maturities remain at the elevated stress levels throughout the simulated horizon.

Second, as a robustness check, a complementary uniform shock scenario is conducted following the BCBS guidelines for monitoring interest rate risk in the banking book (as part of the Pillar 2 risk under the Basel II framework).[5] This simply involves a uniform increase of 200 basis points across all maturities and countries – even though this might not be applicable for all euro area countries given the safe-haven character of some sovereigns.

The postulated rise in sovereign bond yields, or declines in the prices of these bonds, for both approaches (simulated and uniform shocks) has a number of effects. First, it implies mark-to-market valuation losses on euro area banks' sovereign exposures in the trading book.[6]

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4 In the simulation, long-term government bond markets in Spain, Belgium and Italy are set as shock-originating markets, i.e. interest rates are assumed to move to or beyond the specified quantile thresholds. The response for all other markets/countries is computed as the mean of the simulated paths that are consistent with the scenario assumption. The simulation also comprises various iTraxx indices, responses for which serve as input to the insurance sector stress test in Section 4.2.3. The cut-off date for simulating market risk shock sizes has been set at 17 November 2011.

5 See also Basel Committee on Banking Supervision, "Principles for the Management and Supervision of Interest Rate Risk", July 2004.

6 The valuation haircuts are calibrated to the new levels of government bond yields, using the sovereign debt haircut methodology applied in the EBA 2011 stress-test exercise; see the ECB note posted on the EBA website entitled "Annex 4: Guidance for calculation of losses due to application of market risk parameters and sovereign haircuts", dated 18 March 2011.

Second, with respect to banking book exposures, and similar to the approach taken in the EBA 2011 stress test, provisioning according to rating-implied credit risk parameters is employed.

Third, the increase in sovereign credit spreads would be expected to raise the cost of euro area banks' funding, impacting on banks' profits via net interest income. The way in which bank funding costs rise is complex. First, there is an immediate and persistent increase in short-term interest rates by 46 basis points[7] above the baseline, which is assumed to be driven by rising liquidity premia owing to counterparty credit risk concerns.[8] The increase in short-term interest rates is passed on to banks' retail deposit rates and to their short-term and floating lending rates. In addition, it was assumed that 50% of the increases in national sovereign CDS spreads is passed through to the rates of maturing long-term loans and 100% to the costs of wholesale funding, if applicable.[9]

Fourth, the increase in interest rates across all euro area countries has direct implications for the macroeconomic outlook, which in turn will affect banks' credit risk.[10] The country-specific scenario translates into an overall impact on euro area real GDP of -0.01 in 2011, -0.31 in 2012 and -0.52 in 2013, in percentage points relative to the baseline, which is based on the September 2011 IMF World Economic Outlook. Under the uniform shock scenario (BCBS), euro area real GDP would decline by -0.01, -0.37 and -0.49 percentage point over the scenario horizon from 2011 to 2013.

GLOBAL DEMAND SCENARIO: RISKS OF A DOUBLE DIP?

As already highlighted in Section 1, global macro risks have recently increased with a number of negative data releases, in particular emanating from the United States. This has raised the risk that the global economy could be entering a soft patch, and in the worst case a double-dip recessionary phase, with adverse consequences for banking sector credit risks and profitability.

Table 4.2 Key drivers impacting euro area GDP under the adverse scenarios

	Key assumptions driving impact on GDP
Contagion risk	A widening and deepening of the sovereign debt crisis fuelling increases in short and long-term interest rates
Demand shock	Confidence-driven adverse shock to euro area foreign and domestic demand

Hence, in the scenario considered here, the trigger is assumed to be a confidence-driven slowdown in demand in the United States, which in turn negatively affects global demand, including euro area domestic demand.

Relative to the baseline, the global demand shock translates into an overall impact on euro area real GDP of -0.05, -0.69 and -0.61 percentage point in 2011, 2012 and 2013. The impact on real economic activity differs considerably

7 The size of the shock to short-term interest rates has been derived as a response to the simulated contagion scenario.
8 The same simulation procedure used for calibrating long-term bond yield shocks across countries has been applied at the euro area level to the three-month EURIBOR.
9 The transmission of the changes in sovereign CDS spreads (50% and 100%) is in line with the methodological note for the 2011 EU-wide stress test published on 18 March 2011 on the EBA website. The country-specific shocks to CDS spreads have been scaled according to the calibrated shocks to ten-year government bond yields based on estimated regressions of CDS spreads on long-term government bond yields.
10 The macroeconomic impact is derived by a multi-country, EU-wide, simulation tool, which is based on impulse response functions of endogenous variables to predefined exogenous shocks. The tool furthermore incorporates intra-EU trade spillovers.

Table 4.3 Overall impact on euro area GDP under the baseline and the adverse scenarios

(2010 – 2013; percentages; percentage point deviations from baseline levels)

	2010	2011	2012	2013
Baseline (annual growth rate)	1.79	1.62	1.09	1.53
Percentage point deviations from baseline level:				
Contagion scenario (simulation-based; country-specific)		-0.01	-0.31	-0.52
Uniform shock scenario (BCBS)		-0.01	-0.37	-0.49
Global demand scenario		-0.05	-0.69	-0.61
Joint shock scenario (contagion and global demand)		-0.02	-0.63	-0.80

Sources: ECB and ECB calculations.

across countries, being especially pronounced for some of the euro area countries, reflecting among other things the varying degrees of trade openness.

Summing up, Tables 4.2 and 4.3 display the key factors driving euro area GDP under the adverse scenarios, as well as the overall impact on euro area GDP measured in percentage point deviations from baseline levels.

IMPACT ON LCBGS' SOLVENCY POSITIONS UNDER THE BASELINE AND ADVERSE SCENARIOS

On the basis of the specified scenarios, the impact on euro area banks' profit and loss and ultimately on their solvency positions is estimated by projecting the main variables determining banks' solvency, such as the credit risk parameters, profits and risk-weighted assets.

The balance sheet and income statement data are based on banks' published financial reports, while also taking into account the supervisory information disclosed in the context of the EBA 2011 EU-wide stress test. The sample includes 17 euro area LCBGs. The data applied are at the consolidated banking group level. Capital injections occurring in the first four months of 2011 have been taken into account. Bank balance sheets are assumed to be static over the simulated horizon, which is a simplifying assumption given the currently constrained access to funding for some banks and thus potentially lower credit growth.[11]

The projection of banks' credit risk – in terms of changes to probabilities of default (PDs) and loss given default (LGD) – is estimated at the level of exposure types using an autoregressive distributed lag methodology.[12] The projected changes at the country level are then applied to bank-specific levels of loss rates, as reported in the context of the EBA 2011 stress-test exercise in mid-July.

For exposures to sovereigns and financial institutions in the banking book, provisioning is generally based on rating-implied PDs.[13] The only exception to this rule is for Greek sovereign

exposures, for which a 50% loss rate is used, in accordance with the postulated accounting treatment of the private sector involvement (PSI) part of the Greek programme agreed by euro area Heads of State or Government on 26 October 2011.[14]

Expected losses are in turn calculated as the product of each bank's outstanding exposures at default (EADs) to each sector at end-2010 and the PDs and LGDs over the horizon.

The computation of banks' profits is based on a loan-deposit margin multiplier approach to assess the impact of interest rate changes.[15] The respective changes in short-term loan and deposit rates are then multiplied by the outstanding amounts of loans and deposits for each bank at end-2010.

In addition, the fact that some banks operate with a substantial funding gap, which implies that part of their loan portfolio would also need to be refinanced in an environment of higher money market rates, is taken into account.[16] Furthermore, simplifying judgmental assumptions about income related to fees and

11 The static balance sheet assumption does not allow for a reduction in risk-weighted assets, which would be a potential option for banks to increase core Tier 1 capital.

12 The applied forecast methodology applies an autoregressive distributed lag (ADL) framework to model PDs and loss rates (LRs) across sectors and countries, which is based on a satellite multi-equation model set-up at the euro area level, through which country-specific macroeconomic scenario assumptions are fed in to obtain an internally consistent set of PD/LR parameters under both the baseline and the adverse paths.

13 Similar to the approach taken in the EBA stress-test exercise; see EBA, "2011 EU-wide Stress Test: Methodological Note – Additional Guidance", June 2011.

14 Since the exact implementation of the PSI loss rate calculation has not yet been decided by the relevant authorities, a loss rate of 50% is used in this section for all banking book exposures without taking into account any net present value calculation conditional on current market prices.

15 The methodology applied to estimate the coefficient multipliers was presented in Box 7 of the December 2010 FSR. See also Box 13 of the June 2009 FSR for further details.

16 As a conservative assumption, it is assumed that the increase in the national sovereign CDS spreads from December 2010 until 17 November 2011 remains constant over the simulation horizon and is passed through one-to-one to the costs of market-based debt refinanced and thus adds to the net interest payments banks will have to honour. The maturity profile of wholesale funding has been approximated with publicly available information from banks' financial reports.

commissions as well as to trading have been applied.[17] Moreover, given the interest rate increase under the adverse scenarios, liquidity constraints might arise and even further dampen profits.

Risk-weighted assets (RWA) are calculated at the bank level for credit risk using the Basel formulae for the internal rating-based (IRB) approach assuming fixed LGDs as well as a static balance sheet. Tax and dividend assumptions are bank-specific, using the average ratio of positive tax payments over pre-tax profits from 2008 to 2010. For dividends, the median dividend-to-net income ratio over the 2008-10 horizon has been applied.

The overall impact of the various shocks on banks' income as well as capital buffers is ultimately assessed on the basis of core Tier 1 capital ratios.

Under the baseline scenario, euro area LCBGs' capitalisation is on average projected to increase

from a core Tier 1 capital ratio of 8.7% in 2010 to 9.8% by end-2013 (see Chart 4.22). Whereas there is a substantial positive impact on solvency from expected strong profit developments as well as from the capital-raising actions taken by banks in the first four months of 2011, baseline results are negatively affected by an increase in average PDs (and thus in loan losses and RWA) and in particular by the assumed 50% impairment losses on Greek sovereign debt.

Turning to the results for euro area LCBGs' solvency positions under the adverse scenarios, taking into account changes in credit risk, effects on bank profits and risk-weighted assets, the impact on LCBGs' solvency position can be estimated under the different scenarios (see Charts 4.23 and 4.24).

17 Contrary to the expectation of lower trading income and fee and commission income expressed in the overview of Section 4.1, trading income and income from fees and commissions are assumed to remain constant.

Chart 4.22 Average contribution of profits, loan losses and risk-weighted assets to core Tier 1 capital ratios of euro area LCBGs under the baseline scenario

(2010 – 2013; percentages)
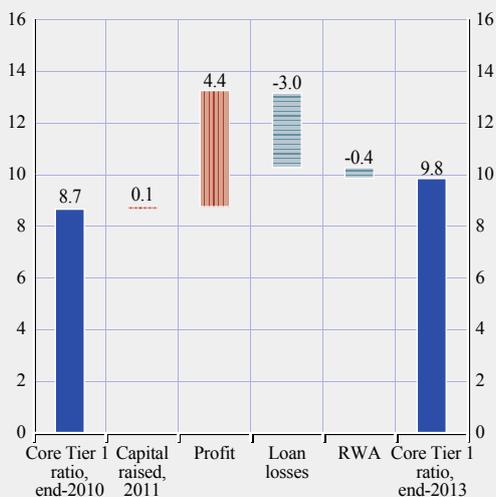
Sources: Individual institutions' financial reports, EBA, ECB and ECB calculations.

Chart 4.23 Average core Tier 1 capital ratios of euro area LCBGs under the baseline and adverse shock scenarios

(2010 – 2013; percentages)

1 end-2010
2 baseline, end-2013
3 global demand shock, end-2013
4 contagion scenario, end-2013
5 joint shock scenario (global demand and contagion), end-2013
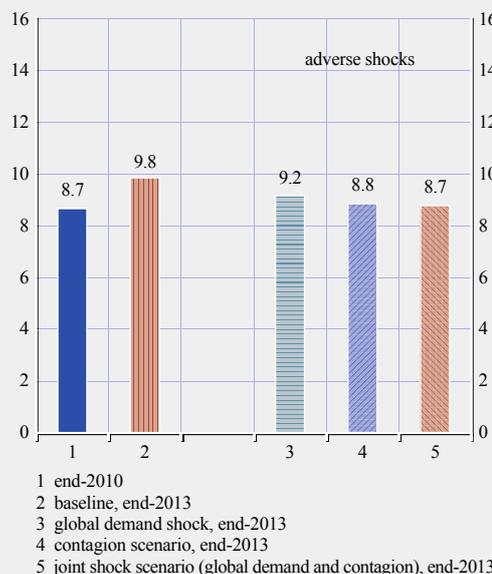
Sources: Individual institutions' financial reports, EBA, ECB and ECB calculations.

The main results are the following: first, the data-based, country-specific contagion scenario turns out to produce a slightly worse outcome on average than the global demand scenario. Under the simulation-based contagion scenario, the euro area average core Tier 1 (CT1) capital ratio reaches 8.8% by end-2013. Second, the uniform shock scenario (BCBS), owing to its more pronounced bond yield shock, results in even stronger results, with the euro area average CT1 capital ratio going to 8.7% (not depicted in Charts 4.23 and 4.24). Third, turning to the global demand contraction scenario, a reduction in banks' capitalisation to a euro area average CT1 ratio of 9.2% is observed. Finally, a joint shock scenario, combining the contagion and the global demand contraction scenarios, would yield a CT1 ratio of 8.7% (not depicted in Chart 4.24).

In contrast to the methodological approach applied in the EU "banking package" announced by the EU Council on 26 October 2011, the risk

assessment analysis presented in this section relies on rating-implied (i.e. non-mark-to-market) haircuts for the sovereign exposures in the banking book (with the exception of the 50% PSI for Greek debt). If a mark-to-market approach had been applied to all sovereign exposures, the adverse scenarios would result in lower average CT1 capital ratios. This would be mitigated should EU banks raise the considerable amount of capital needed to comply with the CT1 capital ratio threshold of 9%, as announced by the EBA on 26 October 2011.[18] However, if banks were to focus on credit deleveraging instead of capital injections to close the capital gap identified by the EBA, it could have detrimental implications for the real economy that may trigger further loan losses and suppress profitability and hence exert downward pressure on bank solvency positions.

4.3 EURO AREA INSURANCE SECTOR RESILIENT THOUGH RISK FROM ECONOMIC OUTLOOK HAS INCREASED

4.3.1 FINANCIAL SOUNDNESS OF LARGE INSURERS [19]

In line with the expectations outlined in the June 2011 FSR, large primary insurers continued to show a broadly stable performance in the second and third quarters of the year. The moderate economic activity in some euro area countries, however, weighed on the underwriting performance and decreased the growth of gross premiums written (see Chart 4.25). In addition, certain non-life insurance markets continued to be affected by strong competition.

The Japanese earthquake and other natural catastrophes caused some extraordinary losses for euro area insurers in the second quarter of 2011. The combined ratios of large primary

Chart 4.24 Average contribution of profits, loan losses and risk-weighted assets to core Tier 1 capital ratios of euro area LCBGs under the adverse scenarios

(2010 – 2013; percentages)

1 Core Tier 1 ratio, end-2010
2 Capital raised, 2011
3 Profit
4 Loan losses
5 RWA
6 Core Tier 1 ratio, end-2013
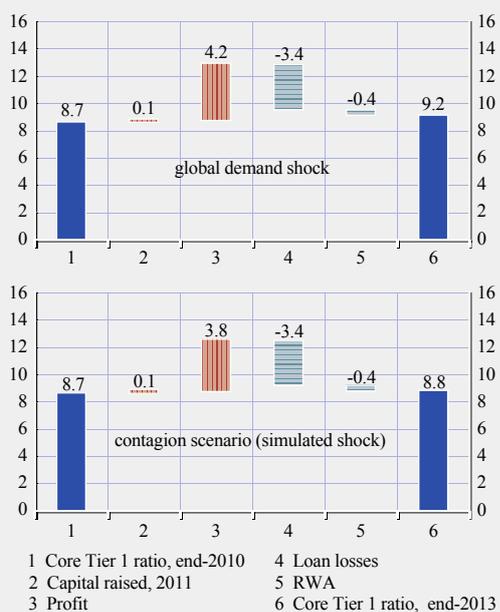
Sources: Individual institutions' financial reports, EBA, ECB and ECB calculations.

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18 Banks will be expected to build up these buffers by the end of June 2012.
19 The analysis is based on a sample of 19 listed primary insurers with total combined assets of about €4.3 trillion representing 60% of the gross premiums written in the euro area insurance sector, and on a sample of three reinsurers with total combined assets of about €310 billion, representing about 30% of total global reinsurance premiums. Quarterly data were only available for a sub-sample of these insurers.

Chart 4.25 Growth of gross premiums written for selected large euro area primary insurers

(2007 – Q3 2011; percentage change per annum; maximum, minimum, interquartile distribution and median)
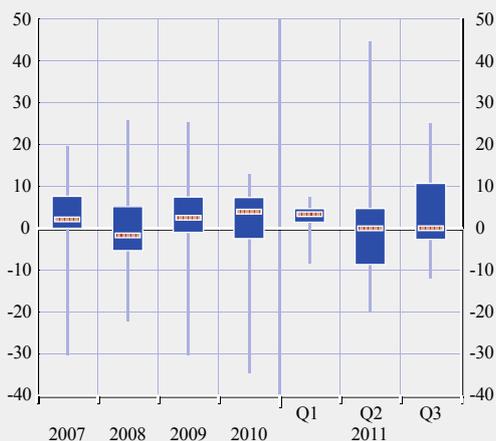
Sources: Bloomberg, individual institutions' financial reports and ECB calculations.

Chart 4.27 Growth of gross premiums written for selected large euro area reinsurers

(2007 – Q3 2011; percentage change per annum; minimum-maximum distribution and weighted average)
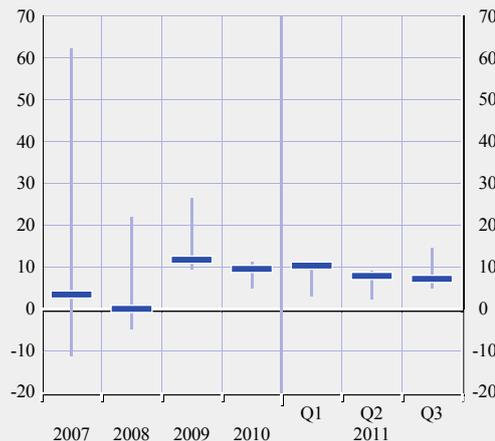
Sources: Bloomberg, individual institutions' financial reports and ECB calculations.

insurers, however, declined after the increase experienced in the first quarter, and altogether remained below 100% in the second and third quarters for all primary insurers in the sample

Chart 4.26 Investment income and return on equity for selected large euro area primary insurers

(2008 – Q3 2011; maximum, minimum, interquartile distribution and median)
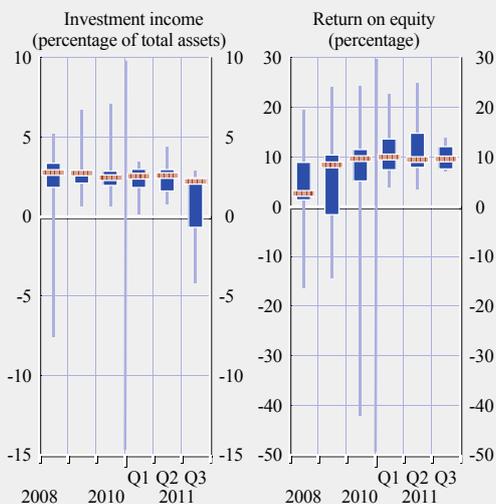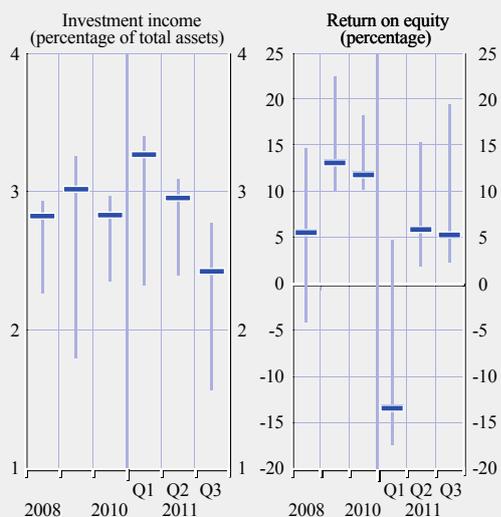
Sources: Bloomberg, individual institutions' financial reports and ECB calculations.
Note: The quarterly data are annualised.

(see Chart S115).[20] As regards investment income, many insurers wrote down the value of holdings of Greek government bonds in the second quarter. The adverse developments in the financial markets had a more marked impact on the investment income of some euro area insurers in the third quarter (see Chart 4.26). As pricing developments in some non-life markets and performance in emerging markets mitigated the effect of natural catastrophes and investment losses on profitability, the median return on equity comfortably remained close to 10% for the primary insurers in the sample.

Major euro area reinsurers improved their financial performance significantly after the first quarter of 2011, which was marked by costly natural catastrophes. The weighted average combined ratio of the reinsurers in the sample dropped to around 92% in the third quarter from over 140% in the first quarter, and losses largely remained below expectations (see Chart S118). All reinsurers in the sample recorded positive returns on equity and annual growth in premiums

20 The combined ratio is calculated as the sum of the loss ratio (net claims to premiums earned) and the expense ratio (expenses to premiums earned). A combined ratio of more than 100% indicates an underwriting loss for an insurer.

Investment income
(percentage of total assets)

Return on equity
(percentage)

median   weighted average

Primary insurers
(maximum, minimum,
interquartile distribution)

Reinsurers
(minimum-maximum
distribution)

written, supported by increases in both rates and demand for reinsurance following the unusual concentration of natural catastrophes. Investment income has, however, declined during the second and third quarters, following the adverse developments in key financial markets (see Charts 4.27 and 4.28).

Despite the negative impact of natural catastrophes on capital positions of insurers in the second quarter of 2011, the capital buffers still seem to include a reasonable amount of shock-absorption capacity, not least because of the strong capitalisation at the end of 2010 (see Chart 4.29).[21] In general, many insurers have a preference to hold capital significantly in excess of regulatory requirements in order to achieve a targeted credit rating.

4.3.2 INSURANCE SECTOR OUTLOOK AND RISKS

The financial condition of large euro area insurers is, on average, likely to remain broadly stable during the next six to twelve months. The most significant challenges relate to investment and underwriting risks, which are significantly affected by global and euro area growth prospects. The risks that are discussed below are not necessarily the most likely future scenarios that could affect insurers negatively, but are rather potential and plausible events that could, should they occur, materially impair the solvency of insurers.

EARNINGS OUTLOOK

Analysts' expectations are above the current earnings levels and therefore point towards a rebound of euro area insurers' earnings (see Chart 4.30). The recent revision of the prospects for economic growth (see Section 1.1) has, however, increased the risk that the demand for both life and non-life insurance products, and ultimately insurers' earnings, remain sluggish. The market for reinsurance hardened during

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21 Note that national and company practices differ largely with regard to measurement of capital adequacy and disclosure of information under the current Solvency I regime. The forthcoming Solvency II regime will bring a more uniform treatment in this regard.

Chart 4.30 Earnings per share (EPS) for selected large euro area insurers and real GDP growth

(Q1 2002 – Q4 2012)

- actual EPS (EUR)
- October 2011 EPS forecast for end-2012 (EUR)
- real GDP growth (percentage change per annum)
- forecast for real GDP growth in 2012 (percentage change per annum)
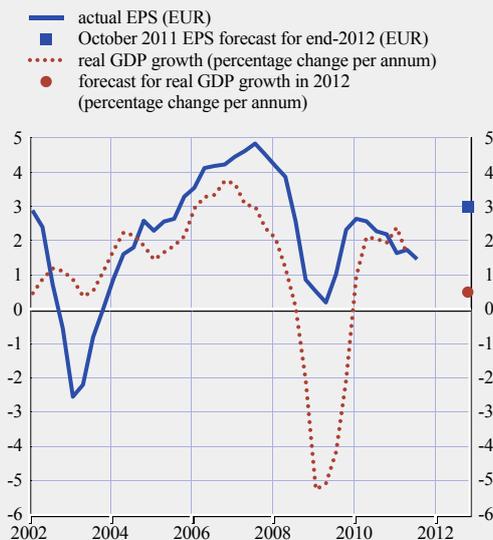
Sources: European Commission, Thomson Reuters Datastream and ECB calculations.

Chart 4.31 CDS spreads for a sample of large euro area insurers and the iTraxx Europe main index

(Jan. 2007 – Nov. 2011; basis points; five-day moving average; five-year maturity; senior debt)

- minimum-maximum range of large euro area insurers
- average of large euro area insurers
- iTraxx Europe
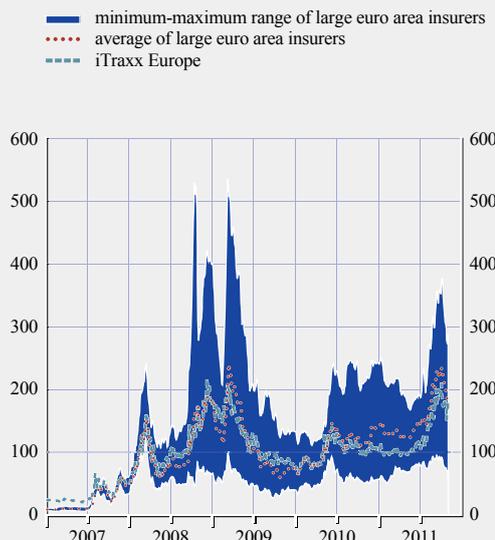
Sources: Bloomberg and JPMorgan Chase & Co.

the first half of 2011, resulting in premium increases in both quarters following the large natural catastrophes. Reinsurers and analysts expect the demand for reinsurance to continue to increase further for some time, also in light of the adoption of risk-based capital requirements in the near future. The risks stemming from the macroeconomic environment may, however, change the prospects for reinsurance pricing as well.

Market-based indicators for insurers signal a less certain outlook than they did six months ago. In line with developments concerning other institutions in the financial markets, euro area insurers' credit default swap (CDS) spreads and their dispersion across institutions widened significantly during the first months after the finalisation of the June 2011 FSR and have remained at high levels despite the downward direction since October 2011 (see Chart 4.31). The stock prices of insurance companies broadly followed developments in the overall

stock market. In mid-November 2011 euro area insurers' stock prices stood on average 28% below the levels seen at end-May 2011 (see Chart S124).

INVESTMENT RISK

Financial market and investment risks continue to be important for the insurance sector, given the significance of investment activity for insurers' income and the long-term nature of liabilities, which is often counterbalanced to the extent possible with matching investment maturities.

Looking at the distribution of assets across investment classes, large euro area insurers continued to exhibit high exposure to government and corporate bonds in particular. In contrast, exposures to equity, structured credit and commercial property remained low on aggregate (see Chart 4.32, and Charts S120 and S121 for a longer-term view of insurance companies and pension funds).

Chart 4.32 Investment mix for selected large euro area insurers

(Q2 2010 – Q2 2011; percentage of total investments; maximum, minimum and interquartile distribution)
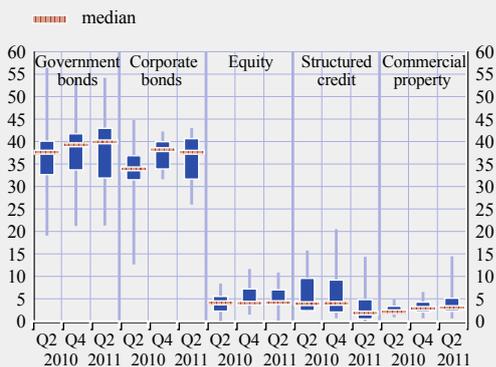
Sources: JPMorgan, individual institutions' financial reports and ECB calculations.
Notes: Based on consolidated financial accounts data. The equity exposure data exclude investment in mutual funds.

Chart 4.33 Investment uncertainty map for euro area insurers

(Jan. 1999 – Oct. 2011)
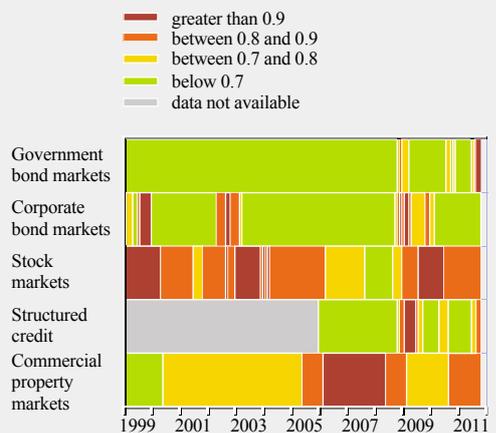
Sources: ECB, Bloomberg, JPMorgan Chase & Co., Moody's, Jones Lang LaSalle and ECB calculations.
Notes: The chart shows the level of each indicator compared with its "worst" level (i.e. its highest or lowest level, depending on what is worse from an insurer's investment perspective) since January 1999. An indicator value of one signifies the worst conditions in that market since January 1999. "Government bond markets" is the euro area ten-year government bond yield and the option-implied volatility for ten-year government bond yields in Germany; "Corporate bond markets" is the average of euro area A-rated corporations' bond spreads and the actual and forecast European speculative-grade corporations' default rates; "Stock markets" is the average of the index level and the price/earnings ratio of the Dow Jones EURO STOXX 50 index; "Structured credit" is the average of euro area residential mortgage-backed securities and European commercial mortgage-backed securities spreads; and "Commercial property markets" is the average of the average euro area commercial property capital values and value-to-rent ratios. For further details on how the uncertainty map is created, see Box 13 in ECB, *Financial Stability Review*, December 2009.

The increased uncertainty about future developments has contributed to a continuation of risks related to investment losses or muted income in the markets in which insurers invest since the publication of the June 2011 FSR (see Chart 4.33). The following sections discuss risks related to long-term yields and credit exposures in more depth.

Risks related to long-term yields

Exposures to highly rated long-term government bond yields remain the most important component of the investment risk faced by insurers, given the high involvement of the sector in the market as investors. The interest rate risk relates, first, to the protracted period of historically low levels of AAA-rated government bond yields, and second, to the high volatility that the rates are currently experiencing. The high uncertainty surrounding the global economic outlook increases the risks related to the latter in particular.

As regards the risk related to the low levels of interest rates, the continued decline of yields on some of the highly rated government bonds makes the achievement of solid investment returns challenging for the insurers. While lower levels of some AAA-rated government bond yields have bolstered the valuation of insurers' available-for-sale fixed income investments, they continue to be problematic for the profitability of guaranteed life insurance products in particular.[22]

The substantial holdings of government bonds by euro area insurers also make them vulnerable to the volatility of interest rates. In particular, a sudden rise in yields could result in unrealised losses in terms of asset valuation for those assets that are marked to market.[23] Large, listed insurers mainly classify their bond holdings as "available

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[22] For a discussion of the impact on insurers of low risk-free interest rates, see Box 16 in ECB, *Financial Stability Review,* June 2010.

[23] Large, listed euro area insurers generally follow International Financial Reporting Standards (IFRS), which provide for a uniform treatment of financial assets (depending on their respective accounting classification) but (currently) not of insurance liabilities.

for sale" and they are thus entered in the balance sheets at fair value. As a consequence, any recorded losses or gains lead to movements in shareholders' equity.

Overall, insurance companies seem to be in a good position to face the challenge posed by the low-yield environment. Aggregate investment returns have not decreased markedly since 2008 despite the low yields. In addition, guaranteed returns on insurance policies are decreasing over time.[24] Insurance companies are also usually careful in matching assets with liabilities and/or hedging their exposures with interest rate derivatives, thereby mitigating the risk of mismatches in returns.[25] As regards the short-term effect of increased volatility, it is accompanied with factors that would counteract it in the long term. The impact of a sudden increase in yields would be mitigated by the ability of insurers to reinvest in higher-yielding assets and thereby boost their investment income. In addition, insurers are typically able to hold investments until maturity, as their liabilities are not very liquid and as claims payments often take a long time to materialise and can be anticipated to some degree. Finally, a higher discount rate implied by an increase in long-term yields would also reduce the value of liabilities in jurisdictions where these are marked to market. The gradual move towards a market-consistent approach across jurisdictions on the eve of the Solvency II regime strengthens this effect over time. Overall, it seems that the low-yield environment is more detrimental to insurers' financial performance than the valuation effect caused by high volatility, despite the fact that the risk of the latter has increased lately.

Other investment risks
Besides risks related to long-term interest rates, insurers, like any other investors, are subject to the materialisation of other credit and market risks in their investments. A general deterioration of market conditions could in particular impact the investment income of the sector in a material way.

In this regard, a further deterioration in the credit quality of some lower-rated sovereign bond issuers can pose challenges to some insurers in the form of marking-to-market valuation declines on balance sheets. However, investment exposures of large euro area insurers to lower-rated government bonds appear in aggregate to be manageable.

A slowdown in the economic recovery may reveal vulnerabilities in some segments of the corporate sector. This could result in a materialisation of credit risk in corporate bonds, equities, structured credit products and various types of commercial property investment.

Corporate bond exposures, together with government bond exposures, remain high in relation to other investment classes (see Chart 4.32). Within the class of corporate exposures, insurers remain particularly vulnerable to developments in the banking sector. To begin with, many insurers are part of a financial conglomerate. Second, holdings of debt securities issued by euro area monetary financial institutions (MFIs) represented 24% of insurers' and pension funds' total holdings of debt securities and 9% of their total financial assets in the second quarter of 2011.[26] Third, some forms of credit risk protection represent an additional link between the insurance and banking sector with a high potential for systemic effects in terms of financial stability. Although data availability for such activities remains low, the available data show that their significance

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24 See the first half-year Financial Stability Report 2011 published by EIOPA, available at https://eiopa.europa.eu/publications/financial-stability/index.html. The diminishing guarantees apply to all EIOPA member countries that have reported data for the survey, except for Finland, Malta and Sweden. Evidence from Germany is also provided in A. Kablau and M. Wedow, "Gauging the impact of a low-interest rate environment on German life insurers", *Deutsche Bundesbank Discussion Paper Series 2*: Banking and Financial Studies, No 02/2011, 2011.

25 See e.g. Committee on the Global Financial System, "Fixed income strategies of insurance companies and pension funds", July 2011.

26 Insurance companies and pension funds in addition invested in quoted shares of euro area MFIs, even though the share (0.5% of total financial assets) was minimal. See Section 4.4 for more information about interlinkages between the insurance and banking sectors.

has diminished over the years and does not seem to be large for European insurers in particular (see Box 13).

In general, insurers are reasonably well protected against credit risk related to bonds through the regulatory limits on investments that they are allowed to make in bonds with lower ratings. The ability of insurers to hold investments until maturity also acts as protection against market volatility. On the other hand, possible rating downgrades of highly rated government bonds could risk forced selling in the high end of the market, possibly with a realised (albeit probably small) loss.[27]

Finally, the investment uncertainty map implies continued fragilities in euro area equity and commercial property markets, and increased investment risk for structured credit products in the past months. The risks in these markets nevertheless need to be put into the context of relatively limited aggregate investment exposures of large euro area insurers.[28] A quantification of these risks in Section 4.3.3 below confirms that large insurers' investment risks are centred in the bond markets.

Looking forward, the low yields on highly rated government bonds and strong competition could increase the incentives for insurers to take on riskier investments to boost returns, such as riskier corporate bonds and emerging market debt. The risk-adjusted capital requirements of the upcoming Solvency II regime will also impact the investment allocation of insurance companies. First, incentives for long-term investment are expected to diminish owing to the high associated cost in terms of capital. As regards asset classes, government bonds and covered bonds receive a favourable capital treatment and may therefore gain in attractiveness. Several additional direct and indirect factors may impact the investment behaviour of insurers and the associated credit risk under Solvency II.[29]

Although the final calibration of Solvency II is still under discussion, it is conceivable that many insurers have already started to anticipate the expected regulatory changes. The transitional arrangements of the regulation may furthermore give insurers up to ten years to adapt to the new rules once the legislation is in place. The final impact on the investment behaviour of insurance companies is therefore likely to stretch over a significant period of time and is expected to be gradual. Nevertheless, the developments deserve to be closely followed, also owing to the potentially significant size of the overall effect and the importance of insurers as investors in the financial markets (see Section 4.4).

27 See also Box 16 in the June 2010 FSR. Section 4.4 discusses the impact of the investment behaviour of insurers on other markets in more depth.

28 It should be noted, however, that this does not preclude the possibility that equity risk is material for smaller insurers that may be important at the local level in some jurisdictions.

29 For example, hedging of exposures and matching the duration of assets and liabilities are recognised as risk-mitigating measures and their use therefore reduces the capital requirements of an insurer. Using internal models for calculating capital requirements instead of the standard formula may also provide significant capital relief for large insurers and in particular groups that are well diversified. See the EIOPA report on the fifth quantitative impact study (QIS5) for Solvency II, March 2011, available at https://eiopa.europa.eu

Box 13

CREDIT RISK PROTECTION BY INSURANCE COMPANIES

Traditional insurance activities are rarely thought of as harbouring significant systemic risk, not least given stringent risk management and the rather illiquid nature of claims inherent in the business models of insurance providers. The financial crisis has illustrated, however, that other non-core activities, which typically bear more similarities to banking activities than to traditional insurance contracts, may embed more potential to disrupt financial stability.

Indeed, the most material insurance event in the current crisis, the near-collapse of American International Group (AIG) in 2008, was triggered by the increased collateral calls on the credit default swap (CDS) contracts that the company had been selling.[1] In particular, activity in writing CDSs has attracted the attention of regulators, academics and the industry itself given their potential for systemic risk.[2] Selling CDS contracts can be placed in a broader context of credit risk activities conducted on the non-life insurance portfolio of an insurer. These activities consist of three distinct types of credit risk protection: credit risk insurance, granting financial guarantees and writing CDSs.[3] This box takes up each of these three activities and their features, and analyses their risk.

A first strand of credit risk activity concerns *credit insurance*, an activity in which many insurers are involved and, as such, is usually classified within core insurance activities. A credit insurance policy insures the policyholder against non-payment of goods and services by their clients. Systemic risk in this field could be related to credit crises that potentially affect many clients simultaneously and can therefore be a source of rapid increases in loss ratios of possibly non-diversified insurance providers. Despite the wide involvement of insurers, the absolute amounts are small, which results in credit insurance accounting for only a very small share of the insurance market.[4]

A second strand of credit risk activity concerns *financial guarantees*, notably those provided by the so-called monoline financial guarantors. A monoline earns its moniker from the fact that it only insures against default of investment-grade debt securities and does not get involved in other insurance businesses. The business model is based on a high credit rating of the monoline, which is justified by them only insuring high-grade securities. The first phase of the US sub-prime financial crisis in the summer of 2007 saw a sharp reduction in these activities.[5]

A third strand of credit risk activity concerns *writing CDS contracts*. In principle, insurers would be natural sellers of such products, because their investment horizon is very long and they are therefore less vulnerable to short-term volatility related to mark-to-market valuations. Insurance companies have typically used CDSs for hedging their credit risk. A low-yield environment can, however, also increase the attractiveness of CDSs as an alternative investment class for insurers.[6] The risk in CDS writing not only arises from the credit risk aspect, but also from the challenges it poses in terms of liquidity: in contrast to traditional credit insurance, CDS writing not only leads to cash flows at the time when an insured credit event occurs, but also to increased collateral requirements in the eventual case that the probability of the event increases. The fact

1   For a comprehensive overview of the AIG near-collapse, see e.g. W. K. Sjostrom, "The AIG Bailout", *Washington and Lee Law Review*, Vol. 66, pp. 493-991, 2009.
2   Systemic risk can arise in particular if these activities are combined with a high level of leverage by the insurance company that is conducting them. For sources, see e.g. Joint Forum, "Review of the differentiated nature and scope of financial regulation – Key issues and recommendations", January 2010; V. V. Acharya, J. Biggs, H. Le, M. Richardson and S. Ryan, "Systemic risk and the regulation of insurance companies", in V. V. Acharya, T. F. Cooley, M. P. Richardson and I. Walter (eds.), *Regulating Wall Street – the Dodd-Frank Act and the new architecture of global finance*, John Wiley & Sons, Inc., New Jersey, pp. 241-301, 2011; Geneva Association, "Systemic risk in insurance – An analysis of insurance and financial stability", special report of The Geneva Association Systemic Risk Working Group, March 2010; CEA, "Insurance: a unique sector – Why insurers differ from banks", June 2010; and most recently, International Association of Insurance Supervisors (IAIS), "Insurance and Financial Stability", November 2011.
3   Overviews of credit risk activities can be found in e.g. Geneva Association, "Systemic risk in insurance – An analysis of insurance and financial stability", March 2010.
4   According to Swiss Re, premiums accounted for USD 6.9 billion in 2005, or less than 1% of non-life premiums written. For a more thorough analysis of credit insurance, see e.g. Swiss Re, "Credit insurance and surety: solidifying commitments", *Sigma*, No 6/2006, 2006.
5   See Box 4 in the June 2008 FSR for an in-depth discussion of financial guarantees.
6   See e.g. Fitch Ratings Global Credit Derivatives Surveys of November 2005 and September 2006.

that counterparties to CDS writing are often important banking entities that are closely interlinked with the financial markets may also be a conduit for adverse developments to engender systemic consequences.[7]

Of these three strands of credit risk activity for insurers, CDS activity has the unfortunate coincidence that it both embodies the largest financial stability risks and nonetheless remains the area with what are arguably the most severe data shortcomings – thereby complicating an accurate monitoring of prospective risks. CDS markets remain opaque and comparing data from different sources may yield very different results.[8] Available data suggest indications of a declining trend in the involvement of insurance companies in CDS writing over the past few years. Most importantly, the exit of the biggest insurance player – AIG – from the market in 2008 led to a material decrease of the activity in the insurance sector (see Chart A).[9] At that time, deteriorating credit quality in the financial markets and improving yields in the traditional underwriting business also contributed to other insurance companies having started to reduce their exposures already well before the AIG difficulties.[10] It is noteworthy that CDS writing for purposes other than hedging is forbidden for insurance companies in many countries. As a consequence, insurance companies typically have to found an affiliated, unregulated, entity to conduct any trading using CDSs for income-enhancement purposes.[11] The overall minor significance (2%) of insurers as sellers of CDS contracts, shown in Chart B, reflects these aspects.

In contrast, the use of CDSs as hedging instruments has increased during the crisis according to a recent report by the Committee on the Global Financial System (CGFS), and may continue to increase in the coming years.[12] Solvency II will acknowledge the effective use of risk-mitigating techniques in its capital requirements, including via the use of derivatives. For the purpose of risk management, insurers are allowed to use derivatives in their balance sheet, and regulation often requires these exposures to be collateralised and with diversified counterparties. Rather

Chart A CDS notional amounts sold outstanding – insurance and financial guarantee firms

(H2 2004 – H1 2011; USD billions)
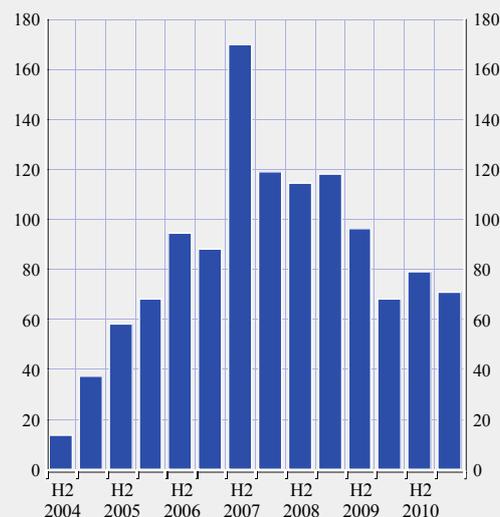
Source: Bank for International Settlements (semi-annual OTC derivatives statistics at end-June 2011).

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7 This was the case for AIG, for example. Although collateral calls were the main trigger for the near-collapse of the insurer, it should be noted that increased requests to return the securities borrowed under AIG's securities lending programme also contributed to the unmatched liquidity needs, which were accentuated by the high leverage of the company. See Sjostrom, *op. cit.*, and Box 16 in ECB, *Financial Stability Review*, June 2009.

8 For a thorough comparison of data sources, see ECB, "Credit default swaps and counterparty risk", August 2009.

9 This has led Fitch Ratings to exclude insurance companies from its Global Credit Derivatives Survey. For argumentation, see Fitch Ratings, "Global Credit Derivatives Survey: Surprises, Challenges and the Future", August 2009.

10 This trend is also visible in the Fitch Ratings Global Credit Derivatives Surveys of 2005 and 2006, if AIG's Financial Products Corporation is excluded from the data.

11 AIG, for example, conducted its CDS writing activities via its Financial Products Corporation in London. For a description of the legal framework in Europe in particular, see Box 19 in ECB, "Credit default swaps and counterparty risk", August 2009.

12 See CGFS, "Fixed income strategies of insurance companies and pension funds", July 2011.

Chart B CDS notional amounts sold outstanding – main seller categories

(H2 2011; percentages)
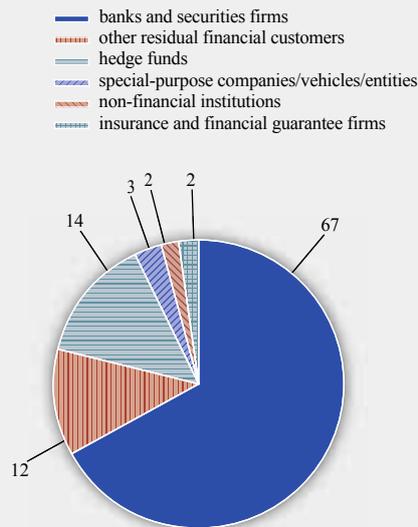
- banks and securities firms
- other residual financial customers
- hedge funds
- special-purpose companies/vehicles/entities
- non-financial institutions
- insurance and financial guarantee firms

Source: Bank for International Settlements (semi-annual OTC derivatives statistics at end-June 2011).

than CDSs, these derivatives are however typically mostly foreign exchange, interest rate and equity derivatives, to match the financial risks that insurers guarantee. Life insurers in particular use derivatives extensively to reduce interest rate risk.

All in all, available data would suggest that the selling of CDS contracts by insurance companies is not on a scale sufficient to pose a material threat to euro area financial stability at present. Nevertheless, the potential of such activity to be a source of systemic risk should not be underestimated, not least given its role in the aftermath of the failure of Lehman Brothers. Indeed, the loopholes for regulatory arbitrage that have led to a significant systemic event in the past need to be closed. A clear understanding of insurance activities at the consolidated level, as required by the Joint Forum and the CGFS, among others, is key in this regard.

UNDERWRITING RISKS

The risk that the accumulated losses from catastrophic events turn out larger than projected remains prominent for the euro area insurance sector. At the same time, the occurrences of natural catastrophes often pave the way for increased pricing power, enabling insurers to counterbalance high claims with a boost in gross premiums earned. The market for insurance has indeed hardened lately as tariffs for catastrophe-related products in particular have increased. The expected slowdown in the economic recovery may, however, make it less likely that this trend will continue in the future.

The first half of 2011 saw an unusual accumulation of natural catastrophes. The losses related to the Japanese earthquake include damage caused by the earthquake and tsunami, but also indirect damage via fires, nuclear power-related strains and business disruption. The estimates of insured losses now amount to USD 30 billion, making the Japanese earthquake the costliest earthquake for insurers in history. The estimated insured losses from New

Zealand's earthquake of February 2011 amount to USD 10 billion. In addition, weather-related catastrophes have already caused insurance losses of USD 27 billion. This sum includes the massive tornados that hit the South and Midwest of the United States in April and May, and Australian floods in January 2011 (see Chart 4.34). The forecasts indeed foresaw above-average activity during 2011, also owing to the expected impact of La Niña climate phenomenon for 2011 (see Chart 4.35).[30] Forecasts for 2011 have, however, not been markedly exceeded by the actual events, and the August updates introduced no revision to the forecasts made earlier. This should be supportive for insurers in terms of their having set aside adequate reserves.

The sizeable insured losses caused by the natural catastrophes during the first half

30 See e.g. the press release of Munich Re of 12 July 2011. La Niña climate phenomenon refers to the recurrent move of atmospheric disturbances to meet humid and warm air; extreme weather events are more probable under such conditions than in normal times.

of 2011 have been absorbed by the insurance and reinsurance sectors without widespread solvency problems. Looking ahead, however, several rating agencies and other market participants have signalled that capital reserves have been significantly reduced by the events during the past six months. Any additional catastrophe is therefore likely to constrain insurers further and eventually materially impact their solvency if recapitalisation efforts were not to succeed.

On the other hand, the occurrence of natural catastrophes also enables insurers and reinsurers to increase their prices, at least on products closely related to the events, which would have a positive effect on gross premiums written. The markets for both insurance and reinsurance have indeed hardened during the first half of 2011, resulting in premium increases for reinsurers in both quarters. Reinsurers and analysts in addition expect the demand for reinsurance to continue to increase further for some time, also in light of the adoption of risk-based capital requirements in the

near future. However, the expected slowdown in the economic recovery may hit the insurance underwriting business, which typically follows trends in the overall economy. Underwriting income is therefore likely to remain subdued for primary insurers until the economic recovery has gained more momentum. The outcome for the reinsurance sector of the potential decrease in demand for reinsurance by primary insurers owing to economic developments, on the one hand, and of the increase in demand for reinsurance following the accumulation of natural catastrophes and regulatory developments, on the other, is uncertain.

4.3.3 ASSESSING THE RESILIENCE OF EURO AREA INSURERS

In this section, the major investment risks identified in the previous sections are quantified in order to assess the potential size of the impact on the large euro area insurers,[31] should the risks

31 The exercise was based on a sample of 13 major insurance groups in the euro area.

materialise in an adverse manner. The assessment takes into account the following market and credit risk components: an increase in interest rate risk, equity price risk and property price risk; and a deterioration of the creditworthiness of borrowers through growth in credit spreads for the marketable instruments and an increase in loss rates for loan portfolios.

The stress-test exercise for the insurance sector was designed to allow an assessment under the adverse macroeconomic scenarios that seek to map the risks discussed in this issue of the FSR.[32] The main features of the macro-financial scenario are discussed in Section 4.1.3. Thus, the stress test addresses: (i) contagion risk related to an intensification of the euro area sovereign debt crisis; and (ii) the risk of an unexpected slowdown in global demand triggered by a confidence-driven worsening of the macroeconomic outlook in the United States and the euro area. These risks are transmitted to the insurance sector through two channels: (i) valuation effects on financial securities owing to changes in prices; and (ii) the credit quality of loan portfolios. From the perspective of insurers' balance sheets, the stress-test exercise deals with the financial instruments and investments accounted for as assets. Finally, the parameters and assumptions of the insurance stress test mainly relate to developments in long-term interest rates and sovereign credit spreads, changes in equity and property prices, and alterations to credit risk parameters (i.e. probabilities of default (PDs) and losses given default (LGDs) of loan portfolios).

The analysis of the impact of market risk factors on insurers was performed following the assumption that the market values of shares, bonds and property decrease sharply and abruptly with effects occurring instantaneously, before institutions would have an opportunity to react and adjust their portfolios. The sensitivity analysis of market risks shows the losses that are largely a function of the size of the exposures, their composition and the size of the shocks. The assessment of the credit risk in the insurers' loan books followed the general framework of

the bank stress test, implying the scenario-based estimation procedure. Therefore, the credit risk losses reflect the amount of losses that could be borne cumulatively over a horizon of the next two years.

The exposures of the insurance companies analysed in this section are to a great extent similar to those which prevailed in mid-2011. Firstly, given that the available data on the insurers' balance sheets lack sufficient granularity, simplifying assumptions need to be made, which may limit the accuracy of the results. Whenever data were available, holdings of sovereign debt securities were analysed using a country-level granularity. Otherwise, broad aggregates of sovereign holdings were used, broken down into holdings of debt securities of euro area countries under fiscal strain, other euro area countries, and non-euro area EU countries. The holdings of private debt securities were aggregated into non-financial and financial corporate portfolios, as well as asset-backed securities (ABSs) and mortgage-backed securities (MBSs). Holdings of corporate non-financial debt securities were additionally segregated by the investment grade. Insurers' investments in property covered both commercial and residential property.[33] Investments in equity included holdings of shares as well as investments in equity funds and indices. Secondly, no hedging or other risk-mitigation measures were taken into account, which means that some losses might be overestimated. Unit-linked financial investments were excluded from the scope of the exercise. Thirdly, the changes in income and expenses other than those analysed in this framework were assumed to be fixed.

The credit risk assessment was carried out by employing the data on aggregate loan portfolios only (i.e. with no granularity by residency or

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32 The exercise is not related to the EU-wide stress tests in the banking and insurance sectors coordinated by the European Banking Authority (EBA) and the European Insurance and Occupational Pensions Authority (EIOPA), respectively.

33 Typically, the information on property investments was not sufficiently granular; therefore, total investments in property were considered.

counterparty sector). The starting levels of loss rates were proxied by: (i) loss rates implied by provisioning in 2010; and (ii) the EBA reported average loss rate of the retail and corporate portfolios of banks domiciled in the home country of the insurance group under consideration. The ECB-projected average changes of credit risk parameters for the home market of the insurance groups were assumed to reflect an average respective change in the total portfolio.

The government bond portfolio valuation haircuts were estimated on the basis of the representative euro area sovereign bonds of five-year maturity. Under the global demand scenario, the sovereign-specific haircuts reflected the actual change in corresponding yields from mid-2011 to 17 November 2011 (the cut-off date of this FSR). Then, an additional widening of long-term sovereign yields by 168 and 200 basis points on average in the euro area was introduced respectively under the contagion scenario with simulated country-specific shocks and the uniform-across-countries shock scenario.

The revaluation of corporate bonds was additionally[34] influenced by a widening of credit spreads. The size of the latter was set by simulating a joint, multivariate forward distribution of daily compounded changes of various iTraxx indices with a 60-day horizon. Despite the shocks to the credit spreads having been derived from the contagion scenario, the resulting shock sizes were then applied to the other scenarios too. On average, the simulated response of credit spreads on corporate debt securities equals 96 basis points. Finally, haircuts were derived from implied changes in the value of a hypothetical average security having the characteristics of the representative market index of bond portfolios.[35] The haircuts on ABS and MBS portfolios were estimated using the value corresponding to the 5% percentile from the respective univariate forward distributions that were simulated from daily data of the relevant market indices with the 60-trading-day horizon. All haircuts were applied uniformly across the sample of large euro area insurers. Finally, picking only the

Chart 4.36 A quantified analysis of losses for a sample of large euro area insurers

(Q2 2011 – Q2 2013; percentage of total assets)
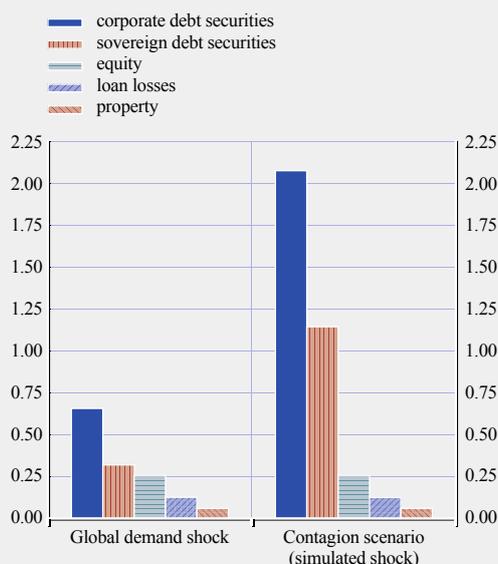
Sources: Bloomberg, individual institutions' financial reports, JPMorgan, Thomson Reuters Datastream and ECB calculations.
Notes: Two sets of loss rates were applied; however, the chart illustrates only more conservative estimates of loan losses. Losses on equity and property holdings are the same under both depicted scenarios owing to the same size of the shock.

most severe parameter from all three macro scenarios, stock prices were assumed to decline by 14% and property prices by 2.6% on average in the euro area.[36]

Chart 4.36 depicts credit and market risk stress-test losses[37] under the various shocks. Credit risk losses in the loan portfolios of the insurance companies appear to be contained owing to the generally low share of credit instruments in total assets. At the same time, insurers are highly exposed to market risk and their investments in debt securities could potentially become a major source of fragility.

34 i.e. in addition to an increase in long-term interest rates.
35 Typically, various iBoxx euro corporate bond indices with an average maturity of five years, a 4.2-5.3% average coupon rate and a 3.2-4.8% average yield as at mid-November 2011.
36 The shock for stock prices was derived from the actual data from April 2011 to 17 November 2011. Property prices react endogenously to other elements of the macro-financial scenario.
37 The results here are measured in terms of the change in total assets rather than in the solvency ratio. Therefore, even if the same macro-financial adverse scenarios are employed, any direct comparison with the stress test of banks should be avoided.

The insurance sector is a major investor in sovereign bond markets. The results indicate that, under the assumptions of an intensified euro area sovereign debt crisis and an unexpected increase in long-term interest rates, the average losses from sovereign holdings could amount to 1.1% of assets. Even though sovereign-related issues could serve as a trigger for crises, investments in corporate portfolios appear to be a more sizeable source of the losses. Under the same scenario, losses could grow to 2.1% of the assets on average. The uniform shock scenario (not depicted in Chart 4.36) would produce even stronger effects and might cause losses equalling 1.7% and 2.3% of assets respectively from sovereign and corporate debt securities holdings. It is noteworthy that a considerable portion of these losses is associated with holdings of debt securities issued by other financial companies. Furthermore, the range of stress-test losses on exposures to sovereign and corporate securities is wide, entailing that some of the institutions under consideration are particularly vulnerable to conditions in these markets.

While conditions in several euro area property markets remain fragile, the related potential losses for insurers would be limited due to contained exposures, on average. Regarding equity price risk, losses from the adverse shock are largely related to the size of investments. The exposure to equity instruments of some insurance companies is rather high and, if not hedged, could become a significant source of risk, should adverse shocks materialise. On average, results point to average losses on equity holdings of 0.3% of total assets.

4.4 RISKS STEMMING FROM INTERLINKAGES BETWEEN FINANCIAL INSTITUTIONS HAVE INCREASED

Regional, maturity and currency mismatches in financial intermediaries' balance sheets and their intertwined interaction are at the centre of the still growing risks to the euro area financial system. Reassuringly, the ongoing pressure towards sustainable operations is gradually translating into a wider diversification of risks.

There are, however, indications of substantial remaining risks in the operation of systemically important institutions, as the perceptions of risks associated with counterparty activity have substantially increased in the last six months. Beyond the euro area banking sector, there are a number of vulnerabilities which have become evident since the last FSR associated with the pernicious feedback effects between sovereign risk, banking system fragilities and economic growth, and which at present are a critical risk for the euro area banking system.

4.4.1 LINKAGES STEMMING FROM BANKS' OPERATIONS

Viewing the economy as being composed of layers of financial intermediation from savers to borrowers, the inner component of the economy is the activity taking place within the banking sector. Roughly, this activity and the risks stemming from it can be described first through the infrastructure supporting banks' transactions, and subsequently through the linkages between banks' functions.

Intermediation-related transactions
The infrastructures supporting the operation of, among others, euro area banks experienced a number of incidents since the publication of the last FSR which have significance from a financial stability perspective.

On 25 July 2011, the Trans-European Automated Real-time Gross settlement Express Transfer system (TARGET2), the real-time gross settlement system owned and operated by the Eurosystem, was prevented from starting its daylight operations at the standard 07.00 CET. From a technical point of view, this incident can be considered as the most far reaching one since the start of TARGET2, as it lasted around three hours and caused complete system downtime. The fact that it occurred early in the day, combined with the quick activation of contingency measures for the processing of very critical payments, helped limit its consequences for TARGET2 participants and the financial system as a whole. Nevertheless, ancillary systems affected by the incident

experienced later than normal processing of some central counterparty margin calls and of transactions related to securities settlement and retail payment systems.

Necessary and appropriate technical measures to prevent similar events from reoccurring have been implemented by the TARGET2 operator since the incident. In particular, the contingency measures, which were activated for the first time, proved to be effective. The event was managed in a pragmatic manner, and operational staff at the ECB/national central banks, as well as on the system participants' side, appeared to be well trained and familiar with the contingency procedures.

There were no incidents in EURO1 (a large-value net settlement system operating in euro among EBA Clearing member banks with a registered office or branch in the EU), and the TARGET2 incident did not have any impact for the following reasons. The EURO1 system operates on weekdays from 07.30 to 16.00 CET. In this period EURO1 offers a liquidity management arrangement, which consists of two phases. During the pre-funding phase, each EURO1 participant can inject at all times during the processing hours (until 15.30 CET) additional liquidity from its TARGET2 account into the pre-settlement EURO1 account held at the ECB to increase its position in the system. The window distribution phase entails that payment capacity can be shifted from EURO1 to TARGET2 at six pre-defined distribution windows, namely at 11.00, 12.00, 13.00, 14.00, 15.00 and 15.30 CET. After the cut-off time at 16.00 CET, the EURO1 system settles on the same day in central bank funds via a settlement account opened with the ECB in TARGET2 using the settlement procedure of the TARGET2 Ancillary System Interface ("ASI4"). Due to the fact that the incident occurred and was solved prior to the EURO1 cut-off time, the critical end-of-day settlement process was not impacted. The pre-funding and liquidity distribution messages sent by the EURO1 participants are not considered as critical payments in TARGET2 and, therefore, the two liquidity phases were not

impacted since the participants were informed to send such messages after the problem was solved.

During the reporting period (from April to October 2011), CLS, a leading foreign exchange settlement system for the global market, continued to operate smoothly, while its settlement activity continued to grow (on average, a volume of 418,000 trades with an average daily value equivalent to USD 4.9 trillion was settled per day). On the occasion of the TARGET2 incident mentioned above, the fact that the ECB had to invoke manual contingency payment processes with the EUR Nostro banks and with CLS resulted in a delayed completion of settlement of Asia-Pacific payouts by one hour. Following the incident, the ECB together with CLS reviewed – from an operational perspective – the contingency procedures in order to strengthen the efficiency and timeliness of the respective communication and reconciliation processes.

Interbank functional linkages
The intensification of sovereign tensions since the last FSR has further intensified strains in

Chart 4.37 Ratio of interbank funding to total assets across euro area banking sectors

(2007 – H2 2010; percentages)

median
mean
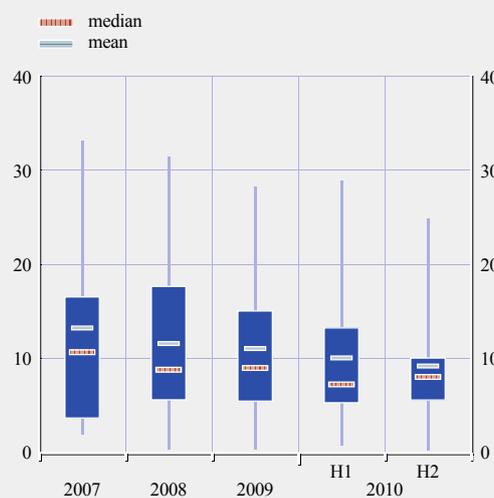
Source: ECB.

Chart 4.38 Mean EONIA rate and dispersion across member banks

(Sep. 2008 – Nov. 2011; weekly mean and non-parametric non-normal bootstrap confidence limits, indicating last data closing date)
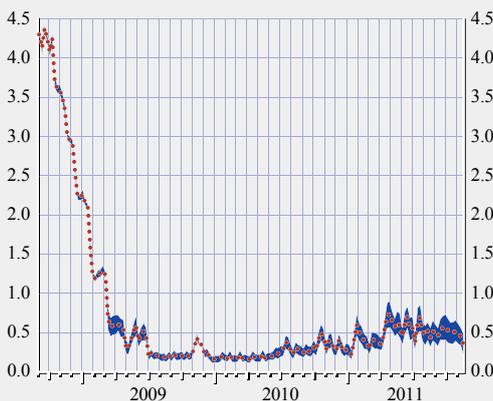
Sources: EURIBOR and European Banking Federation.
Note: The segmentation in the euro money market denoted by the different rates asked for by the participants indicates the absence of liquidity.

Chart 4.39 Eurosystem counterparties using each other's uncovered bonds as collateral

(Sep. 2008 – Nov. 2011; monthly distribution of the number of counterparties per issuer)
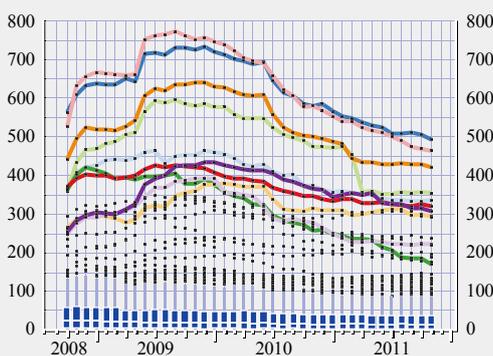
Sources: ECB and ECB calculations.
Notes: Average monthly number of Eurosystem counterparties using a given bank issuer's bonds as collateral. For any given month, the figure displays the distribution of such values across bank issuers (box plot with the box capturing 50% of the values and lower and upper whiskers extending the range to 1.5 standard deviations in each direction – values outside this range are marked by a point). The time evolution of these values identifies changes in the "concentration" of the use of these bank bonds as collateral. The ten banks issuing the uncovered bank bonds that are most widely used by other counterparties are displayed as coloured lines. While most ECB counterparty bank bonds are held by a relatively small number (<150) of banks, a few banks' securities have been consistently posted as collateral by a very high number of counterparties.

bank funding markets. Higher counterparty risk stemming from heightened macro-financial uncertainty has conditioned bank funding choices, notably by limiting banks' reliance on the interbank market (see Chart 4.37), increasing the share of secured versus unsecured funding, in particular by issuing covered bonds (backed by mortgages) and government-guaranteed bonds (see Section 4.2.2).

Interbank markets have effectively closed to banks domiciled in countries under EU/IMF programmes and became further restricted for banks in countries where sovereign risk concerns intensified, such as Italy and Spain. Faced with an illiquid interbank market (see Chart 4.38), some euro area banks with an over-reliance on short-term funding will address the need to term out their funding structure, likely resulting in medium-term changes to their business models.

Funding activity among euro area banks extends well beyond the short-term cash market, and is primarily evident in their cross-holdings of bank-issued securities, notably bonds, resulting in a direct exposure. Evidence from the collateral held at the ECB supports the image of a highly interconnected banking system with respect to cross-holdings of bank securities. One finds evidence of the key importance of a few core institutions for drawing funding from "satellite" banks across the euro area, as only disproportionately few banks' bonds continue to be widely used as collateral. This reveals the significant potential impact that the default of one such core issuer would have on the system (see Chart 4.39).

Owing to the financial linkages tying the operation (mostly funding) of large euro area banks together, the rise in counterparty risk entailed by the reduced interbank activity also resulted in a substantial increase in the joint vulnerability of euro area banks as a whole (see Chart 4.40). The increase over the last six months in the probability of two or more

Chart 4.40 Probability of a simultaneous default of two or more large euro area banks

(Jan. 2007 – Nov. 2011; probability; percentages)

Sources: Bloomberg and ECB calculations.
Notes: Probability of a simultaneous default of two or more large euro area banks within two years on the basis of CDS and equity prices of LCBGs. For further details of the indicator, see the box entitled "A market-based indicator of the probability of adverse systemic events involving large and complex banking groups" in ECB, *Financial Stability Review*, December 2007.

LCBGs defaulting has been sharper and larger than in the past, pushing this measure of systemic risk to heights not observed since its inception in 2007.

4.4.2 LINKAGES STEMMING FROM CROSS-SECTORAL INTERACTION

Euro area banks' intermediation activity results in various forms of linkages with institutions and entities in other sectors. Interdependencies through funding activity and/or asset holdings reveal channels directly relating banks' behaviour and performance with those of other financial institutions, such as insurance companies and other financial intermediaries (OFIs). In addition, ultimate sources of funding for banks also include economic agents beyond the financial sector holding bank liabilities (non-financial sector exposures to banks). Similarly, the credit granted to the non-financial sector represents the exposure of banks to the non-financial sector.

The former link – financial and non-financial sector funding of banks – has been under particular strain over the last six months.

Policy-makers have been taking measures aimed at preventing such strains from translating into strains in credit provision to the non-financial sector.

Bank activities involving other financial intermediation sectors

The activity of euro area banks underlying their more granular economic intermediation function has both funding and credit issuance aspects. In addition to the broader perspective covered in the next section, more micro relationships support euro area banks' activities, stemming primarily from their funding needs and strategies.

In addition to banks' 18% share of investment in senior bank bonds (a major funding tool of banks), insurers and hedge funds each hold about 10% and money market funds hold as much as 62%.[38]

A notable link is that between banks and *insurance companies and pension funds* regarding the general availability and liquidity of such bank funding instruments. There have been concerns that the gradual deterioration in the quality of assets held in non-bank financial sectors could lead to forced selling of securities, triggering a further deterioration in the asset value of securities held or issued by banks. While this phenomenon is a concern in conditions of high uncertainty regarding sovereigns (see below), there is little evidence of substantial securities sales by the insurance or pension fund sectors. Looking forward, regulatory and accounting changes impinging upon the ability of institutional investors to provide long-term risk capital (see Section 4.3) may reduce incentives to invest in long-term bank risk capital.[39] This notwithstanding, bank bonds are likely to continue to be an interesting investment vehicle for insurers, as the increase in the capital charge is not substantial owing to the fact that insurance companies hold bank bonds with an average maturity of three to five years,

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38 Based on data compiled by Deutsche Bank Global Markets Research.
39 Committee on the Global Financial System, "Fixed income strategies of insurance companies and pension funds", July 2011.

Chart 4.41 Financial assets of euro area insurance companies and pension funds

(Q1 2008 – Q2 2011, percentage of total financial assets)

- shares
- ····· other securities
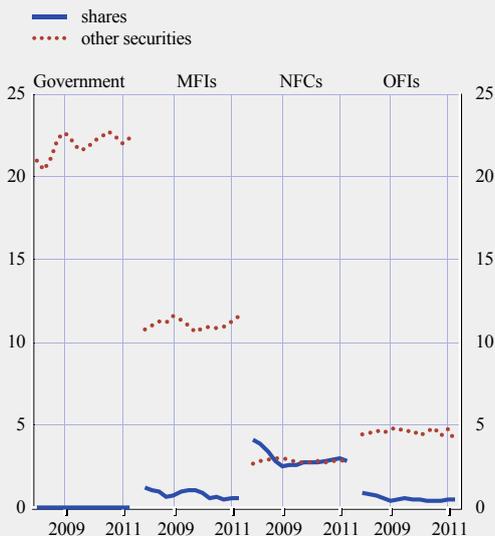
Source: ECB.

and that these companies will not experience major surcharges under the new regime (the capital charge may even be further reduced by Solvency II).

Also important is the link between insurance and banking activities within a financial conglomerate and/or as a result of investment exposures through holdings of equity, debt and debt securities. Euro area insurance companies and pension funds held about €727 billion of financial assets issued by euro area monetary financial institutions (MFIs) in the second quarter of 2011, up from €694 billion in the first quarter (see Chart 4.41). Holdings of securities issued by the government and MFI sectors remain significant and account for the bulk of their financial assets.

In addition, there are concerns that current market conditions will lead to stricter requirements for interest rate risk hedging, which is very widely used to transfer risk across markets. Stricter counterparty limits resulting from downgrades could result in a smaller number of eligible counterparties. Reduced risk appetite of hedging counterparties, together with reduced financial strength, would result in higher hedging costs and potentially fewer participants dominating the market, negatively affecting the resilience of this important activity.

The so-called *shadow banking sector*, referring to activities related to credit intermediation and liquidity and maturity transformation which take place outside the regular banking system in Europe, is playing a significant role in financial intermediation in general and the funding activities of banks in particular. A useful characterisation of shadow banks is according to the function that they serve, notably securitisation, money market activities, repo transactions and hedged operations (hedge funds).

Banks' funding strategies vis-à-vis other financial sectors relate to *securitisation operations*, notably covered bond issuance and the emergence of complex products.

A key development since the last FSR has been the significant deterioration in funding from US *money market funds*. In October 2011, US money market funds' total holdings of European paper declined by 9% relative to September and by 42% since May (see Section 4.2). The changes in funding from this important US source are a significant and ongoing development. Whereas during the crisis in 2008 the fall in the supply of such funding was global, the change over the summer of 2011 was primarily a European phenomenon (see Chart 4.42).

In addition, within the euro area the impact of this development is centred on a few banking sectors, notably French banks, whose commercial paper (CP) and certificate of deposit (CD) holdings declined by USD 34 billion between end-May and end-August 2011. This reduction in outstanding volumes has also been accompanied by a marked shortening of the maturities of this debt (the average maturity of French bank CP/CDs decreased from about 80 days at the end of March 2011 to 40 days at the end of August 2011), making the dependence on this source of funding more fragile.

Source: Fitch Ratings.
Note: The distribution across all countries receiving funds from US money market funds is shown in blue.

While no official data are available on the overall size of the repo market in the euro area, the International Capital Market Association (ICMA) estimated the total value of outstanding repos in the EU in December 2010 to be €5.9 trillion (lending plus borrowing positions). An anecdotal increase of long-term collateral upgrade trades or liquidity transfer deals (securities lending across financial sectors) has been recently observed. Among the various structures possible, the most common appears to have been a collateralised loan, where liquid assets, such as government bonds or high-grade corporate bonds, are lent for a fee to a bank by long-term investors (e.g. pension funds and insurers). The loan is then collateralised with illiquid assets, typically asset-backed securities of one form or another. Banks have then used the high-grade assets in repo transactions with central banks and long-term investors achieve a higher return.

While *hedge funds* in general appear to have quite a limited role (at the end of 2010, assets held by euro area hedge funds slightly exceeded €100 billion), they are part of the complex network of financial intermediaries instrumental to the growth of shadow banking, either through their involvement in securitisation activities or in the repo market. Notably, credit hedge funds' strategies include investing in tranched OTC-traded securities, thereby exploiting possible arbitrage opportunities in (synthetic) collateralised debt obligations.

Hedge funds in general suffered investment losses (see Section 3.2). Being much less leveraged in comparison with three years ago helped to alleviate funding liquidity pressures stemming from prime brokers' margin calls. Potentially significant investor withdrawals may still carry some funding liquidity risk for hedge funds, and for the banking sector more broadly, especially if hedge fund trades become crowded, adversely affecting

Looking ahead, the Basel III net stable funding ratio creates incentives for banks to fund themselves using more stable sources on a structural basis. As a result of the implementation of this standard, banks have an incentive to match more closely the maturity of both sides of the balance sheet and thereby increase resilience to shocks, including to bouts of sovereign-induced risk aversion.

Owing to their nature, *repurchase agreements* serve as an important funding and valuation channel across financial sectors. According to Gorton (2010),[40] variation in the haircuts applied by main dealers on secured transactions has been substantial with the advent of the crisis, indicating that haircuts increased from a negligible level to rates approaching 50% in late 2008. This increase represents a substantial reduction in the liquidity multiplier effect of repo transactions and would clearly reduce their pro-cyclical effect, and – irrespective of their accounting treatment – would represent a monetary contraction.

40 See G. Gorton, "Questions and answers about the financial crisis", document prepared for the US Financial Crisis Inquiry Commission, 2010.

financial markets. The ongoing releveraging of the hedge fund sector, which reflects its still important linkages to the investment sectors, needs to be closely monitored.

In addition to these notable developments in the shadow banking sector, credit derivatives have recently acquired an important role as a transmission channel across financial sectors. This is the consequence of increasing risk stemming from sovereign securities. Credit protection against sovereign risks, whilst still only a minor share of the credit derivatives market, is taking an increasing share of that market, suggesting that contagion could spread across sectors and the credit derivatives market as a whole could be affected. Recent data from the Depository Trust & Clearing Corporation indicate that net nominal positions of sellers of CDS protection against sovereign risk stand at about USD 4.6 billion for Greece, USD 4.2 billion for Ireland, USD 6 billion for Portugal, USD 18.6 billion for Spain and USD 25 billion for Italy. This notwithstanding, there is no evidence of possible pockets of risk concentration (gross exposures), or of alternative forms of guarantees reducing the exposures through CDSs.

Exposures across sectors

Financial intermediation in the euro area financial system can be characterised by the financial links between the system and different macroeconomic sectors, such as the household, non-financial corporate or government sectors.

A notable development over the last six months has been the strengthening of the link between the financial and sovereign sectors. Fundamentally, the ratings of sovereigns determine baseline funding conditions for resident financial institutions in general and banks in particular, both in terms of market access and pricing. The reason is that it is not possible to diversify away the risks related to the resident sovereign. Almost without exception, this resulted in the ratings of banks being downgraded following the downgrade

Chart 4.43 Rating actions on selected sovereigns and subsequent bank rating actions

(June 2008 – Nov. 2011)
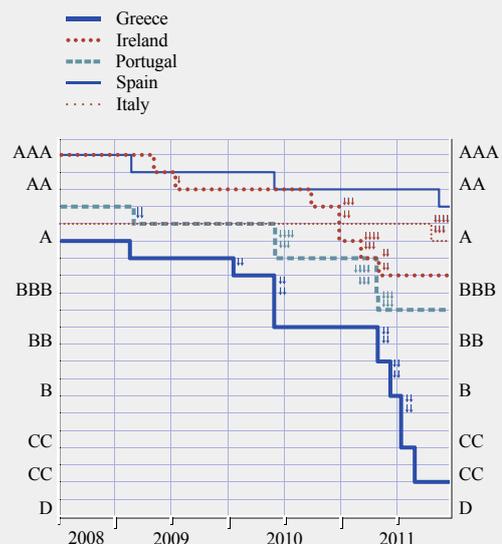
Source: Standard & Poor's.
Notes: The grey arrows represent the number of bank downgrades that have been made during the week following the sovereign downgrade. In the case of Ireland, S&P rates eighteen banks, in the case of Portugal seven banks, in the case of Greece four banks, in the case of Spain fourteen banks, and in the case of Italy seven banks.

of the host sovereign rating (see Chart 4.43). Uncertainty related to how these risks are to be mitigated also resulted recently in high volatility in the stock market valuation of banks, in particular in some countries.

In addition to sovereign support, sovereign-related problems could result in the subsequent forced sale of bank securities, as investors are generally bound by rating thresholds in their investment guidelines (see Section 4.2).

More generally, the banking system stands at the very core of the economy of the euro area, reallocating funds from savers to investors and functioning as the net recipient of financial resources (funding) from all sectors except non-financial corporations (NFCs) and government (see Chart 4.44).

Since the onset of the financial crises, the inter-sectoral dependency of most of the sectors in

Chart 4.44 Inter-sectoral holdings of financial assets in the euro area

(Q1 2011)

1 Non-financial corporations
2 Monetary financial institutions
3 Other financial intermediaries
4 Insurance companies and pension funds
5 Government
6 Households
7 Rest of the world
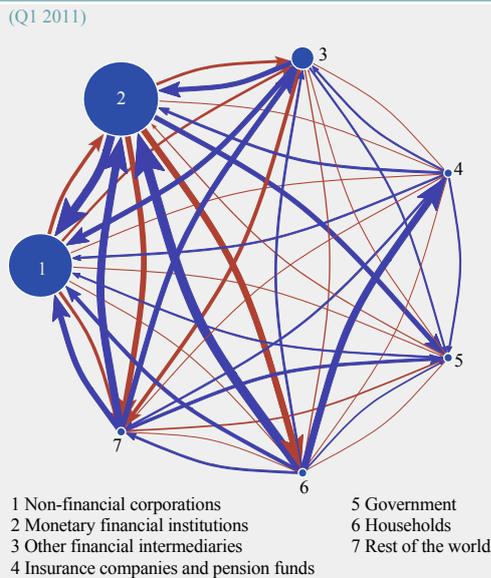
Source: ECB.
Note: The direction of the arcs reflects the financial assets of one sector vis-à-vis another sector. The thickness of the arcs reflects the relative size of these holdings. The relative sum of incoming or outgoing arcs indicates the degree of connectivity of one sector to the other sectors. The colours of the arcs indicate whether a sector is a net lender (blue) or net borrower (red) against the counterparty sector. The size of the nodes shows the intra-sector financial assets.

Chart 4.46 Selected inter-sectoral financial assets in the euro area by instrument

(Q1 2011; EUR billions)

- other
- investments in equity
- lending through securities
- loans and deposits
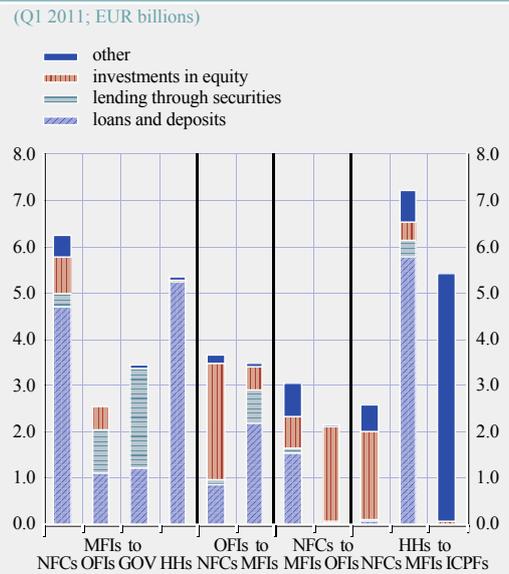
Source: ECB.
Notes: Only the sectors with financial assets vis-à-vis another sector exceeding €2.5 billion were selected. The inter-sectoral financial assets by instrument were estimated on the basis of financial accounts data using the maximum entropy method, except for loans and deposits. GOV stands for government, HHs for households and ICPFs for insurance companies and pension funds.

Chart 4.45 Degree of connectivity of various sectors in the euro area to the remaining sectors

(Q1 2000 – Q1 2011; percentage of total financial assets)

- non-financial corporations
- monetary financial institutions
- other financial intermediaries
- insurance companies and pension funds
- government
- households
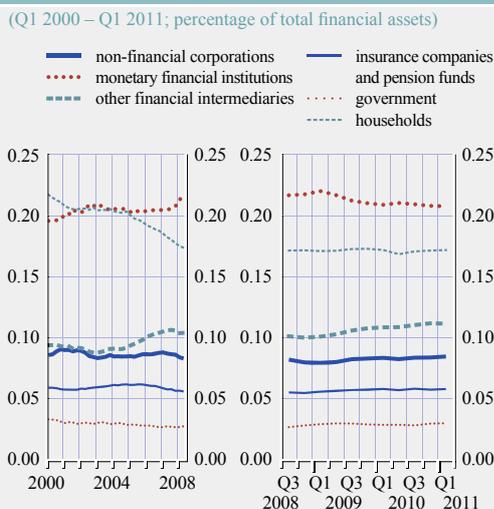
Source: ECB.
Note: The lines show the ratio of inter-sectoral financial assets (liabilities) of a sector to the total financial assets in the euro area. Assets and liabilities vis-à-vis the rest of the world were also included.

the euro area remained broadly stable, with a slight upward tendency for all sectors except the MFI sector (see Chart 4.45). The MFI sector experienced a decrease in this measure, largely due to an ongoing deleveraging process. The noticeable fall in the degree of households' inter-sector connectivity before the crisis was largely explained by the rapid accumulation of financial assets in the economy, while the build-up of financial assets in the household sector was slower owing to the fact that the latter invested considerably in the real estate market. After corrections in the real estate market, this trend is no longer apparent in several countries.

Risks to a given sector stem either directly from the counterparty sector, or indirectly from other sectors, as there is the potential for shock propagation. As the major counterparty to all other sectors, the banking system is particularly vulnerable to propagation risks.

BEYOND THE STRESS TESTING OF INDIVIDUAL BANKS: HOW SHOCK PROPAGATION THROUGHOUT THE ECONOMY MAY MULTIPLY INITIAL LOSSES

Stress tests aim at identifying weak points in financial systems by estimating the potential losses in individual financial institutions under various adverse but plausible scenarios. The majority of present methodologies are designed to capture the effect of stress on the capital buffers of the particular institution under examination. However, the assessment in many cases stops there, without considering potential knock-on effects on other institutions that might be interconnected with the institution under investigation. Such second-round effects might act as important amplifiers of stress in the financial system because in a modern economy bilateral financial interlinkages across various sectors are tight. As a result, financial stress in some sectors could cause a chain reaction in which the balance sheets of other financial and non-financial sectors might also be adversely affected.

Examination of the flow-of-funds data (from financial accounts) provides a way to assess the economic relevance of these interlinkages and can also provide information on the distribution of losses within the economy. A useful starting point is the observation that in the financial accounts each financial instrument issued has a counterparty. This means that if a sector experiences an adverse shock to the value of its assets, which is also reflected as a loss on its equity, this loss of equity value is transmitted to those sectors (or to other institutions within the sector itself) which hold that equity on the assets side of their balance sheets.[1] For example, when a banking sector in a given country faces loan impairments, the losses are reflected in lower equity values of that sector. Subsequently, other sectors holding the equity of the banking sector also suffer losses, which are proportionate to the size of the holdings of equity issued by banks. A process of shock propagation then kicks in, as the losses incurred by the other sectors are also reflected in their own equity values. Theoretically, the propagation process would continue as long as one of the following things happens: either some of the sectors report a positive earnings shock that more than offsets the initial shock that triggered the propagation, or, alternatively, the shock reaches a sector that either is not connected to any other sector[2] or is not subject to marking to market so that it does not need to deduct asset losses from its equity.[3]

Importantly, the overall losses and precise dynamics of the shock propagation mechanisms depend on the structural characteristics of the network of bilateral exposures. Charts A and B provide examples of the estimated bilateral exposure networks in one instrument category, quoted and unquoted shares, in two euro area countries. The banking system in country A is owned by domestic counterparties to a greater extent than in country B. As a result, a relatively larger proportion of bank impairment losses is passed into the spillover mechanism and overall losses tend to be higher. In country A, domestic sectors also invested in relatively large shares

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1 See O. Castrén and I. K. Kavonius, "Balance sheet interlinkages and macro-financial risk analysis in the euro area", *ECB Working Paper Series*, No 1124, 2009.

2 For instance, households and government sectors typically hold large amounts of equity issued by other sectors, but they do not issue their own equity; therefore, these sectors do not transmit the shocks further. The rest of the world sector can be expected to spread the shocks globally so that only a fraction would return back to the system that was initially affected. In the current assessment framework, it is assumed that the rest of the world does not transmit losses further.

3 Alternative shock propagation channels can be envisaged which originate from the liabilities side of a sector. For example, a liquidity shock may force the economic agents to curtail their asset holdings in order to maintain a specific balance sheet condition, such as a targeted leverage ratio. These asset reduction actions, in turn, have an impact on the liabilities side of the sectors that are the counterparties of the instrument positions which are subject to changes.

Chart A Quoted and unquoted share holdings in country A as reported in the financial accounts
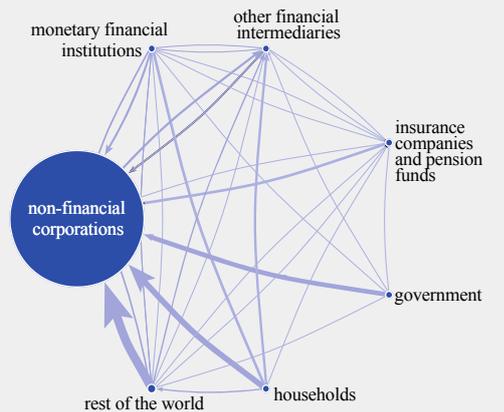
monetary financial institutions

other financial intermediaries

insurance companies and pension funds

non-financial corporations

government

rest of the world

households

Sources: ECB and ECB calculations.
Notes: The direction of the arcs reflects the equity holdings of one sector by another sector, while the thickness of the arcs reflects the relative size of those holdings. The nodes reflect intra-sectoral holdings of equity.

Chart B Quoted and unquoted share holdings in country B as reported in the financial accounts
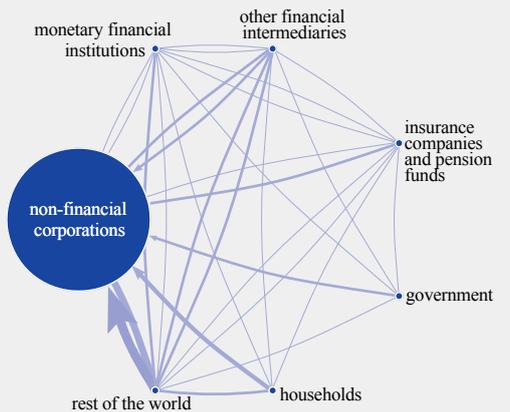
monetary financial institutions

other financial intermediaries

insurance companies and pension funds

non-financial corporations

government

rest of the world

households

Sources: ECB and ECB calculations.
Notes: The direction of the arcs reflects the equity holdings of one sector by another sector, while the thickness of the arcs reflects the relative size of those holdings. The nodes reflect intra-sectoral holdings of equity.

of equity which is issued by other sectors. In country B, in contrast, the structure of bilateral equity holdings features the rest of the world sector playing a more prominent role. Therefore, in country A, the spillover effects would tend to be concentrated in the domestic economy, while country B would "export" them abroad.

To illustrate these points, Charts C and D plot a hypothetical shock propagation and convergence process for countries A and B in the case where the shock is assumed to be a permanent impairment of MFI sector loans to households, non-financial corporations and the rest of the world.[4] The size of the shock was computed to be consistent with the results of the credit risk stress test under the uniform shock scenario (see Section 4.2.3).[5] The estimations indicate that the shock has largely converged in ten iterations.

The exercise reveals that there are important differences between the two economies in how losses are propagated. In particular, countries where shocks propagate mostly across the domestic financial and non-financial sectors are more severely hit by spillover effects. This is the case of country A where the cumulated loss of each domestic sector on average reaches 0.21 of its financial assets. In country B where the rest of the world sector acts as an important shock absorber, the average cumulative loss of domestic sectors remains at 0.05 of financial assets.

Overall, the analysis of financial networks at different levels of aggregation is rapidly gaining importance in financial stability assessment, as it allows for estimating how the adverse impact of a given financial disturbance might multiply along the bilateral linkages among firms and sectors. This makes it possible to rank alternative scenarios in terms of the losses that are generated in the subsequent rounds as a result of propagation effects. In addition, structural features of networks

4   The latter was included to approximate for the consolidated MFI balances as flow-of-funds statistics are reported on an unconsolidated basis.
5   The size of the shock was derived from the bank-specific stress-test output as the difference between the weighted average cumulative two-year loss rate under the adverse scenario and baseline scenario. In this vein, the unexpected component of the loan impairment loss, which should not be priced in equity, is captured.

Chart C Impact of the propagation of the shock through the country A economy

(Q1 2011; x-axis: number of propagation rounds;
y-axis: propagation losses measured as a percentage of financial
assets of the sector; reported as a cumulative sum)

— non-financial corporations
⋯⋯ monetary financial institutions
— — other financial intermediaries
— insurance companies and pension funds
⋯⋯ government
— — households
—·— rest of the world
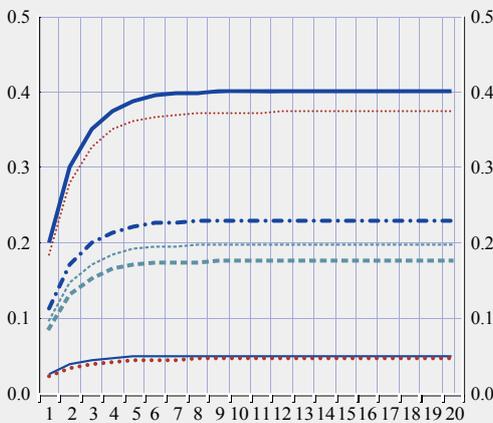
Sources: ECB and ECB calculations.

Chart D Impact of the propagation of the shock through the country B economy

(Q1 2011; x-axis: number of propagation rounds;
y-axis: propagation losses measured as a percentage of financial
assets of the sector; reported as a cumulative sum)

— non-financial corporations
⋯⋯ monetary financial institutions
— — other financial intermediaries
— insurance companies and pension funds
⋯⋯ government
— — households
—·— rest of the world
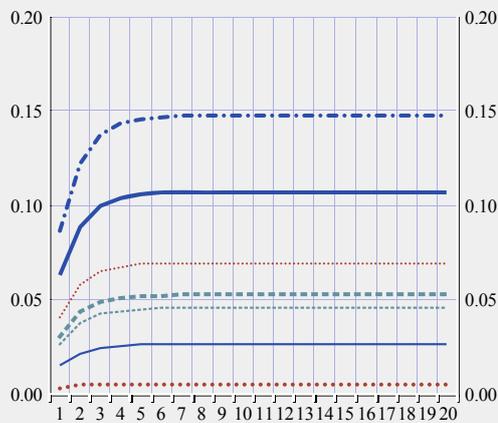
Sources: ECB and ECB calculations.

of bilateral linkages, which may not be fully understood, may be important factors in determining the overall losses from shock propagation. Analysis which highlights these features can therefore generate policy recommendations which focus on mitigating the adverse implications of these structural characteristics.

IV SPECIAL FEATURES

A COMMON EQUITY CAPITAL, BANKS' RISKINESS AND REQUIRED RETURN ON EQUITY

In the ongoing reform of the financial system, a key regulatory objective is to increase the soundness and resilience of banks. In line with this objective, regulators have placed emphasis on higher common equity capital requirements. The industry has been critical of a higher reliance on equity. Since equity is the most expensive source of capital, it is often asserted that higher equity ratios may materially increase banks' funding costs, with adverse consequences for credit availability.

Based on a sample of large international banks, this special feature provides an assessment of the relationship between banks' equity capital, riskiness and required return on equity. Following a methodology employed in recent papers, an attempt is made to measure these relationships in the light of the hypothesis of Modigliani and Miller[1] on the irrelevance of the capital structure for the value of the firm.

The empirical evidence discussed in this special feature supports the notion that higher capital requirements tend to be associated with a decrease in the riskiness of equity returns and thus of the required risk premium, in line with the theoretical argument. This conclusion counters the industry's concern about a material increase in funding costs and further supports the regulators' focus on higher equity requirements.

INTRODUCTION

The new Basel III standards for internationally active banks represent the cornerstone of the revised global regulatory reform. The overarching objective of Basel III is to strengthen the quantity, quality and consistency of the regulatory capital base. To achieve this aim, regulators have chosen to place particular emphasis on the component of capital which has the highest loss-absorbing capacity in a going concern, namely common equity. Under the

previous regime, banks could hold as little as 2% of common equity as a share of risk-weighted assets. The new rules demand a higher common equity ratio equal to 7% of risk-weighted assets, i.e. the new minimum (4.5%) plus the capital conservation buffer (2.5%).[2]

In addition to Basel III, a parallel strand of work has addressed systemically important financial institutions (SIFIs). Joint efforts by the Basel Committee and the Financial Stability Board have resulted in the publication of a consultative document proposing a set of measures to *initially* be applied to global systemically important banks (G-SIBs).[3] These measures are specifically designed to address the negative externalities and moral hazard posed by these firms.

According to the consultative document, G-SIBs will need to satisfy additional loss-absorbency requirements beyond Basel III. In quantitative terms, the framework proposes a progressive capital surcharge, ranging from 1% to 2.5% of common equity, depending on a bank's systemic importance.[4] Crucially, regulators have chosen to focus exclusively on common equity as the eligible tool for meeting the surcharge.

Overall, the regulatory focus on higher common equity requirements has evident benefits: (i) it makes an institution more resilient to adverse shocks; and (ii) it reduces the probability and the impact of default, and thus the severity of the externality imposed on the broad financial system.

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1 F. Modigliani and M. Miller, "The cost of capital, corporation finance and the theory of investment", *American Economic Review*, No 48, 1958.

2 This increase is further bolstered by the stricter definition of eligible capital components, which aims to eliminate elements that are not truly loss-absorbing in stress periods.

3 The focus on global banks is only an initial step. It is foreseen that the framework will be extended to all SIBs and to non-bank SIFIs. See Basel Committee on Banking Supervision, "Global systemically important banks: Assessment methodology and the additional loss absorbency requirement", 2011.

4 Systemic importance is measured according to an indicator-based methodology developed by the Basel Committee. While an examination of this methodology is beyond the scope of this special feature, it is key for the overall framework.

The decisions leading to both the Basel III requirements and the surcharge on G-SIBs benefited from impact and calibration studies that have shown that the overall long-term effect of the new standards on banks' lending capacity and, ultimately, on the real economy will be moderate, especially if phased in gradually. Based on the results of these studies, the international regulatory community agreed to introduce the capital conservation and counter-cyclical capital buffers (envisaged under Basel III) as well as the higher loss-absorbency requirements for G-SIBs between January 2016 and the end of 2018. This delayed timeline has been devised to give banks time to adjust to the new rules, while minimising short-term disturbances to banks' strategies, business models and capital planning.

A THEORETICAL PERSPECTIVE ON THE COST OF EQUITY

While generally supporting the underlying objectives of the regulatory reform, the industry has criticised the introduction of higher common equity requirements as a decision fraught with potentially adverse consequences. T he industry's core argument is based upon the premise that equity is more expensive than debt because it is riskier. This implies that increasing the equity share in the capital structure (i.e. decreasing banks' leverage) would adversely affect banks' realised return on equity. The industry claims that the return on equity required by investors to hold banks' equity would be broadly insensitive to the decrease in leverage, thus leading to a material increase in funding costs. In turn, this substantially higher cost of funding for banks would translate into a higher cost of credit for clients and counterparties and possibly in lower credit availability.

In spite of the industry criticism, financial theory provides the intellectual basis to defend the insistence on higher common equity, including from a cost of funding perspective.[5] The theoretical benchmark is the well-known Modigliani and Miller (M-M) theorem[6] on the irrelevance of the capital structure for the value of the firm, under a certain set of conditions. Starting with Miller[7], several scholars[8] have argued that there are no strong logical arguments against the theoretical validity of the M-M proposition for banks.[9] Indeed, the M-M theorem shows that the industry's view of the cost of equity as *invariant to the degree of leverage* is logically flawed. The fallacy lies in the fact that, as leverage declines, the riskiness of banks' equity declines as well, and so does the rate of return investors require to hold equity. This effect offsets the increased weight of the more expensive equity in the capital structure, so that – absent taxes and other frictions – the overall cost of capital stays unchanged as bank leverage varies.[10] This is the essence of the M-M result.

The crucial issue is that higher equity reduces leverage. Hence, as claimed by the industry, reduced leverage decreases the return on equity in good times[11] (when a bank earns more than its cost of capital, i.e. when it makes a profit). At the same time, however, it increases the return on equity in bad times, i.e. when a bank experiences a loss. In other words, higher equity capital lowers the return on equity in good times, but raises it in bad times: the volatility of equity returns decreases. As a result, the risk borne by shareholders also falls. Since rational pricing implies that a less risky financial claim commands a lower risk premium, it follows that the required return on equity for a better capitalised bank will also fall.

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5 Beyond a purely prudential perspective.
6 Modigliani and Miller, op. cit.
7 M. Miller, "Do the M&M propositions apply to banks?", *Journal of Banking and Finance*, No 19, 1995.
8 For a thorough exposition, see A. Admati, P. DeMarzo, M. Hellwig and P. Pfleiderer, "Fallacies, irrelevant facts and myths in the discussion of capital regulation: why bank equity is not expensive", *Stanford Graduate School of Business Research Paper Series*, No 2063, 2011.
9 The findings in Gropp and Heider suggest that there are considerable similarities between the capital structures of banks and non-financial firms (see R. Gropp and F. Heider, "The determinants of bank capital structure", *Review of Finance*, No 14, 2010).
10 The argument assumes that the riskiness and the profitability of the firm do not change in response to changes in the capital structure. It cannot be excluded, however, that higher capital requirements could induce changes in banks' strategies and risk profiles.
11 Basically, the same level of profit is distributed over a larger equity stake.

The validity of the M-M result hinges on a set of assumptions, namely: complete and frictionless markets, symmetric information, lack of agency problems and no taxes. In practice, the existence of deviations from these idealised conditions suggests that one cannot expect a full M-M effect. Moreover, there are reasons that may further undermine the logic of the M-M theorem in the case of banks, and especially large banks. First, banks are highly leveraged institutions for which the value of the tax shield of debt (i.e. the fiscal advantage delivered by the deductibility of interest expenses) tends to be fairly sizeable. Second, in the case of large banks deemed "too big to fail", the implicit government guarantee to rescue a bank nearing insolvency translates into a lower risk premium charged by shareholders and creditors: correctly anticipating a bail-out, investors rationally underprice the cost of bankruptcy. Third, banks are unique with respect to other economic agents in that they are able to issue money-like liabilities, which command a liquidity premium and a convenience yield that decrease their interest rate. The argument is usually applied to deposits, but a strand of banking theory suggests that it can be extended to most banks' short-term liabilities, such as repos and other forms of short-term wholesale funding.[12]

Ultimately, the extent of the validity of the M-M proposition for banks is an empirical question that deserves appropriate analysis. As discussed, while it may be excessive to expect a full M-M effect, there are solid reasons why a negative relationship between banks' risk and capital is to be expected. The issue is of evident importance, since a validation of the M-M implication would sharply undermine the industry's key concern about a sizably higher cost of funding.

TESTING THE M-M EFFECT ON A SAMPLE OF LARGE INTERNATIONAL BANKS

Kashyap et al.[13] and Miles et al.[14] have recently tested the M-M hypothesis on a sample of US and UK banks respectively. With regards to these two countries, the findings of the papers provide evidence of a significant negative relationship between leverage, on the one hand, and banks' riskiness and return on equity, on the other hand.

This special feature investigates whether these findings also apply at a global level, by taking into account a broader sample of large, internationally active banks. This empirical investigation is further justified by the regulatory decision to require that a set of designated G-SIBs fully meet the capital surcharge, beyond the Basel III standards, through common equity.

In the following, the methodology proposed by Kashyap et al. and Miles et al. is applied to a sample of large, international commercial, universal and investment banks. For this purpose, a panel of publicly listed international banks was constructed.[15] The dataset, gathered via Bloomberg on a consolidated basis, includes semi-annual balance sheet data for banks headquartered in 18 countries, spanning the period from the first half of 1995 to the second half of 2011.

The starting point for the sample was the 70 largest global commercial and investment banks in terms of total assets as of year-end 2010. Data quality checks led to a final sample of 54 banks.[16] In particular, the data were cleaned to exclude: (i) banks with no observations for either the dependent or one of the explanatory variables; (ii) banks with no data available before 2004[17]; and (iii) data entry errors[18].

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12 Building on this key observation, Stein argues that it is privately efficient for a bank to set a very high level of debt, beyond what is socially optimal (see J. Stein, "Monetary policy as financial-stability regulation", *Quarterly Journal of Economics*, forthcoming).

13 A. Kashyap, J. Stein and S. Hanson, "An analysis of the impact of 'substantially heightened' capital requirements on large financial institutions", University of Chicago Booth School of Business and Harvard University, 2010.

14 D. Miles, G. Marcheggiano and J. Yang, "Optimal bank capital", *CEPR Discussion Paper Series*, No 8333, 2011.

15 See Table A.4 for the list of international banks in the sample.

16 The smallest bank in the sample held total assets of above €185 billion at the end of 2010.

17 To avoid relying on a sample where the financial crisis which started in 2007 is overrepresented.

18 Such as unit errors and incorrect decimal places.

While no attempt is made to develop criteria to select a set of G-SIBs, this sample of the largest international banking groups comprises most of the G-SIBs identified by the Basel Committee on Banking Supervision and the Financial Stability Board. Thus, the findings of the analysis are also related to the decision of regulators to focus on common equity as the instrument for meeting the surcharge requirements.

Do higher levels of equity capital decrease banks' risk?

As discussed, the empirical test performed here follows the simple approach proposed by Kashyap et al. and Miles et al.

The starting point of the analysis is to choose a suitable measure of banks' equity risk. A natural and easily computable measure is the beta (β) of the bank's share price, as defined within the capital asset pricing model (CAPM).

For each bank, its equity beta is estimated over a six-month rolling window using traded daily stock market returns together with the returns for the reference national index, from the first half of 1995 until the second half of 2011. Then, the relationship between banks' *risk* (proxied by the banks' equity beta) and *equity capital* is tested.[19] While several measures of bank equity capital are available, the chosen variable is the ratio of common equity to total assets. This is in line with both the market and the regulatory focus on common equity as the capital component with the highest loss-absorbing capacity in a going concern.

The model estimated is a simple fixed effects regression[20]:

$$\hat{\beta}_{it} = a_i + bCapratio_{it-1} + X_{it}'c + d_t + u_{it}$$

for banks $i = 1...J$ and time periods $t = 1, 2, ...T$,

where a_i is a vector of bank-specific fixed effects, X a matrix of regressors that include control variables and d_t a vector of time fixed effects.

The inclusion of time fixed effects (d_t) in the regression makes it possible to account for factors that have an impact on banks' average risks from year to year, such as a general economic boom or downturn. It should be noted that it is possible that leverage (i.e. the inverse of the capital ratio) and banks' riskiness are simultaneously determined by a bank's manager. In other words, the causal link between leverage and beta is not assured as it could also run in the opposite direction. For instance, a bank manager may first set a target risk profile and then decide on the leverage that is consistent with the target. More generally, as noted by Kashyap et al., banks with different risk profiles may choose different capital structures.

In order to account for this potential endogeneity problem, the beta is regressed on the lagged capital ratio. Furthermore, the choice of control variables attempts to capture other factors that can affect banks' risk which are specific to each bank: return on assets (to account for overall bank profitability), total assets (to account for size), and risk-weighted assets (to control for a regulatory measure of balance sheet risk).

The results of the regressions are shown in Table A.1. Column (1) shows the baseline regression where the only regressor is the lagged capital ratio.[21]

As predicted, the coefficients show that banks' risk (proxied by the beta) declines with increases in the equity-to-assets ratio. The results are highly significant, suggesting that higher bank capital reflects in lower bank market risk.[22]

19 Under the CAPM, and provided that banks' debt is uncorrelated with the market portfolio, a simple linear relationship holds between the equity beta and leverage. See Miles et al. for details.
20 Results remain qualitatively unchanged under the random effects specification, although the capital ratio coefficient declines somewhat.
21 Given the choice of a fixed effects model, the tables only report the *R-squared within*.
22 Robustness tests show that estimates remain highly significant when employing other measures of capital, such as tangible common equity over total assets or common equity over risk-weighted assets. However, the more limited coverage of these data for the sample leads to a reduced number of observations.

Table A.1 Dependent variable: banks' beta (fixed effects estimation), standard errors are robust to clustering at year and bank level

	(1)	(2)
Common equity $_{it-1}$ / assets $_{it-1}$	-0.045	-0.079
	[0.016]***	[0.021]***
Return on assets		-0.072
		[0.036]**
Log risk-weighted assets		0.294
		[0.133]**
Log total assets		-0.205
		[0.121]*
Constant	1.494	0.493
	[0.129]***	[1.242]
Observations	1,372	652
R-squared within	0.360	0.530

Notes: Standard errors in brackets; * significant at 10%, ** significant at 5%, *** significant at 1%.

Table A.2 Gauging the Modigliani-Miller effect

	(1)	(2)
Common equity $_{it-1}$ / assets $_{it-1}$	-0.045	-0.079
	[0.016]***	[0.021]***
Average common equity / assets	5	
Average beta	1.1	
Δ in average beta given a 100% increase in capital	-0.225	-0.400
Δ in average beta given a 100% increase in capital, under full M-M validity	-0.550	-0.550
Final average beta	0.875	0.701
M-M effect	**41%**	**73%**

Notes: Standard errors in brackets; * significant at 10%, ** significant at 5%, *** significant at 1%.

Column (2) of Table A.1 reports the results of the baseline regression augmented to include additional control variables. The coefficient on the capital ratio and the explanatory power both increase considerably. The coefficients on the control variables also appear significant and of the expected sign. The banks' equity beta increases in total risk-weighted assets, while it decreases in both higher profitability, as measured by return on assets, and size. Although only marginally significant at conventional levels, the negative sign on size may reflect the fact that larger banks are perceived by the market as less risky, owing to better diversification. On the other hand, it could also reflect the implicit government guarantee to bail out the firm when in distress.

These results allow a comparison of the estimated magnitudes with those predicted by the M-M proposition. A full M-M effect implies that when the capital ratio doubles, the beta should decline by half, since the same equity risk is spread over a layer of equity twice as large. The average ratio of equity to assets in the sample is 5%, while the average beta is 1.1. Thus, if the equity ratio doubles to 10%, the beta should fall by half, to 0.55. Table A.1 shows that the coefficient of the equity ratio is -0.045. This coefficient implies that if the equity ratio goes up by 5% (i.e. it doubles), the beta will fall by 0.225 to 0.875 (since 0.045*5 = 0.225).

Given that with a full M-M effect, the beta would fall by 0.55, this implies a M-M effect of 41% (= 0.225/0.55).[23]

Table A.2 summarises the results for the baseline regression (column (1)) and the one including controls (column (2)). Overall, the estimates suggest a M-M effect in a range of 41% to 73%, depending on the specification, thus confirming the findings of Kashyap et al. (and Miles at al.). Indeed, these two papers estimate the M-M effect to range between 45% and 75%.

Do higher levels of equity capital decrease banks' required return on equity?

The estimates discussed so far hinge on the validity of the CAPM. A more direct way of testing the M-M effect would be to investigate the relationship between the required return on bank equity and the capital ratio. Unfortunately, data about earnings expectations are not widely available. As suggested by Miles et al., an alternative, albeit imperfect, approach

23 To gauge the implication for the return on equity, recall that, under the CAPM, the expected risk premium (i.e. return on equity net of the risk-free rate) on an individual stock is the product of the beta multiplied by the market risk premium. Assuming a risk-free rate and a market risk premium both equal to 5%, the estimates in the regression including controls suggest a decline in the equity risk premium for the average bank of 2%, from 5.2% to 3.2%, upon a doubling in the equity ratio. Such an effect is equivalent to 77% of what would be expected under a full M-M effect.

is to employ the realised returns on equity (i.e. the earnings yield on the banks' stock) as a proxy for expected returns.

Table A.3 summarises the results of a simple fixed effects[24] regression of the earnings yield on the common equity ratio.[25]

These estimates suggest that the common equity ratio is also significant in explaining the movement in the required return on bank equity as proxied by realised earnings: the higher the equity ratio, the lower the required return on equity. For a one unit increase in capital, the required return on equity is estimated to decrease by about 40 basis points.

Using these results it is possible to directly compute the decline in the required return on equity associated with a decrease in leverage. Consider the coefficient on the common equity ratio (-0.0041) in Table A.3. At the average equity ratio in the sample, the required return on equity is about 0.123 + (-0.0041*5) = 10.3%. Assuming a risk-free rate of 5%, the equity risk premium of a bank with this capital would be 5.3%. If the capital ratio doubles to 10, the required return on equity would now be 0.123 + (-0.0041*10) = 8.2%, yielding an equity risk premium of 3.2%. Under a full M-M effect, the equity risk premium should fall by half to 2.65%. Altogether, these computations imply that, upon doubling the equity ratio, the reduction in the risk premium on bank equity is around 78%[26] of the reduction expected under a full M-M effect.

Table A.3 Dependent variable: earnings over share price ratio, standard errors are robust to clustering at both year and bank level	
Common equity $_{it-1}$ / assets $_{it-1}$	-0.0041
	[0.0019]**
Constant	0.123
	[0.011]***
Observations	1,277
R-squared within	0.12

Notes: Standard errors in brackets; * significant at 10%, ** significant at 5%, *** significant at 1%

CONCLUDING REMARKS

The evidence presented in this special feature supports the existence of a sizeable M-M effect for a sample of 54 large international banks during the period from the first half of 1995 to the second half of 2011. An increase in the equity ratio (a decrease in leverage) is associated with a decline in both the riskiness of the bank (as proxied by the equity beta) and the required return on its equity (as proxied by the earnings yield). The estimates range between 41% and 78% of what would be predicted under a full effect. Given the caveats limiting the extent of the validity of the M-M assumption in the case of large banks, it is remarkable that these figures are both sizeable and highly significant.[27] Furthermore, they are in line with the findings of Kashyap et al. and Miles et al. for samples of US and UK banks respectively.

The observation that higher common equity ratios are associated with lower risk premia as well as a decline in banks' required return on equity largely downplays the industry's concern about a material increase in funding costs. Ultimately, this evidence provides further support[28] for the regulatory emphasis on higher minimum equity capital requirements in the overhaul of banking regulation. Overall, higher equity requirements are conducive to a less risky banking system, with only modest,

24 This specification also includes year effects. Results remain qualitatively unchanged under the random effects specification.
25 The significance of the coefficient on the capital ratio further improves when employing tangible common equity over total assets as a measure of capital, although its value declines to -0.0033.
26 78% = (5.3-3.2)/(2.65).
27 The fact that the equity beta does not fully reflect changes in leverage may also be due to changes in banks' risk profiles as well as to the inability of investors to promptly recognise the change in risk or to fully rebalance their portfolios.
28 In spite of the findings of this special feature, it cannot be ruled out that some banks may nonetheless react to higher capital requirements by increasing risk. For instance, this behaviour could be induced by flawed incentives in compensation packages, often anchored to non-risk-adjusted performance. Strong and effective supervision remains key. It is the task of supervisors to ensure that the reform will realise its beneficial effects without triggering undesirable consequences.

if any, negative effects in terms of the cost of funding. In particular, this analysis of a sample of large international banks vindicates the

decision taken by international authorities that G-SIBs should fully meet the surcharge with common equity.

However, one caveat is in order. These findings relate to a broad structural link between equity ratios and the cost of equity. They do not suggest that *raising* equity capital in private markets is without cost. Indeed, the well-known debt overhang problem[29] as well as asymmetric information[30] issues suggest that capital issuance can be costly, especially under stressed market conditions. By providing an appropriately long phasing-in period for the new requirements, these concerns have been taken into account by the regulatory community. Indeed, the higher capital ratios could be largely achieved via retained earnings.

Finally, it is worth recalling that recent studies have also suggested that a positive relationship may hold between levels of capital and firm value.[31] These findings point to potential beneficial effects of higher equity capital requirements, which go beyond the neutrality result of M-M.

Table A.4 List of the 54 international banks included in the sample, by country

Bank	Country
Erste Group Bank	Austria
Observations	Australia
Australia and New Zealand Banking Group	Australia
Commonwealth Bank of Australia	Australia
National Australian Bank	Australia
Westpac Banking	Australia
Dexia	Belgium
KBC Group	Belgium
Banco Do Brasil	Brazil
Bradesco	Brazil
Itau Unibanco	Brazil
Bank of Montreal	Canada
Bank of Nova Scotia	Canada
Canadian Imperial Bank of CA Commerce	Canada
Royal Bank of Canada	Canada
Toronto-Dominion Bank	Canada
Credit Suisse	Switzerland
UBS	Switzerland
Commerzbank	Germany
Deutsche Bank	Germany
Deutsche Postbank	Germany
Danske Bank	Denmark
Banco Santander	Spain
BBVA	Spain
BNP Paribas	France
Crédit Agricole	France
Société Générale	France
Intesa Sanpaolo	Italy
Unicredit	Italy
Mitsubishi UFJ	Japan
Mizuho	Japan
Nomura Holdings	Japan
Shinkin Central	Japan
Sumitomo Mitsui	Japan
Woori Financial Group	Korea
ING Group	Netherlands
DnB NOR	Norway
Nordea	Sweden
SEB AB	Sweden
Svenska Handelsbanken	Sweden
Swedbank AB	Sweden
Barclays	United Kingdom
HSBC	United Kingdom
Lloyds Bank	United Kingdom
Royal Bank of Scotland	United Kingdom
Standard Chartered	United Kingdom
Bank NY Mellon	United States
Bank of America	United States
Citigroup	United States
Goldman Sachs	United States
JP Morgan	United States
Morgan Stanley	United States
PNC Financial	United States
US Bancorp	United States
Wells Fargo	United States

29 The debt overhang problem, i.e. the difficulty of raising equity when doing so disproportionally benefits creditors, was first identified by Myers (see S. Myers, "Determinants of corporate borrowing", *Journal of Financial Economics*, No 5, 1977).

30 The adverse selection problem of raising equity in private markets is linked to the idea that managers have private information that investors do not have. As such, investors will tend to discount the price of equity, thus increasing the issuance costs for the firm. The main result here is the celebrated "pecking order theory", according to which a firm raises capital preferentially via retained earnings. See S. Myers and N. Majluf, "Corporate finance and investment decisions when firms have information that investors do not have", *Journal of Financial Economics*, No 13, 1984.

31 For instance, Berger and Bouwman show that capital helps medium and large banks to survive banking crises; obviously, banks which default incur massive value losses (see A. Berger and C. Bouwman, "Bank capital, survival, and performance around financial crises", *Working Paper Series*, No 09-24, Wharton Financial Institutions Center, 2009). More directly, Mehran and Thakor show that bank value and banks' equity capital are positively correlated in the cross-section (see H. Mehran and A. Thankor, "Bank capital and value in the cross-section", *Review of Financial Studies*, No 24(4), 2011).

B   EMPIRICAL DETERMINANTS OF NON-PERFORMING LOANS[1]

This special feature reviews trends in the credit quality of banks' loan books over the past decade, measured by non-performing loans, based on an econometric analysis for a panel of 80 countries. The assessment of overall asset quality and credit risk in the financial sector is an important element of macro-prudential surveillance. A thorough understanding of the main drivers thus facilitates the identification of key vulnerabilities in the financial sector.

Results suggest that – not surprisingly – real GDP growth has been the main driver of non-performing loans during the past decade. Exchange rate depreciations are also linked to an increase in non-performing loans in countries with a high degree of lending in foreign currencies to unhedged borrowers. In addition to these two factors, equity prices also have an impact on non-performing loans, in particular in countries with large stock markets relative to the size of the economy. Finally, interest rates also tend to affect loan quality.

While these findings are found to be robust in the heterogeneous panel dataset, such results should only be applied with great caution to individual countries where additional country and sector-specific factors might have an impact on non-performing loans.

INTRODUCTION

The credit quality of loan portfolios across most countries in the world remained relatively stable in the decade prior to the outbreak of the financial crisis which hit the global economy in 2007/08. Thereafter, the credit quality of loan portfolios deteriorated sharply – tightly linked to the subsequent global economic recession. The fact that loan performance is tightly linked to the economic cycle is well known and not surprising.[2] Notwithstanding a generalised deterioration of loan performance during the global recession, developments have been uneven across countries: the advanced and financially more developed economies as well as countries with specific vulnerabilities have been greater affected. At the same time, some observers have wondered whether the increase in non-performing loans should have been even more pronounced, given the severity of the recession in many countries.

This special feature examines trends in non-performing loan ratios across 80 countries[3], explaining their variation over the past decade and across countries on the basis of an econometric model. Such an analysis is of interest from a financial stability perspective because an assessment of overall asset quality and credit risk in the financial sector is an important element of macro-prudential surveillance. A thorough understanding of its drivers thus facilitates the identification of key vulnerabilities in the financial sector.

The article presents new results on the empirical determinants of non-performing loans mainly by employing a novel dataset covering a large number of countries. Exploiting cross-country variation in non-performing loan trends is likely to yield more robust results than an analysis of individual countries. In fact, time series for non-performing loans are typically short, often covering, at most, ten years of annual data, in particular among the emerging markets. At the same time, studies based on bank-by-bank data are only available for a few economies, meaning that the impact of cross-country differences with respect to structural characteristics on asset quality cannot be studied.

THE EVOLUTION OF BANK ASSET QUALITY DURING THE PAST DECADE

Among the advanced economies, bank asset quality gradually improved from the start of the last decade as non-performing loan ratios declined

1   The special feature draws on R. Beck, P. Jakubik and A. Piloiu, "Asset quality and macroeconomic performance: What role for the exchange rate and stock prices?", *ECB Working Paper Series*, forthcoming.
2   M.H. Pesaran, T. Schuermann, B. Treutler and S.M. Weiner, "Macroeconomic Dynamics and Credit Risk: A Global Perspective", *Journal of Money, Credit, and Banking*, No 38, Vol. 5, 2006.
3   For the regression analysis, the number of countries was reduced for some specifications owing to missing data for indicators employed as independent variables, as explained in more detail below.

**Chart B.1 Annual growth rate of
non-performing loan ratios**

(percentage change per annum)

— emerging markets
······ advanced economies
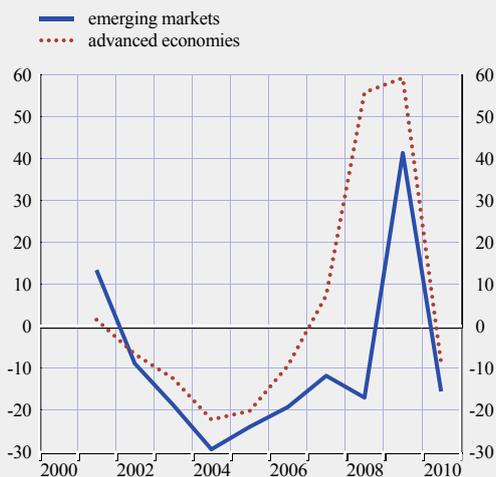
Sources: IMF, World Bank and ECB calculations.
Notes: Definitions for non-performing loan ratios have been harmonised to the extent possible, but may still vary across countries. Aggregates for "advanced economies" and "emerging markets" were computed following IMF classifications and weighted using national GDP based on purchasing power parity (PPP) valuation in US dollar terms.

**Chart B.2 Rise in non-performing loan ratios
versus real GDP growth in 2009, full sample**

(percentage change per annum)

x-axis: real GDP growth
y-axis: growth of NPL ratio
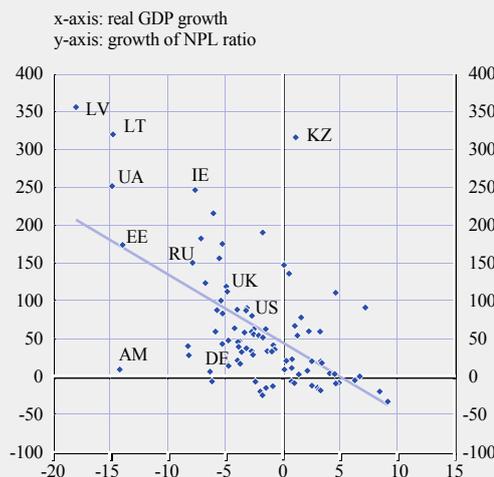
Sources: IMF, World Bank and ECB calculations.

from around 3.0% of total loans in 2000 to around 1.5% in 2006.[4] When problems in the US sub-prime mortgage sector started to emerge in 2007, the amount of non-performing loans began to increase and grew further in 2008 and 2009.

In the emerging markets, the level of non-performing loans was still considerably higher than in advanced economies[5] at the beginning of the last decade as banks still bore the consequences of past currency and banking crises in emerging markets, most notably those in Asia (1997), Russia (1998), Brazil (1999), Turkey (2001) and Argentina (2002). Thereafter, bank asset quality among the emerging markets improved substantially up until 2008, at which point emerging markets also began to feel the effects of the global financial crisis. In 2009 asset quality in the emerging markets deteriorated, but the growth rate of non-performing loan ratios was at around 40%, somewhat lower than in the advanced economies where average non-performing loan ratios increased in 2009 by around 60% (see Chart B.1).

4   For this article, two datasets from the IMF and the World Bank were combined. The IMF's list of Financial Soundness Indicators includes data for non-performing loans from 2005 until 2010 for a large number of countries. The World Bank also provides data for non-performing loans starting from 2000. The dataset from the IMF formed the basis and was complemented by the World Bank data in order to extend the time dimension of the final sample, as well as to take into consideration information on non-performing loans prior to 2005. Possible methodological differences across the definitions of non-performing loans were addressed by comparing the overlapping periods of the datasets: the World Bank dataset was included only when there were no significant differences in levels. Formal tests reject the hypothesis of a structural break in the sample.

5   Since the definitions of non-performing loans vary across countries, comparisons of the levels of non-performing loans across countries and regions should be interpreted with caution. According to the most commonly used ("reference") definition, a default occurs when the bank considers that "an obligor is unlikely to pay its credit obligations to the banking group in full, without recourse by the bank to actions such as realising security (if held)"; or "the obligor is past due more than 90 days on any material credit obligation to the banking group" (Basel Committee on Banking Supervision, paragraph 452). Based on this definition, non-performing loans should include all loans which are 90 days overdue. However, some countries report in their statistics all loans which are 31 days overdue, in some cases those which are 61 days overdue and some countries do not comply with the international standards at all. Therefore, the employed data sample was carefully checked and corrected, where possible, for apparent differences in the applied definitions for non-performing loans.

x-axis: minimum real GDP growth during past crises
(percentage change per annum)
y-axis: peak NPL levels during past crises
(percentage of total loans)

$NPL = -0.9455GDP + 26.163$
$R2 = 0.0853$

Sources: IMF, World Bank, ECB calculations and Laeven and Valencia, op. cit.
Notes: Both panels cover the same group of countries. Past crises refer to the systemic banking crises during the period 1981-2003 including 44 countries, covering among others, the Asian, Latin American and Scandinavian banking crises.

x-axis: minimum real GDP growth during past crises
(percentage change per annum)
y-axis: peak NPL level between 2008 and 2010
(percentage of total loans)

$NPL = -0.4765GDP + 5.5436$
$R2 = 0.2103$

Sources: IMF, World Bank, ECB calculations and Laeven and Valencia, op. cit.
Note: See notes to Chart B.3.

At the country level, developments in asset quality were considerably heterogeneous – in particular with respect to the deterioration in 2009. Whereas in some countries non-performing loans increased by more than 300% (e.g. in some Baltic countries), in other countries asset quality remained stable or even slightly improved. Previous studies have found that asset quality is closely linked to the economic cycle. Thus, the question arises of whether such cross-country differences are simply a reflection of the severity of the recessions in 2009. As Chart B.2 suggests, there is indeed a relatively close correlation between the decline in GDP and the rise in the non-performing loan ratio in 2009. However, some countries (e.g. Latvia, Lithuania, Ukraine and Ireland) saw very large increases in the non-performing loan ratio even when controlling for large declines in GDP among those countries.

A comparison of the performance of non-performing loans in 2008/09 with past crisis episodes, while subject to certain caveats[6], suggests that the level of non-performing loans[7]

was, on average, higher during past crises and that it was more heavily affected by economic recessions during past crises (see Charts B.3 and B.4).

These observations might, to some extent, reflect the fact that past systemic banking crises mainly materialised among the emerging markets, which tend to have higher non-performing loan ratios owing to weaknesses in their financial systems (with some notable exceptions, such as the savings and loans crisis in the United States in 1988 and the Nordic countries' banking crises of the early 1990s). Therefore, a direct comparison with the 2008/09 crisis, which more strongly affected the advanced economies, is subject to certain limitations. At the country level, it nevertheless appears that peak non-performing loan levels

6 A comparison can be performed only for countries which have experienced systemic banking crisis in the past, as documented in L. Laeven and F. Valencia, "Systemic Banking Crises: A New Database", *IMF Working Paper Series,* WP08/224, 2008.
7 Since longer time series are not available for non-performing loan ratios and, therefore, neither are growth rates for non-performing loans during past crises, a comparison is only possible in level terms.

were higher during past crises when controlling for GDP growth (e.g. in the United States, the Nordic countries and most emerging markets). Such observations could point to improvements in the regulatory environment and the cleaning up of bank balance sheets, mainly among the emerging markets, as suggested by the related literature.[8]

DETERMINANTS OF ASSET QUALITY

In addition to economic activity, exchange rate depreciations might also have a negative impact on asset quality, especially in countries with a large amount of lending in foreign currency to unhedged borrowers. Moreover, declines in stock prices might help to explain differences in asset quality. The potential channels through which stock prices could have an impact on non-performing loans are: (i) banks' direct exposure to the stock market; (ii) wealth effects among borrowers; or (iii) a decreased value of collateral. Finally, lending interest rates, which tend to negatively affect asset quality on account of higher borrowing costs, might be a further possible determinant of the level of non-performing loans. To the extent that lending rates are affected by the policy rate set by central banks, the swift monetary policy response to the crisis (mostly in countries with flexible exchange rates which pursue inflation targeting or other strategies aimed at price stability) is thus also taken into account.

Typically, empirical models for non-performing loan ratios include a variable for economic activity, a lending interest rate and other additional variables, such as unemployment and specific features of the banking sector (e.g. specialisation and concentration)[9]. In the econometric model employed for this article, real GDP, nominal effective exchange rates, lending interest rates and share prices are considered as possible determinants of the level of non-performing loans. The rationale for including these additional variables stems from the notion that: (i) an increase in lending interest rates tends to increase the debt service of borrowers with variable rate contracts; (ii) depreciations can negatively affect bank asset quality via balance

sheet effects; and (iii) a drop in share prices might lead to more defaults via wealth effects and a decline in the value of collateral. In addition, the inclusion of stock prices, which are more volatile than economic activity, account for possible non-linear effects. In order to capture the persistence of non-performing loans, the econometric specifications also include the lagged log difference of the dependent variable. Real GDP and nominal effective exchange rates are treated as endogenous, since the causality may run in both directions, and both variables might be correlated with the error term.[10] As the dataset has a short time dimension compared with the cross-sectional (country) dimension, the Arellano-Bond, two-step difference, generalised method of moments (GMM) estimation with robust standard errors is applied.[11, 12]

Overall, the estimated model is able to explain the development of non-performing loan ratios for the panel of advanced and emerging economies reasonably well (see Table B.1). As expected, a rise in (contemporaneous) real GDP growth leads to a decline in non-performing loan ratios.[13] This finding is robust across all

8   J. Mitchell, "The Problem of Bad Debts: Cleaning Banks Balance Sheets in Economics in Transition", *CEPR Discussion Paper Series*, 1998; M.G. Bhide, A. Prasad and S. Ghosh, "Emerging Challenges in Indian Banking", *MPRA Papers*, No 1711, 2001; J. Hawkins and D. Mihaljek, "The banking industry in the emerging market economies: competition, consolidation and systemic stability", *BIS Papers*, No 4, 2001; and G. Ma, "Who Pays China's Bank Restructuring Bill?", *CEPII Working Papers*, No 2006-04.

9   G. Jiménez and J. Saurina, "Credit Cycles, Credit Risk, and Prudential Regulation", *International Journal of Central Banking*, Vol. 2(2), May 2006.

10 Simple pair-wise regressions suggest that non-performing loans do have a significant effect on real GDP and the nominal effective exchange rate. For the other variables considered in the model, this is not the case.

11 D. Roodman, "How to do xtabond2: an introduction to "Difference" and "System" GMM in Stata", *Center for Global Development Working Papers*, No 103, 2006.

12 Other static panel estimation procedures, such as fixed effects and random effects estimations, have also been applied, indicating that the results are robust (the magnitude and the significance levels of the coefficients remained largely the same). A Hausman specification test rejects the null hypothesis that the individual effects are uncorrelated with the other regressors, thus favouring fixed effects estimation.

13 Typically, a decline in economic activity tends to affect non-performing loans with a time lag of a few quarters. With annual data, the impact is attributed to the contemporaneous growth rate of real GDP.

considered specifications and in line with existing research.[14] Lagged GDP growth also significantly affects growth in non-performing loans, but with a positive sign. This finding lends support to the notion that bank asset quality deteriorates with a lag in response to positive growth, on account of loose credit standards applied during the boom period. At the same time, the overall impact of GDP growth (the sum of the lagged and the contemporaneous coefficient) is negative, as expected. With respect to the exchange rate, the results suggest that the effect of the nominal effective exchange rate differs between countries with low and high lending in foreign currency, approximated by international claims[15] relative to GDP. The effect of the nominal effective exchange rate on non-performing loans in countries with significant foreign currency lending is negative, suggesting that a depreciation of the domestic currency leads to a deterioration of asset quality (the balance sheet channel).[16] The inverse effect is observed in a sub-sample of countries with international claims to GDP below the median, meaning that a depreciation of the domestic currency leads to a decline in non-performing loan ratios (the competitiveness channel). A depreciation of the domestic currency can improve the competitiveness of the exporting firms on the foreign market owing to lower prices in the respective foreign currency. For this reason, companies can increase the volume of the exported goods and services and increase their profitability. However, the positive effect on the firms' creditworthiness typically materialises with some lag. All specifications suggest that higher interest rates lead to larger non-performing loan ratios. Higher interest rates tend to decrease the ability of borrowers to service new debt or debt with floating interest rates. Furthermore, during the last decade share prices have had a statistically significant, negative impact on asset quality in both countries with high and low stock market capitalisation. This impact has been slightly stronger in advanced economies in which stock markets are highly capitalised.

To illustrate how different factors affect non-performing loan rates, a contribution analysis (see Chart B.5) considers four countries which represent: (i) advanced economies with floating exchange rates and a bank-based financial system (Germany); (ii) advanced economies with floating exchange rates and a capital market-based financial system (United Kingdom); (iii) catching-up economies with fixed exchange rates and a high degree of foreign currency lending which kept the exchange rate stable during the 2008/09 crisis (Latvia); and (iv) catching-up economies which were subject to a large depreciation of the local currency during the crisis (Ukraine). While economic growth is the key driver of non-performing loans for all four selected economies, the decline in the stock market has also significantly contributed to an increase in non-performing loans, e.g. in Germany during 2009. The two emerging economies, Latvia and the Ukraine, are both exposed to negative balance sheet effects via foreign exchange lending, but differ in terms of exchange rate volatility. In these cases, the contribution analysis reveals that the large depreciation of the exchange rate during the crisis contributed to a significant increase in non-performing loans in the Ukraine in 2009 and 2010 linked to the significant share of foreign currency denominated loans in total loans, especially on households' balance sheets. On the contrary, in Latvia, which maintained its currency board arrangement vis-à-vis the euro during the crisis, the exchange rate did not have

14 J. Glen and C. Mondragón-Vélez, "Business Cycle Effects on Commercial Bank Loan Portfolio Performance in Developing Economies", International Finance Corporation, World Bank Group, January 2011.

15 International claims to GDP can be used as a reasonable proxy for foreign currency lending because cross-border lending tends to be denominated in foreign currency (see P.R. Lane and J.C. Shambaugh, "Financial Exchange Rates and International Currency Exposures", American Economic Review, Vol. 100, No 1, 2010). Data on the share of foreign currency loans in total loans are only available for a significantly smaller sub-set of countries. For this sub-set, the dataset used in the present analysis confirms that there is a positive correlation between international claims and foreign currency lending relative to GDP.

16 A depreciation of the domestic currency leads to an increase in debt payments in local currency terms. If the borrower has no income in foreign currency (as is often the case for households), this can, in extreme cases, lead to a debtor default.

Chart B.5 Contribution of independent variables to the growth of non-performing loans in selected economies

Legend:
- share prices
- lending interest rate
- nominal effective exchange rate
- real GDP
- non-performing loans (-1)
- non-performing loans – actual
- non-performing loans – fitted

Germany
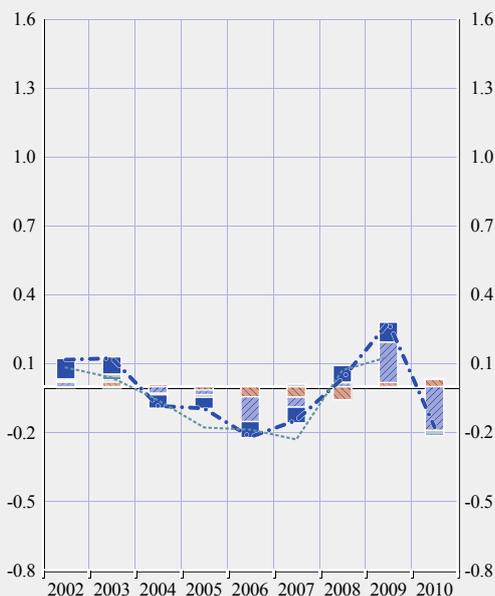
United Kingdom
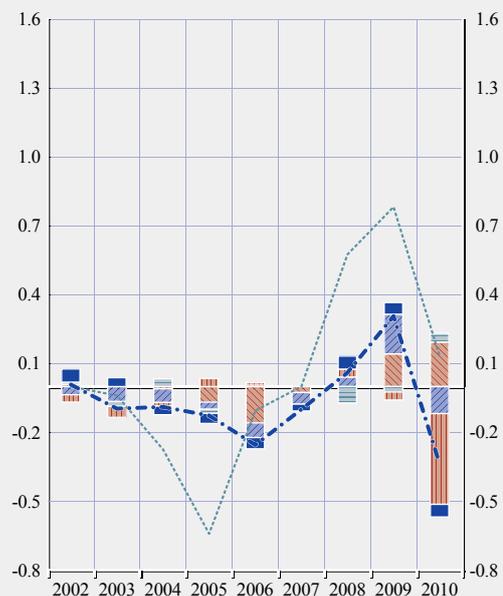
Latvia
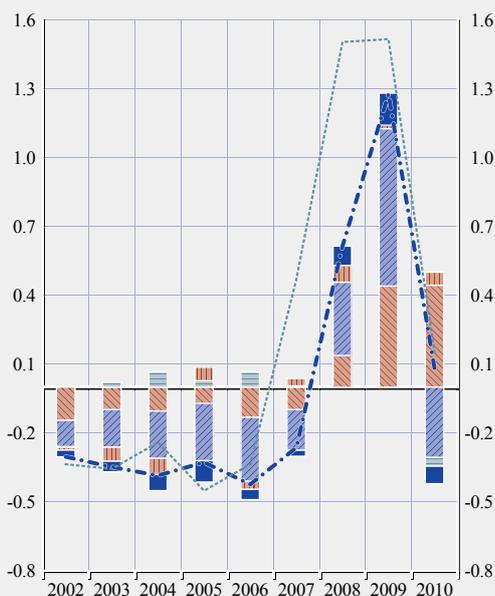
Ukraine
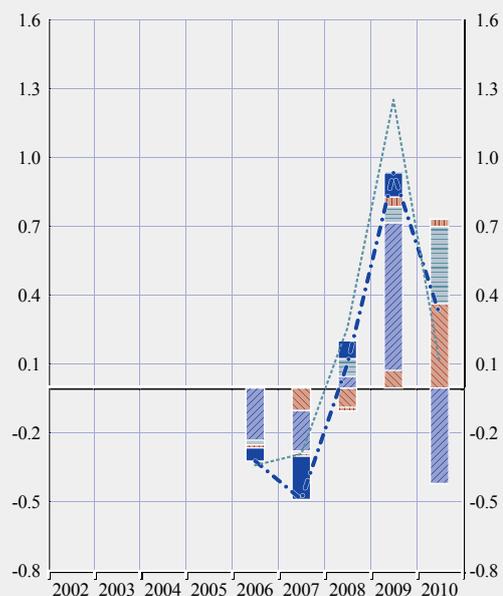
Sources: IMF, World Bank and ECB calculations.
Notes: All indicators are considered in log differences. The fitted values of log difference non-performing loans are computed using Arellano-Bond estimates, for which real GDP and the nominal effective exchange rate were treated as endogenous. For the Ukraine, the time series on non-performing loans starts in 2005 and for Germany, data on non-performing loans is available until 2009. The contribution of each indicator is computed as the product of its coefficient and the actual value of the variable. In the case of Germany, lending interest rates marginally contributed to the decline of non-performing loans in 2010, but the decline is not visible in the chart.

Table B.1 Determinants of non-performing loans

Arellano-Bond estimation	Change in non-performing loan ratio			
	Model 1	Model 2	Model 3	Model 4
Non-performing loan (-1)	0.248***	0.293***	0.191**	0.247***
	(0.000)	(0.001)	(0.050)	(0.000)
Real GDP	-3.661***	-3.819***	-5.213***	-3.478***
	(0.000)	(0.000)	(0.000)	(0.000)
Real GDP (-1)	1.488**	1.615**	2.282***	1.490**
	(0.017)	(0.037)	(0.000)	(0.033)
Nominal effective exchange rate	0.639			0.496
	(0.273)			(0.303)
Nominal effective exchange rate (-1)	-0.358			-0.281
	(0.110)			(0.177)
Lending interest rate (-1)	0.182**	0.181***	0.226**	0.198**
	(0.023)	(0.010)	(0.039)	(0.001)
Share prices	-0.267**	-0.229**		
	(0.012)	(0.025)		
Nominal effective exchange rate * low level of international claims		0.821*	1.113*	
		(0.056)	(0.006)	
Nominal effective exchange rate * low level of international claims (-1)		-0.521**	0.063	
		(0.028)	(0.852)	
Nominal effective exchange rate * high level of international claims		0.052	0.406	
		(0.975)	(0.659)	
Nominal effective exchange rate * high level of international claims (-1)		-1.168	-1.430**	
		(0.166)	(0.026)	
Share prices * low stock market capitalisation				-0.265*
				(0.055)
Share prices * low stock market capitalisation (-1)				-0.035
				(0.787)
Share prices * high stock market capitalisation				-0.300***
				(0.001)
Share prices * high stock market capitalisation (-1)				-0.015
				(0.903)
No of observations	321	321	419	320
No of groups	51	51	64	51
No of instruments	47	34	61	50
AR(1), p-value	0.007	0.006	0.009	0.007
AR(2), p-value	0.718	0.673	0.370	0.742
Hansen, p-value	0.416	0.330	0.445	0.344
Chi-squared	228.486	239.538	141.176	250.577

Notes: Coefficients and p-values in parentheses from Arellano-Bond two-step difference GMM estimations with robust standard errors (xtabond2 in Stata). ***, ** and * denote significance at 1%, 5% and 10% levels respectively. All variables are considered in log differences. All variables including real GDP and the nominal effective exchange rate are treated as endogenous. An increase in the nominal effective exchange rate suggests an appreciation. In models 2 and 3, the nominal effective exchange rate is interacted with a dummy variable that takes the value of one for countries with a level of international claims to GDP above the median, and zero otherwise. In model 4, the share prices are interacted with a dummy variable that takes the value of one for countries with stock market capitalisation above the median, and zero otherwise. The number of instruments is always kept below the number of groups. AR(1) and AR(2) are the Arellano-Bond tests for first and second-order autocorrelation of the residuals. (One should reject the null hypothesis of zero first-order serial correlation and not reject the null hypothesis of zero second-order serial correlation of the residuals.) The Hansen test of over-identifying restrictions suggests that the instruments are appropriate.

a significant impact on non-performing loans. At the same time, since interest rates had to increase to defend the currency board, higher lending rates contributed, albeit marginally, to the large increase in non-performing loans in Latvia. The case of the United Kingdom demonstrates how an accommodative monetary policy response to the crisis, which led to a decrease in lending interest rates, positively influenced the quality of bank loans. In the case of Germany, however, the contribution of a more accommodative monetary policy stance to dampening growth in non-performing loans was more limited owing to a less pronounced decline in lending interest rates compared with the United Kingdom.[17]

17 The transmission of policy rates to bank lending rates depends on many factors, such as the maturity of loans. For the empirical exercise, aggregate lending interest rates from the IMF's International Financial Statistics have been used, with the exception of Germany, where lending interest rate data refer to mortgage rates for new housing loans, as reported by the Deutsche Bundesbank.

CONCLUDING REMARKS

This special feature reviewed developments in non-performing loans over the past decade, in particular during 2008/09, amid the ongoing crisis. The econometric analysis of the empirical determinants of non-performing loans suggests that real GDP growth has been the main driver of non-performing loans during the past decade. Therefore, a drop in global economic activity remains the most important risk for bank asset quality in the current circumstances. At the same time, asset quality in countries with specific vulnerabilities may be negatively affected by additional factors. In particular, exchange rate depreciations might lead to an increase in non-performing loans in countries with a high degree of lending in foreign currencies to unhedged borrowers. A further decline in stock prices would also negatively affect banks' asset quality, in particular in countries with large stock markets relative to the size of the economy. To some extent, these risks have already materialised: the depreciation of local currencies in central, eastern and south-east Europe against the Swiss franc has negatively affected asset quality in countries with a significant share of foreign exchange lending. The drop in global share prices since the summer of 2011 is also likely to negatively affect bank asset quality, in particular in advanced economies with relatively large stock markets.

C GLOBAL LIQUIDITY: MEASUREMENT AND FINANCIAL STABILITY IMPLICATIONS

Global liquidity, both in times of abundance and shortage, has a range of implications for financial stability. Surges in global liquidity may be associated with strong asset price increases, rapidly rising credit growth and – in extreme cases – excessive risk-taking among investors. Shortages of global liquidity may lead to disruptions in the functioning of financial markets and – in extreme cases – depressed investor risk appetite, leading to malfunctioning markets.

This special feature takes a broad perspective and starts by defining and identifying the key drivers behind the multifaceted concept of global liquidity, all of which are related to more accommodative global financing conditions.[1] Thereafter, a conceptual framework is proposed for how policy-makers can monitor global liquidity. This involves looking in depth at a broad set of indicators such as: (i) short-term interest rates in advanced and emerging economies; (ii) asset price valuation indicators; (iii) uncertainty, risk appetite and financial liquidity indicators; and (iv) capital flows, international reserves and cross-border credit growth. Building on this framework, the special feature also discusses policy responses to global liquidity developments from a financial stability viewpoint.

INTRODUCTION

In spite of increased attention to global liquidity in recent years, a clear-cut definition is still missing. Liquidity is a multifaceted concept and, if anything, the common element in all of the definitions appears to be "ease of financing". From a global perspective, an essential distinction is made between central bank liquidity and liquidity created outside the public sector. Central bank liquidity can be considered as the amount of funds unconditionally available to settle claims through monetary authorities. Liquidity generated outside the public sector refers to liquidity provided by the financial and non-financial sectors, and is considered a key determinant of funding conditions globally.[2]

Chart C.1 Real broad money growth in advanced and emerging economies

(Q1 1998 – Q3 2010; percentage change per annum)

— advanced economies
⋯ emerging markets
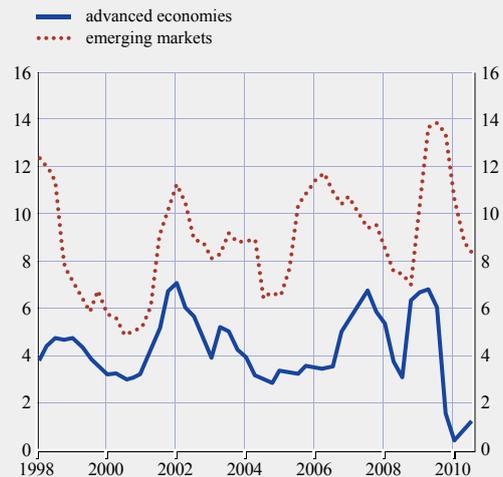
Sources: ECB, Eurostat, BIS and IMF.
Note: The data are converted into euro using the purchasing power parity exchange rate. The advanced economies include France, Germany, Japan, the United Kingdom and the United States. The emerging market economies comprise Brazil, Chile, China, India, Malaysia, Mexico, Russia, South Africa, South Korea and Saudi Arabia.

Traditionally, global liquidity has been defined as the sum of narrow money created by central banks and international reserves within advanced economies. Such a monetary liquidity measure is, however, less suitable today owing to global financial integration, new financial innovations that have led to alternative channels of access to credit and the growing importance of emerging markets. On the former point, a broader definition of money – including "close substitutes" for money – helps to capture global liquidity. On the latter point, real broad money growth has been higher in emerging economies compared with advanced economies over the past decade (see Chart C.1). This suggests that traditional measures that only include advanced economies do not fully measure overall global

1 This special feature partly reflects the ECB contribution to a wider study of global liquidity by the Committee on the Global Financial System in a paper entitled "Global liquidity – concept, measurement and policy implications", *CGFS Papers,* No 45, November 2011.
2 This type of liquidity is endogenous in nature, which is related to the fact that the provision of liquidity by banks is closely linked to liquidity provision by other financial institutions (given that this determines the circumstances through which balance sheets can be funded).

liquidity. These measures also fail to take into account the increasing role of liquidity generated by the financial and non-financial sectors.

INDICATORS OF EXCESS GLOBAL LIQUIDITY

Not only is it difficult to arrive at a unanimous definition of the concept of global liquidity, but it is equally difficult to derive a quantitative threshold to identify an excess or a shortage of global liquidity.

Nevertheless, a number of specific indicators of global liquidity are presented which help to address the shortcomings of the traditional measures and provide a picture of when liquidity may be abundant or scarce. Depending on the policy question at hand, these indicators can be divided into four broad categories. Each is assessed below. Given the difficulties in determining to what extent global liquidity is excessive or scarce, it is important to stress that any conclusion should be based on a broad set of indicators.

Short-term interest rates and global liquidity conditions

A first set of indicators which can provide a measure of global liquidity conditions relates to short-term interest rates in advanced and emerging market economies. Short-term interest rates, mostly determined by central banks, are a crucial determinant of households', banks' and non-financial firms' financing costs and thus is an essential element in understanding global liquidity conditions as a precondition to gauging financial stability risks from extreme liquidity conditions. Domestic short-term interest rates, through expectations about the future path of policy rates, also influence risk-free (nominal) yield curves. Interbank market rates and those for other financial assets, in turn, are set on the basis of these risk-free rates, adding risk premia for liquidity and counterparty risks that reflect market-specific characteristics (such as depth of markets or risk management practices) as well as risk appetite. The level of interest rates, in turn, affects the growth rate of credit and overall liquidity conditions throughout the economy.

Chart C.2 Real ex post interest rates in advanced and emerging economies

(Q1 2002 – Q2 2011, percentage change per annum)

advanced economies
emerging markets
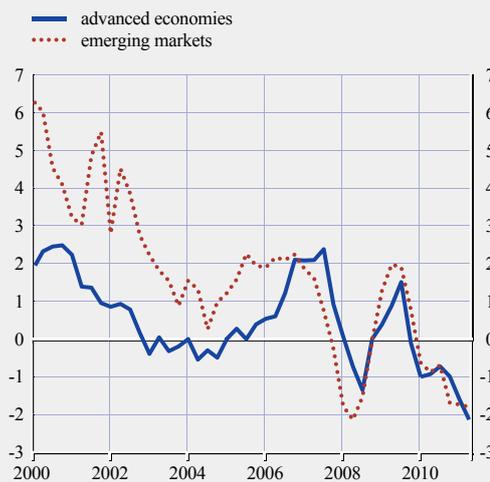
Sources: Haver Analytics and ECB calculations.
Notes: The advanced economies include the euro area, Japan, Sweden, Switzerland, the United Kingdom and the United States. The emerging market economies include Argentina, Brazil, China, Hong Kong, Indonesia, India, Mexico, Russia, Singapore, South Korea, Taiwan, Thailand and Turkey.

Chart C.2 presents real interest rates in advanced and emerging economies. The real interest rates are calculated by subtracting the annual rate of inflation from the individual economies' policy rates. These rates are then aggregated together using GDP weights. This type of indicator is one tool for gauging global liquidity conditions. For instance, prolonged periods of very low real rates may induce excessive risk-taking and elevated credit growth, which may have adverse consequences for financial stability.

Two important features can be noted from the chart. First, there has been a marked convergence in short-term real rates in advanced and emerging market economies over the past decade. This probably reflects closer real economic and financial ties between the two economic blocs. Second, real ex post interest rates have hovered in negative territory since early 2010, resulting from low policy rates coupled with relatively high inflation rates in some economies. The low short-term real rates observed over the past two years should mainly be seen as a reflection of

Chart C.3 Aggregate GDP-weighted Taylor rule estimates for advanced and emerging economies

(Jan. 2002 – Apr. 2011, percentages)

— advanced economies: actual rate
····· advanced economies: predicted rate
----- emerging markets: actual rate
— emerging markets: predicted rate
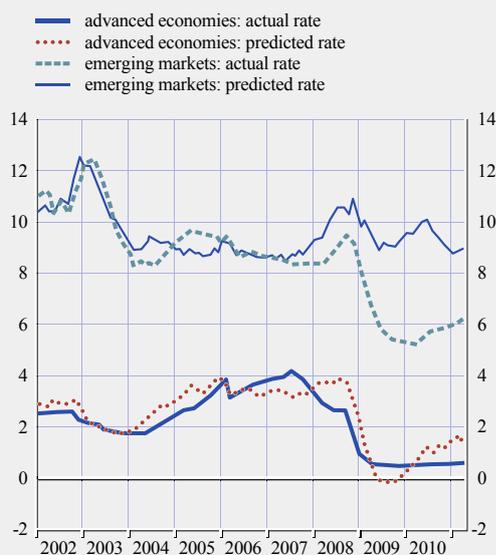
Sources: Haver Analytics, Consensus Economics and ECB calculations.
Notes: The advanced economies include Australia, Canada, the euro area, Iceland, Israel, Norway, New Zealand, Sweden, Switzerland, the United Kingdom and the United States. The emerging market economies include Brazil, Chile, Colombia, the Czech Republic, Hungary, Indonesia, India, Mexico, Peru, the Philippines, Poland, Romania, Russia, South Africa, South Korea, Thailand, Turkey and the Ukraine.

policy measures taken around the world to face the global economic challenges.

An alternative means by which to demonstrate the role of central bank interest rates in determining global liquidity conditions would be to make use of Taylor rules. Taylor rules can show how central banks have historically adjusted their policy rates to changes in the macroeconomic environment (i.e. inflation and output).[3] It should be noted that results will differ, depending on the way the Taylor rules are estimated (backward looking, forward looking, the inclusion of an interest smoothing component, how the output gap measure is calculated, etc.). Moreover, estimates are based on average central bank behaviour over the sample under consideration. Structural changes in the macro series, changes in central banks' objectives and market participants' behaviour are not fully taken into account. Keeping these

caveats in mind, by aggregating the estimates for a large set of economies, Taylor rules can still help policy-makers to form a rough view about global liquidity conditions.

A simple rule of thumb says that liquidity is neither too high nor too low if policy rates are broadly in line with the policy rates implied by the Taylor rule. While subject to numerous caveats, not least that unconventional monetary policy measures are not taken into account, aggregated Taylor rules can nonetheless provide an illustrative cross-country quantitative benchmark for evaluating global liquidity.

Comparing aggregated actual and implied policy rates suggests that throughout the current crisis, interest rates in emerging markets have been below those implied by standard Taylor rules, whereas central banks in advanced economies, on an aggregate basis, have set their policy rates broadly in line with Taylor rule predictions (see Chart C.3).[4]

Asset price valuation

Alternatively, global liquidity conditions can indirectly be measured by asset price valuation indicators. Misaligned asset prices may partly reflect excessive liquidity conditions with negative consequences for financial stability. For instance, excess liquidity and loose financing conditions may induce investors to take on too much risk, thereby compressing the risk premium on financial and real estate assets. As a result, asset prices may rise to levels elevated from their fundamentals, which in turn may lead to costly asset price booms and

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3 See J.B. Taylor, "Discretion versus policy rules in practice", Carnegie-Rochester conference series on public policy, No 39, 1993; A. Orphanides, "Taylor Rules", *Finance and Economics Discussion Series*, Federal Reserve Board, No 18, 2007; and IMF, "What is global liquidity?", *World Economic Outlook,* October 2007.

4 A. Amzallag, S. Bashir and M. Fratzscher, "Inflation targeting in advanced and emerging economies - before and after the financial crisis", *ECB Working Paper Series*, forthcoming. The Taylor rule rates are estimated up to March 2008 using real-time, forward-looking expectations of inflation and the output gap. More recent data is used to project the rates forward and thus assess whether pre-financial crisis monetary policy objectives appear to have shifted in each country. Chart C.3 displays the real GDP-weighted averages of individual country policy and Taylor rule-predicted rates.

Chart C.4 Aggregated price/earnings (P/E) ratio for advanced and emerging economies

(1980 – 2011; ratio)

- advanced economies
- emerging markets
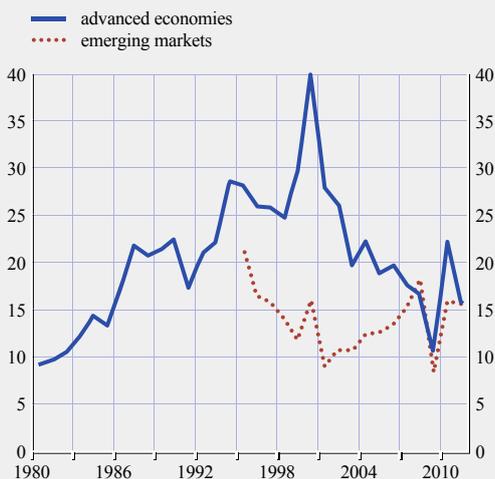
Sources: Thomson Reuters Datastream and Haver.
Notes: The aggregated P/E ratio for advanced economies consists of GDP-weighted estimates for the United States, the euro area, Japan, the United Kingdom, Sweden and Switzerland. The P/E ratio for emerging markets is aggregated by Thomson Reuters Datastream.

busts. Empirical research on global liquidity and asset prices has mostly focused on the impact on equity, commodity and house prices. For instance, Baks and Kramer[5] find that global liquidity (as measured by G7 excess money growth) is negatively correlated with interest rates and positively related to equity returns. The IMF has recently examined the linkages between global liquidity expansion, asset prices and capital inflows in emerging economies.[6] This study found that rising global liquidity is associated with rising equity returns and declining real interest rates in 34 "liquidity-receiving" economies. In addition, Alessi and Detken[7] examine the extent to which financial and real indicators can help to predict costly asset price boom and bust cycles, using data from between 1970 and 2007 for 18 OECD countries. They find that global financial variables (M1 gap and credit gap, in particular) are more informative than real variables in detecting these boom and bust cycles.

A standard valuation metric for stock markets is the price/earnings (P/E) ratio. In general, the P/E

ratio tends to display mean-reverting behaviour over time (see Chart C.4). The reversion back to its mean usually emanates from its price component and, to a lesser extent, reflects a correction of the earnings component. Thus, if the P/E ratio is hovering at levels much above its mean, this could indicate it has risen above the levels suggested by its "fundamentals". During 2011 P/E ratios in emerging markets have remained rather stable, broadly in line with their long-term averages, whereas P/E ratios in advanced economies have dropped to levels slightly below their long-term averages.

Uncertainty, risk appetite and financial market liquidity indicators

A third set of indicators to measure global liquidity relates to estimates of uncertainty, risk appetite and financial market liquidity indicators. For instance, the search for yield (or lack thereof) can have important implications for global financial stability through misallocations of financial and economic resources and the associated financial stability risks. Policy-makers should also view global liquidity in relation to market uncertainty and risk aversion. There is empirical evidence that during periods of ample liquidity, asset price volatility tends to be low. Abnormally low asset price volatility can have the effect that market participants take on too much risk in their portfolio decisions, which in turn can have adverse consequences for financial stability in the form of misallocations and costly asset price booms and busts.

The implied volatility derived from option prices on the US S&P 500 index (i.e. the VIX index) is an indicator of risk monitored by most policy-makers and financial market commentators. This measure is theoretically appealing as it measures the expected volatility

5   K. Baks and C. Kramer, "Global Liquidity and Asset Prices: Measurement, Implications and Spillovers," *IMF Working Paper*, No 99/168, 1999.

6   IMF, "Global Liquidity Expansion: Effects on 'Receiving' Economies and Policy Response Options", *Global Financial Stability Report*, April 2010.

7   L. Alessi and C. Detken, "Quasi real time early warning indicators for costly asset price boom/bust cycles: A role for global liquidity", *European Journal of Political Economy,* No 27(3), 2011.

Chart C.5 Decomposition of the VIX into uncertainty and risk aversion

(Jan. 1990 – Aug. 2011)

- — uncertainty
- ▦ risk aversion
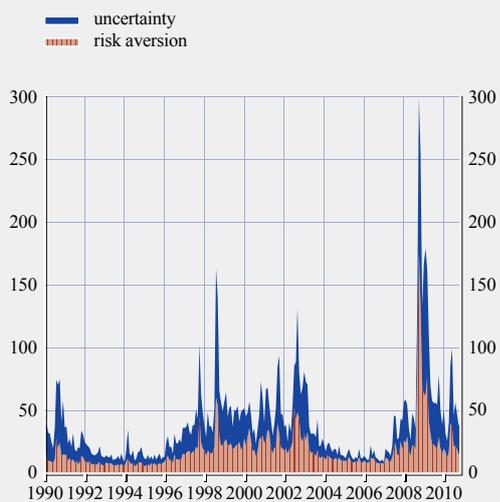
Sources: Thomson Reuters Datastream and ECB calculations.
Note: Risk aversion is the difference between the squared VIX (rescaled to reflect expected variance over a period of one month) and the conditional variance (uncertainty).

Chart C.6 Spreads between three-month deposit and overnight index swap rates in selected money markets

(Aug. 2007 – Nov. 2009; basis points)

- — EUR
- ⋯ GBP
- --- USD
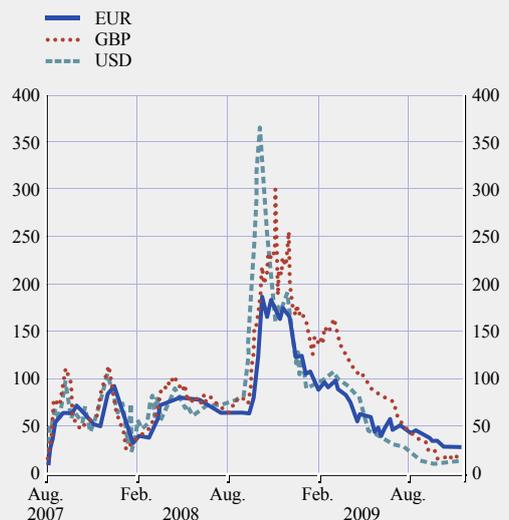
Source: Bloomberg.

in the eyes of investors. If expected volatility measures across major markets remain well below their average for a prolonged period, this can indicate that global liquidity is too ample.

It is important to note that implied stock market volatility captures both the perceived price and level of uncertainty of future stock price movements. Bekaert et al.[8] thus attempt to decompose the VIX into its risk aversion (price) and uncertainty (level) components (see Chart C.5). This decomposition can help policy-makers to gauge the interactions between global liquidity and market uncertainty/risk aversion.

Bekaert et al. examine the link between market uncertainty/risk aversion and monetary policy in the United States. This is important more broadly in the context of the assessment of global liquidity given that "risk aversion" and "economic uncertainty" may have different effects on asset prices. For example, to the extent that excessively low global asset returns lead to a search for yield among investors, the

related rise in risk appetite may be symptomatic of a rise in global liquidity.

Financial market liquidity can also be used to assess global liquidity conditions. For instance, substantial concerns over liquidity risk in September 2008 triggered looser global financing conditions, and a subsequent rise in global liquidity (see Chart C.6). Arbitrage would imply a zero spread in interbank term spreads at a three-month maturity, while a non-zero spread is indicative of tension in the interbank market. This indicator can provide policy-makers with insights into the degree of liquidity risk faced by the banking sector as a whole across major markets.

Developments in carry trades are also of interest in the context of global liquidity as carry trades are more likely to occur in an environment of favourable financing conditions and low financial market volatility, while they tend to

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8   G. Bekaert, M. Hoerova and M. Lo Duca, "Risk, Uncertainty, and Monetary Policy", *NBER Working Papers*, No 16397, 2010.

Chart C.7 Global carry trade attractiveness indicator

(Jan. 1997 – Oct. 2011)

Sources: Thomson Reuters Datastream and ECB calculations.
Notes: The Japanese yen and the Swiss franc are defined as funding (low-yielding) currencies and the Australian dollar, the Canadian dollar, the US dollar and the New Zealand dollar as investing (high-yielding) currencies. The attractiveness indicator is computed as the interest rate differential between a high-yielding currency and a low-yielding currency, divided by the exponentially weighted moving average (EWMA) volatility of the foreign exchange rate between the two countries. The global carry trade attractiveness indicator is computed as an equally-weighted average of the eight bilateral series.

favourable carry trade environment. By averaging carry trade attractiveness indicators for a number of well-known bilateral funding and investment currency strategies, it is possible to gauge carry trade attractiveness on a global scale.

This global carry trade attractiveness indicator suggests less favourable conditions for carry trades since 2007/08 mainly owing to higher foreign exchange volatility (see Chart C.7). From a global liquidity perspective, the low attractiveness of carry trades possibly reflects less favourable funding conditions and global liquidity shortages.

All in all, financial market liquidity indicators have the common theme of being volatile and should thus be treated with utmost caution. Notwithstanding the obvious caveats, a close monitoring and analysis of a broad range of financial market indicators can be helpful if a policy-maker wishes to better understand the interaction between global liquidity conditions and the functioning of financial markets.

retract in use during global liquidity shortages. Carry-trade opportunities mainly arise owing to differences in the monetary policy stance across regions. A carry trade consists of an unhedged bet where an investor borrows in low-yielding currencies and invests in high-yielding currencies. If the bilateral exchange rate between the two countries remains unchanged over the investment horizon, the investor makes a profit equal to the interest rate differentials.

No direct data on carry trades exist so policy-makers have to rely on indicators such as ex post returns from carry trade strategies, currency flows in the international banking system or net open positions of non-commercial traders in different currency futures. In addition, one ex ante approach is to compute a "carry trade attractiveness indicator".[9] This is computed as the interest rate differential between a high-yielding currency and a low-yielding currency, divided by the exchange rate volatility between the two currencies. A "high" ratio between two currencies would imply, everything else held equal, a

Capital flows, international reserves and cross-border credit growth

A fourth and last set of indicators to measure global liquidity relates to capital flows, international reserves and cross-border credit growth. The potential for sudden stops and reversals in such flows represents an important financial stability risk. Given that the quality of the data used to calculate these indicators can sometimes be questionable, a broad set of indicators should be monitored before any policy actions can be taken.

Over recent decades, emerging markets have become increasingly important for the world economy. Strong economic growth coupled with rising asset prices and relatively high credit growth means that these economies should also be closely monitored from a global liquidity perspective.

9   See G. Galati, A. Heath and P. McGuire, "Evidence of carry trade activity", *BIS Quarterly Review*, September 2007.

The combination of the increased importance of emerging markets and improved opportunities to seek finance abroad suggests that measures of cross-border credit should be closely monitored by policy-makers. In fact, the growth in international bank credit exhibits boom-and-bust cycles that correspond closely to episodes of financial distress. Moreover, periods of particularly strong growth in cross-border credit often coincide with episodes of elevated risk appetite and compressed risk premia.

Furthermore, developments in various measures of capital flows (net, gross and the composition of flows), stock prices, credit growth and foreign reserves in emerging markets are particularly important.

An environment of excessive global liquidity may be characterised by abnormally high capital inflows to emerging markets, stock prices surging to levels much above firms' earnings growth, credit growth rising much faster than nominal GDP growth and foreign reserves increasing to levels beyond what would satisfy the traditional motives for holding reserves

Global liquidity and capital flows are closely connected. Push factors, such as accommodative monetary policy and quantitative easing strategies in advanced economies, may drive capital into emerging market assets. Apart from potentially being a reflection of excess liquidity, elevated capital inflows may have a number of adverse consequences for financial stability. First, strong inflows can place further upward pressure on assets in countries where valuations are already high, therefore leading to substantial deviations of prices from fundamental values. Second, strong net inflows can produce undesired real exchange rate appreciation, leading to overshooting and an undermining of the competitiveness of the economy. Third, an environment of high appetite for emerging market securities in combination with low interest rates in advanced economies increases the incentive for emerging markets to issue debt in foreign currency, especially in countries with exchange rate regimes that are not fully flexible.

This could lead to excessive exposure to foreign exchange risk.

Foreign reserve accumulation in emerging markets warrants further discussion, given the substantial increase in reserve holdings in these economies, particularly since 2007. Foreign reserves are partially accumulated by these economies for precautionary purposes, as a liquidity buffer to self-insure against future crises. The build-up of reserves has been used in some cases as a tool for maintaining export competitiveness by controlling the pace of appreciation of the domestic currency.

The accumulation of reserves can contribute to global liquidity through its impact on global bond yield configurations, as flows of capital to emerging markets are channelled back to advanced economies, mainly via purchases of US Treasury bonds. As global liquidity in a broad sense can be seen as (and measured by) the "ease of financing", strong foreign demand for US Treasuries exerts a downward pressure on yields and thus has a marked impact on global liquidity. It is difficult to estimate the exact price sensitivity of bond yields owing to

Chart C.8 Foreign reserve holdings in emerging markets

(Q1 2000 – Q2 2011; USD billions)

- reserves
- 100% of short-term debt
- 20% of M2
- three months of imports
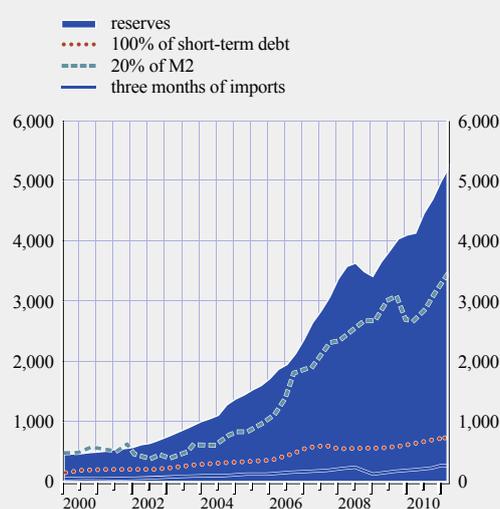
Sources: IMF, WEO and World Bank.

elevated demand, but one often-quoted study by Warnock and Warnock[10] finds that foreign purchases significantly lowered US Treasury yields, by some 90 basis points in 2005.

Rule-of-thumb measures to assess a benchmark level of reserves include three months of import coverage, 20% of broad money, or 100% of short-term debt. Levels of reserves beyond these benchmarks provide an indication of excess reserves. Accumulation of reserves for non-precautionary purposes can affect global liquidity conditions by contributing to an artificially low yield environment. The level of reserve holdings in emerging markets has been in excess of all three rule-of-thumb benchmark levels since 2003 (see Chart C.8).

POLICY RESPONSES

Armed with signals from these methods for measuring global liquidity, a key question is how public sector authorities respond when the measures signal important aberrations. In this vein, the ongoing discussions regarding policy responses to global liquidity developments can be summarised in terms of two broad needs. First, there is a need to agree on measures that can deal with liquidity surges and the associated build-up of risks. Second, policy-makers need to improve the ability to handle situations of liquidity shortages and the ensuing potential disruptions.

Global capital and liquidity regulations discussed within the Basel Committee on Banking Supervision are at the core when it comes to dealing with liquidity surges. Regarding capital regulations, there is a need for banks to hold more capital as well as counter-cyclical capital buffers and additional capital to further enhance their loss-absorption capacity. This is particularly crucial for institutions that are deemed systemically important. Furthermore, strengthened liquidity regulation should help to constrain the ability of the banking system to provide maturity transformation services, which should then reduce the amplitude of boom-bust cycles in global liquidity provision.

These reforms are, however, not enough by themselves to avoid costly asset price booms and busts; they need to be complemented with further macroprudential policy initiatives.

When it comes to addressing liquidity shortages, they can be divided into domestic and foreign currency liquidity shortages. Domestic shortages are usually handled by the central banks in the form of changes in liquidity operations and, in some cases, via purchases of assets. It is important to note that the central bank is the only institution which can supply domestic liquidity in an unlimited quantity.

To address foreign currency shortages, the main sources of public sector liquidity at the international level include: foreign exchange reserves, various IMF lending facilities (including new IMF instruments which increase the scale and flexibility for responding to global liquidity shortages), regional arrangements, special drawing rights and currency swaps and related arrangements between central banks. While foreign reserves helped to insulate some emerging market economies from funding difficulties in the course of 2008, the level of these reserves remain, as indicated above, beyond a level which could be considered to be precautionary.

Central bank currency swap arrangements have been an effective tool for addressing foreign currency liquidity shortages. While it is important that there are no technical obstacles to establishing these swap lines in times of need, it is of even more importance that the provision of liquidity under such arrangements is subject to "constructive ambiguity". Central banks should hence not commit ex ante to the provision of international liquidity in a crisis. This is necessary in order to: (i) preserve monetary policy autonomy; (ii) respect the mandate, resources, expertise and, ultimately, nature of these institutions; and (iii) minimise

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10 F. Warnock and V. Warnock, "International capital flows and US interest rates", *Journal of International Money and Finance*, Vol. 28, October 2009.

the risk of moral hazard behaviour at the global level on the part of the recipients of the liquidity. The unique ability of the central bank to provide unlimited liquidity in the currencies that are demanded globally means that its role in addressing global liquidity shocks is key. That said, the financial risks for the liquidity-providing central banks need to be kept to a minimum. To enable central banks to continue to fulfil their mandate, it will be necessary for liquidity-providing mechanisms to protect the soundness of central banks' balance sheets. This implies an appropriate design which includes the use of risk-mitigating mechanisms. While central bank policies are the key avenue for influencing public sector liquidity, the regulatory and macroprudential policy framework has a central role in influencing liquidity provision by the financial and non-financial sectors.

CONCLUDING REMARKS

This special feature defined and empirically illustrated the notion of "global liquidity". Since the concept of global liquidity is very broad, the focus has been on a core sub-set of definitions and measures. It has been argued that policy-makers should aim to monitor a broad set of indicators and that the indicators may differ depending on the policy question at hand.

The financial stability implications of global liquidity may differ according to the indicator used to measure it. In broad terms, however, global liquidity affects financial stability through its impact on asset prices and overall financing and credit conditions. Global liquidity generated by the financial and non-financial sectors is strongly cyclical, and closely related to investor risk appetite and (de)leveraging by financial institutions. In times of easy funding conditions, there may be global liquidity surges associated with strong asset price rises, rapidly rising credit growth and higher risk-taking among investors. Such liquidity-surging cycles may reverse in times of financial distress through deleveraging. As a result, addressing global liquidity cycles and surges in global liquidity require an appropriate macro-prudential policy framework

to mitigate the risks to financial stability. In times of global liquidity shortages, the central bank plays a crucial role in the provision of public sector liquidity. It is important to stress, however, that this should be seen as part of a multi-layered approach whereby no single player has overall responsibility for handling a global liquidity crisis.

D   MAPPING THE STATE OF FINANCIAL
STABILITY

*The ongoing global financial crisis has
demonstrated the importance of understanding
the sources of systemic risk and vulnerabilities
that may lead to systemic financial crises. An
early identification of sources of vulnerabilities
is essential as it makes it possible to take
preventive, targeted policy actions. This
special feature presents the Self-Organising
Financial Stability Map (SOFSM), which is
a novel methodology based upon data and
dimensionality reduction for mapping the state
of financial stability, visualising the sources
of systemic risks and predicting systemic
financial crises.*

INTRODUCTION

Understanding the sources of systemic risk
and vulnerabilities that may lead to a systemic
financial crisis is of central importance to
policy-makers as it allows policy actions
to be taken to prevent the further build-up
of vulnerabilities or to enhance the shock-
absorption capacity of the financial system.

Much of the empirical literature deals with
early warning systems that rely on conventional
statistical modelling methods, such as the
univariate "signals" approach or multivariate
logit/probit models. For example, Berg
and Pattillo[1] apply a discrete choice model
to predicting currency crises; Fuertes and
Kalotychou[2] to predicting debt crises; and
Lo Duca and Peltonen[3] to predicting systemic
crises. Berg et al.[4] provide a comprehensive
review of the literature.

Given the changing nature of financial crises,
stand-alone numerical predictions are unlikely
to convey a comprehensive picture. This
motivates the development of tools with clear
visual capabilities to complement numerical
predictions. The dimensionality of the problem
complicates visualisation, since a large number of
indicators are often required to accurately assess
vulnerabilities that could lead to a financial crisis.

In addition to the limitation of standard two and
three-dimensional visualisations for describing
higher dimensions, there is also the challenge
of visualising temporal or cross-sectional
information relevant for predicting financial
stress. While composite indices of leading
indicators and predicted crisis probabilities
provided by early warning systems enable
comparisons across countries and over time, these
indices fall short in disentangling the individual
sources of vulnerability. Methods for exploratory
data analysis can, to some extent, overcome these
types of shortcomings. Exploratory data analysis
attempts to describe the relevant phenomena in
easily understandable forms. The Self-Organising
Map (SOM) is a method that combines two
groups of methods for exploratory data analysis:
data and dimensionality reduction techniques.
The SOM provides a non-linear description of
the multi-dimensional data distribution on a
two-dimensional plane without losing sight of
individual indicators. Thus, the two-dimensional
output of the SOM makes it particularly useful
for visualisations, or summarisations, of large
amounts of information.

This special feature presents a novel
methodology for mapping the state of financial
stability and the sources of systemic risks using
the SOM. The Self-Organising Financial
Stability Map (SOFSM)[5] enables a two-
dimensional representation of a multi-
dimensional financial stability space that makes
it possible to disentangle the individual sources
of vulnerabilities which have an impact on
systemic risks. The SOFSM can be used to

1   A. Berg and C. Pattillo, "Predicting currency crises – the
indicators approach and an alternative", *Journal of International
Money and Finance*, No 18, 1999.
2   A.M. Fuertes and E. Kalotychou, "Early Warning System for
Sovereign Debt Crisis: the role of heterogeneity", *Computational
Statistics and Data Analysis*, No 5, 2006.
3   M. Lo Duca and T.A. Peltonen, "Macro-financial vulnerabilities
and future financial stress – assessing systemic risks and
predicting systemic events", *ECB Working Paper Series*,
No 1311, 2011.
4   A. Berg, E. Borensztein and C. Pattillo, "Assessing early warning
systems: How have they worked in practice?", *IMF Staff Papers,*
No 52, 2005.
5   The SOFSM is presented in more detail in P. Sarlin and
T.A. Peltonen, "Mapping the state of financial stability",
ECB Working Paper Series, No 1382, 2011.

monitor macro-financial vulnerabilities by locating a particular country in the financial stability cycle: either in the pre-crisis, crisis, post-crisis or tranquil state. In addition, the SOFSM model performs at least as well as a standard logit model in classifying in-sample data and in making out-of-sample predictions regarding the ongoing global financial crisis.

THE SELF-ORGANISING FINANCIAL STABILITY MAP

This section introduces the elements that are necessary to construct the SOFSM, namely the methodology based on the SOM; the dataset defining systemic financial crises and macro-financial vulnerabilities; the evaluation framework for assessing the signals of the SOFSM and their suitability for policy use; and the training of the SOFSM.

The Self-Organising Map

The SOM is a data and dimensionality reduction method that uses an unsupervised learning method developed by Kohonen.[6] It maps input data onto a two-dimensional array of output nodes and attempts to preserve the neighbourhood relations in the data rather than the absolute distances. On a two-dimensional grid, the numbers on the x and y-axes do not carry a numeric meaning in a parametric sense: they represent positions in the data space of the map, where each of these positions (x,y) is a mean profile (cluster). In addition, a second-level clustering can be applied on the nodes of the SOM. That is, data can be separated into nodes and nodes into clusters. The intuition of the basic SOM algorithm is presented below (see also Chart D.1).

The algorithm used in the analysis consists of constructing an SOM grid-based on a user-specified number of nodes, which represent the same dimensions (number of variables) as the actual dataset. Generally, the SOM algorithm operates according to the following steps (see Chart D.1).

1. Compare all data points with all nodes to find the nearest node for each data point (i.e., the best-matching unit).

Chart D.1 The Self-Organising Map
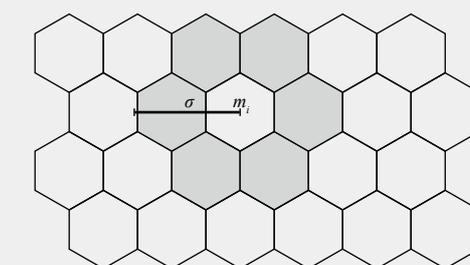
Notes: The chart displays the self-organisation of the SOM. First, each data point is assigned to its best-matching unit m_i. Then, each node m_i is updated to averages of attracted data, including data located in a specified neighbourhood σ.

2. Update each node to averages of the attracted data, including data located in a specified neighbourhood.

3. Repeat steps 1 and 2 a specified number of times.

4. Group nodes into a reduced number of clusters using Ward's[7] hierarchical clustering.

The parameters relevant for the SOM are the radius of the neighbourhood, the number of nodes, the map format (ratio of X and Y dimensions), and the number of training iterations. Large radii result in stiff maps that stress topology preservation at the cost of quantisation accuracy, while small radii lead to a standard k-means clustering with no topology-preserving mapping. The number of nodes determines the granularity of the results.

For the purpose of this analysis, the output of the SOM algorithm is visualised on a two-dimensional plane. The rationale for not using a one-dimensional map is that there are

6   For an overview of the SOM, see T. Kohonen, *Self-Organizing Maps*, 3rd edition Springer-Verlag, Berlin, 2001. The SOM implementation in the Viscovery SOMine package is used here.
7   J.H.Ward Jr., "Hierarchical grouping to optimise an objective function". *Journal of the American Statistical Association*, No 58, 1963.

differences within clusters. A three-dimensional map, while adding a further dimension, impairs the interpretability of data visualisations.

For each individual indicator, a feature plane represents the distribution of its values on the two-dimensional map. As the feature planes are different views of the same map, one unique point represents the same node on all planes. The feature planes are produced in colour. Cold colours represent low values of the indicator and warm colours represent high values, as defined by the colour scale below each feature plane. Shading on the two-dimensional map indicates the distance between each node and its corresponding second-level cluster centre, i.e. those close to the centre have a lighter shade and those farther away have a darker shade. Chart D.2 presents an example of a feature plane for a vulnerability indicator (real equity growth). Feature planes representing the distribution of individual variables on the SOFSM are created for the vulnerability indicators.

SOM quality measures, such as quantisation error, distortion measure and topographic error, are usually used to determine the

quality of a SOM. As the class information (financial stability cycle states) is available, classification performance measures are used for evaluating the quality of the SOM.

Systemic events and vulnerabilities

Systemic financial crises are defined using a financial stress index (FSI).[8] This approach provides an objective criterion for the definition of the starting date of a systemic financial crisis. The rationale behind the FSI is that the larger and broader the shock is (i.e. the more systemic the shock), the higher the co-movement among variables reflecting tensions in different market segments (money, equity and foreign-exchange market).[9]

To define systemic financial crises, the FSI is first transformed into a binary variable. In order to capture the systemic nature of the financial stress episodes, the focus is on episodes of extreme financial stress that have, in the past, led (on average) to negative consequences for the real economy. In practice, a binary "crisis" variable is created that takes a value of 1 in the quarter when the FSI moves above the predefined threshold of the 90th percentile of its country-specific distribution, and 0 otherwise. This approach identifies a set of 94 systemic events between 1990 and 2010 for 28 economies.[10] Chart D.3 illustrates the FSI and identified systemic financial crises for Hong Kong SAR.

To describe the financial stability cycle, other class variables besides the crisis variable are

Chart D.2 An example of a feature plane for a vulnerability indicator

(Q1 1990 – Q1 2005)
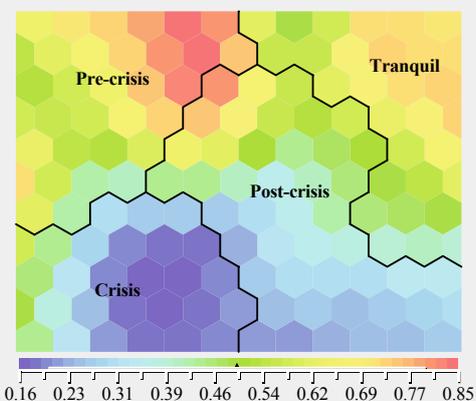
0.16 0.23 0.31 0.39 0.46 0.54 0.62 0.69 0.77 0.85

Sources: P. Sarlin and T.A. Peltonen, "Mapping the state of financial stability", *ECB Working Paper Series*, No 1382, 2011.
Notes: Feature planes are layers of the SOFSM in Chart D.4. This feature plane shows the distribution of a vulnerability indicator (real equity growth) on the grid. Cold colours represent low values of the indicator and warm colours represent high values, as defined by the colour scale.

8 For more details, see M. Lo Duca and T.A. Peltonen, "Macro-financial vulnerabilities and future financial stress – Assessing systemic risks and predicting systemic events", *ECB Working Paper Series*, No 1311, 2011.

9 In M. Billio, M. Getmansky, A.W Lo and L. Pelizzon, "Measuring Systemic Risk in the Finance and Insurance Sectors", *MIT Sloan Research Paper*, No 4774-10, 2011, the authors propose five measures of systemic risk based on statistical relations among the market returns of hedge funds, banks, brokers and insurance companies.

10 The countries in the sample are: Argentina, Australia, Brazil, China, the Czech Republic, Denmark, the euro area, Hong Kong, Hungary, India, Indonesia, Japan, Malaysia, Mexico, New Zealand, Norway, Poland, Russia, Singapore, South Africa, Sweden, Switzerland, Taiwan, Thailand, the Philippines, the United Kingdom, the United States and Turkey.

created. First, a "pre-crisis" class variable is created by setting the binary variable to 1 for the 18 months preceding the systemic financial crisis, and to 0 for all other periods. The pre-crisis variable mimics an ideal leading indicator that perfectly signals a systemic financial crisis in the 18 months before the event. Similarly, a "post-crisis" class variable is set to 1 for the 18 months after the systemic event. Finally, all other time periods are classified as "tranquil" periods.[11]

To analyse the sources of systemic risk and vulnerability, a set of indicators consisting of commonly used metrics in the macro-prudential literature for capturing the build-up of vulnerabilities and imbalances in the domestic and global economy are used.[12] The key variables are asset price developments and valuations, and variables proxying for credit developments and leverage. In addition, other common variables (e.g. government budget deficit and current account deficit) are used to control for vulnerabilities stemming from macroeconomic imbalances.

In line with the literature, several transformations of the indicators (e.g. annual changes and deviations from moving averages or trends) are constructed to proxy for misalignments and a build-up of vulnerabilities. To proxy for global macro-financial imbalances and vulnerabilities, a set of global indicators are calculated by averaging the transformed variables for the United States, the euro area, Japan and the United Kingdom.[13] The final set of indicators is chosen based on their univariate performance in predicting systemic events.

Evaluation framework

To evaluate the performance of models in terms of predicting systemic financial crises and to calibrate an optimal model and threshold for policy action, the approach pioneered in Demirgüç-Kunt and Detragiache[14] is adapted with the technical implementation as in Alessi and Detken, which also accounts for differences in class size.[15] The loss function of the policy-maker is thus defined as:[16]

$$L(\mu)=\mu(FN/(FN+TP)) +(1-\mu)(FP/(FP+TN)) \quad (1)$$

where the parameter μ represents the relative preference of the policy-maker between false negatives and false positives. When $\mu = 0.5$, the policy-maker is equally concerned about missing crises and issuing false signals. The policy-maker is less concerned about issuing

11 The robustness of the chosen variables are tested using different horizons for pre-crisis and post-crisis periods (6, 12, 24 months) in addition to the 18-month horizon.
12 C. Borio and P. Lowe, "Asset Prices, Financial and Monetary Stability: Exploring the Nexus", *BIS Working Papers*, No 114, 2002; C. Borio and P. Lowe, "Securing Sustainable Price Stability: Should Credit Come Back from the Wilderness?", *BIS Working Papers*, No 157, 2004; L. Alessi and C. Detken, "Quasi real time early warning indicators for costly asset price boom/bust cycles: A role for global liquidity", *European Journal of Political Economy,* 27(3), 2011.
13 The robustness of the global variables is also tested by calculating the global variables using weighted GDP averages of all countries in the sample.
14 A. Demirgüç-Kunt and E. Detragiache, "Monitoring Banking Sector Fragility: A Multivariate Logit", *World Bank Economic Review*, 14(2), 2000.
15 L. Alessi and C. Detken, "Quasi real time early warning indicators for costly asset price boom/bust cycles: A role for global liquidity", *European Journal of Political Economy*, 27(3), 2011.
16 The abbreviations are as follows: true positive (TP), false positive (FP), true negative (TN) and false negative (FN).

false alarms when $\mu>0.5$ and more concerned when $\mu<0.5$. To find out the usefulness of a prediction, the loss is subtracted from the expected value of a guess with the given preferences, i.e. $Min(\mu,1\text{-}\mu)$. From this, the usefulness of the model is obtained:

$$U=Min(\mu,1-\mu)-L(\mu). \qquad (2)$$

When using the above framework with a predefined preference parameter value, crisis and tranquil events are classified by setting the threshold on the probability of a crisis so as to maximise the usefulness of the model for policy action. The extent to which policy-makers might be more or less concerned about failing to identify an impending crisis than issuing a false alarm is not explicitly assessed. The benchmark preference parameter of 0.5 belongs to a policy-maker who is equally concerned about missing crises as issuing false alarms.[17]

Training and evaluating the Self-Organising Financial Stability Map

In the analysis, a semi-supervised SOM is employed by making use of the information about the class variables in the model training. To partition the map according to the stages in the financial stability cycle, the second-level clustering is performed using Ward clustering with respect to the class variables (see Chart D.4). The crisp clustering, which is given by the lines that separate the map into four parts, should only be interpreted as an aid for finding the four stages of the financial stability cycle, not as completely distinct clusters.

The predictive feature of the model is obtained by assigning to each data point the pre-crisis value of its best-matching unit.[18] The performance of a model is evaluated using the framework introduced earlier based on the usefulness criterion for a policy-maker. The performance is computed using static and pooled models, i.e. the coefficients or maps are not re-estimated recursively over time or across countries.

To test the predictability of the ongoing global financial crisis, the sample is split

Chart D.4 The two-dimensional grid of the Self-Organising Financial Stability Map

(Q1 1990 – Q1 2005)

Sources: P. Sarlin and T.A. Peltonen, op. cit.
Notes: The chart displays the two-dimensional grid of the SOFSM, which represents a multi-dimensional financial stability space. The lines separate the SOFSM into four parts which represent the financial stability states, but should only be interpreted as an aid for finding the states, not as completely distinct clusters. Within each cluster, the shading on the SOFSM shows the distance of each node to the centre of the financial stability state.

into two sub-samples: the training sample from the fourth quarter of 1990 to the first quarter of 2005, and the test sample from the second quarter of 2005 to the second quarter of 2009. The training framework and choice of the SOM is implemented so that: (1) the model does not overfit the in-sample data (parsimonious); (2) the framework does not include out-of-sample performance (objective); and (3) visualisation is taken into account (interpretability). The chosen SOM has 137 nodes on an 11x13 grid.

A standard logit model is estimated using the same in-sample data as was used for the SOFSM and later used for classifying in-sample data and predicting out-of-sample data.

For the benchmark models, the SOFSM and the logit model perform similarly overall

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17 While a model with $\mu=0.5$ is used as a benchmark model, the model robustness is tested by varying the preference parameter.

18 The best-matching unit is the node that has the shortest Euclidean distance to a data point. When evaluating an already trained SOM model, all of the data is projected onto the map using only the explanatory variables.

Table D.1 In-sample and out-of-sample results for the SOFSM and the logit model

Mode	Data set	Threshold	TP	FT	TN	FN	Positives		Negatives		Accuracy	Usefulness	AUC
							Precision	Recall	Precision	Recall			
Logit	Training	0.72	162	190	830	73	0.46	0.69	0.92	0.81	0.79	0.25	0.81
SOFSM	Training	0.60	190	314	706	45	0.38	0.81	0.94	0.69	0.71	0.25	0.83
Logit	Test	0.72	77	57	249	93	0.57	0.45	0.73	0.81	0.68	0.13	0.72
SOFSM	Test	0.60	112	89	217	58	0.56	0.66	0.79	0.71	0.69	0.18	0.75

Sources: P. Sarlin and T.A. Peltonen, op. cit.
Notes: The table reports results for the logit and SOFSM for the training and test datasets and the optimal threshold. Thresholds are calculated for $\mu=0.5$ and a forecast horizon of six quarters. The table also reports the following measures to assess the performance of the models: TP = true positive, FP = false positive, TN= true negative, FN = false negative, precision positive = TP/(TP+FP), recall positive = TP/(TP+FN), precision negative = TN/(TN+FN), recall negative = TN/(TN+FP), accuracy = (TP+TN)/(TP+TN+FP+FN), usefulness (see formulae 1 and 2), and AUC = area under the ROC curve (TP rate to FP rate, see Chart D.5).

(see Table D.1 and Chart D.5). With regard to the training set, the SOFSM performs slightly better than the logit model in terms of usefulness, recall positives, precision negatives and the area under the curve measure, while the logit model outperforms on the other measures. The classification of the models are of opposite natures, as the SOFSM issues more false alarms (FP rate=31%) than it misses crises (FN rate=19%), whereas the logit model misses more crises (31%) than it issues false alarms

(19%). That also explains the difference in the overall accuracy, since the class sizes are unbalanced (around 20% crisis periods and 80% tranquil periods). The difference in performance of the models on the test set is similar to the training set, except for the SOFSM having slightly higher overall accuracy. This is, in general, due to the higher share of crisis episodes in the out-of-sample dataset.

MAPPING THE STATE OF FINANCIAL STABILITY

Detecting signs of vulnerabilities and potential for contagion

In contrast to early warning systems which use binary classification methods, such as discrete choice techniques, the SOFSM enables simultaneous assessment of the correlations with all four stages of the financial stability cycle. Thus, new models need not be derived for different forecast horizons or definitions of the dependent variable.

By assessing the feature planes of the SOFSM, the following strong correlations are found. First, one can differentiate between early and late signs of systemic crises by assessing differences within the pre-crisis cluster. The strongest early signs of a crisis (upper right part of the cluster) are increases in high domestic and global real equity growth and equity valuation, while most important late signs of a crisis (lower left part of the cluster) are increases in domestic and global real GDP growth as well as domestic real credit growth, leverage, budget surplus and current account deficits. Second, the highest values of

Chart D.5 Out-of-sample receiver operating characteristic (ROC) curves for the Self-Organising Financial Stability Map and the logit model

(Q2 2005 – Q2 2009)

x-axis: false positive rate
y-axis: true positive rate

— logit
···· SOFSM
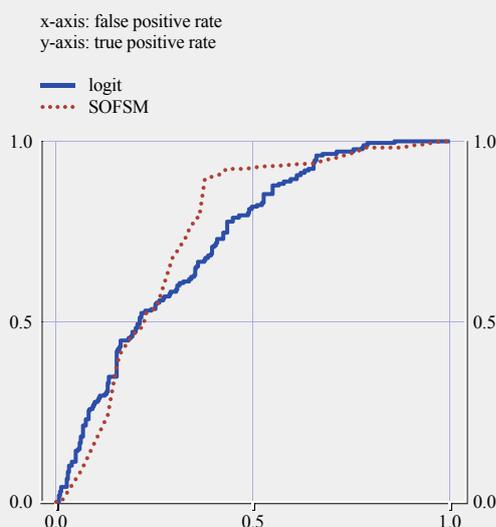
Sources: P. Sarlin and T.A. Peltonen, op. cit.
Notes: The vertical and horizontal axes represent the true positive rate (TP/(TP+FN)) and the false positive rate (FP/(FP+TN)). The assumption used is that $\mu=0.5$. The forecast horizon is 18 months.

global leverage and real credit growth in the crisis cluster exemplify the fact that increases in some indicators may reflect a rise in financial stress only up to a specific threshold. Increases beyond that level are, in this case, more concurrent than preceding signals of a crisis. Similarly, budget deficits characterise the late post-crisis and early tranquil periods.

The topological ordering of the SOFSM enables the assessment, in terms of macro-financial conditions, of neighbouring financial states of a particular position on the map. While transmission of financial contagion is often defined by neighbourhood measures like financial or trade linkages, proxies of financial shock propagation, equity market co-movement or geographical relations, the SOFSM neighbourhood is based upon macro-financial vulnerabilities. When assessing the SOFSM, the concept of neighbourhood of a country represents the similarity of the current macro-financial conditions. Thus, a crisis in one position on the map indicates propagation of financial instabilities to adjacent locations. This type of representation may help to identify the changing nature of crises that surpasses historical experience.

Temporal analysis of the euro area and the United States

Employing the methodology for the United States and the euro area for the first quarters of 2002 to 2011 and the second quarter of 2011, which is the latest data point in the sample, the SOFSM clearly recognises the pre-crisis, crisis and post-crisis stages of the financial stability cycle for both economies (see Chart D.6).

Regarding the capability of the SOFSM to make out-of-sample predictions of the onset of the current financial crisis, the following observations can be made. First, the SOFSM maps the United States and the euro area in the pre-crisis state as early as the first quarter of 2006 (see Chart D.6). While in the first quarter of 2007 the United States remains in the pre-crisis state, the SOFSM maps the euro area in the crisis state. Then, when moving to

Chart D.6 A mapping of the financial stability states of the United States and the euro area in the period 2002–11
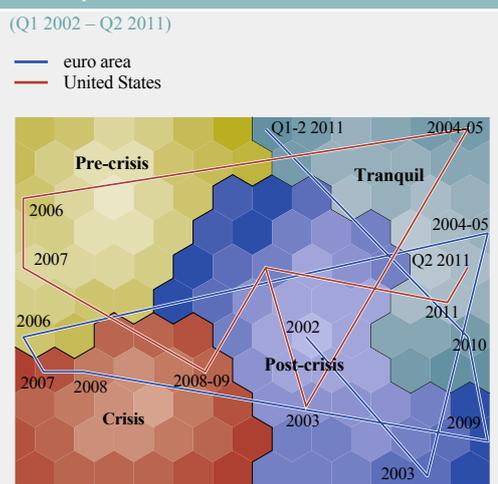
(Q1 2002 – Q2 2011)

— euro area
— United States

Sources: P. Sarlin and T.A. Peltonen, op. cit.
Notes: The chart displays the two-dimensional grid of the SOFSM. The lines that separate the map into four parts are based on the distribution of the four underlying financial stability states. Within each cluster, the shading on the SOFSM shows the distance of each node to the centre of the financial stability state. The data represent the first quarters of 2002 to 2011 and the second quarter of 2011. Data are mapped onto the grid by projecting them to their best-matching units. Consecutive time series data are linked by red and blue lines.

the first quarter of 2008, both the United States and the euro area are classified as being in the crisis state.

Looking at more recent periods, the euro area is located in the tranquil cluster in the first quarter of 2010. This indicates that the aggregated macro-prudential metrics for the euro area as a whole did not reflect the crisis in certain euro area countries. It also coincides with a relatively low financial stress index for the aggregate euro area at that point in time. This can be explained by the vulnerabilities and financial stress in smaller economies being averaged out by better conditions in the larger euro area countries (e.g. Germany), highlighting the importance of country-level analysis. It also stresses the importance of including a broad set of vulnerability indicators in the SOFSM and of cross-checking with other models. The macro-financial vulnerabilities currently used in the SOFSM are best suited for capturing the build-up of vulnerabilities in the form of boom-bust cycles. However, they are less useful

in identifying situations, where, for example, bank funding constraints or counterparty risks in a post-crisis recovery phase cause elevated financial stress that feeds back to the real economy, increasing the probability of a financial crisis. Furthermore, by using the traditional macro-financial vulnerabilities, it is rather difficult to capture situations where, as in the current crisis, self-fulfilling expectations drive the equilibrium outcomes.

Nevertheless, according to the SOFSM, in the second quarter of 2011 the euro area moved to the border of the pre-crisis cluster. With a policy-maker's preference parameter $\mu=0.4$, this particular location in the SOFSM is an early warning unit. At the same time, the United States was located in the post-crisis cluster in the first quarter of 2010 and in the tranquil cluster in the second quarter of 2011.

CONCLUDING REMARKS

This special feature puts forward a Self-Organising Financial Stability Map (SOFSM) based upon data and dimensionality reduction methods for mapping the state of financial stability and visualising the sources of systemic risks. Moreover, the SOFSM can be used as an early warning system, and to analyse contagion on the basis of similarities in macro-financial vulnerabilities across countries. According to the results, the SOFSM makes an out-of-sample prediction identifying the onset of the global financial crisis in the United States as early as the first quarter of 2006.

E THE IMPACT OF DIFFERENT BANK CHARACTERISTICS ON RISK AND PERFORMANCE [1]

This special feature outlines the evidence on the relationship between different bank characteristics and risk before and during the recent financial crisis. A significant amount of bank risk materialised during the crisis. It is argued that two major structural developments in the banking sector (namely deregulation and financial innovation) probably had a large effect on banks' business models and capital levels. This, among other factors, affected banks' incentives to take on new risks in the decade leading up to the crisis. The empirical evidence from a number of studies suggests that banks with higher levels of capital, more stable funding and stronger risk controls performed better during the recent crisis. It also suggests that greater regulation of banks experiencing large increases in stock market valuation is warranted. The main empirical findings are in line with the Basel III recommendations.

INTRODUCTION

The assessment and management of risk are two of the banking sector's core activities. Indeed, a basis for the existence of banks is that they are better than other institutions at screening and managing risks, implying that they can act as delegated monitors for uninformed depositors.[2]

Despite this role, the materialisation of risks observed during the recent crisis raises significant doubts as to whether banks were provided with the right incentives to manage risk effectively. It is likely that certain structural developments occurring within the banking industry over the last two decades have changed banks' business models and affected their incentives regarding risk-taking.[3] This is the theme of this special feature, which, first, reviews the accumulated evidence regarding the impact that banks' business models have had on their performance and the risks they have faced. It then looks at the structural changes brought about by deregulation and financial innovation

in the run up to the crisis; changes that have made the banking industry significantly more complex, larger and more dependent on financial markets. It concludes by analysing the evidence on the realisation of bank risk during the financial crisis period and its implications from a regulatory perspective.

PREVIOUS LITERATURE

A bank's business model has traditionally been considered a major determinant of the risks it faces. Hence, even prior to the crisis, a number of studies had focused on the relation between bank risk and certain characteristics, such as capital, funding sources, corporate governance and diversification.

Conditional on the particular focus and modelling approaches, the literature provides contradictory results on the impact of capital on bank risk. In principle, the higher the capital reserves, the stronger the cushion to endure losses. Higher capital also lowers the incentive to shift risk from shareholders towards exceptionally risky projects at the cost of debt-holders. This is especially the case in the banking sector where a quasi-flat (i.e. not fully risk-adjusted) deposit insurance exists, which can create incentives for shareholders to take on excessive risk in order to optimise the option value of the deposit insurance.[4] Recent studies also find that a higher level of capital is conducive to a more rigorous screening of borrowers, thus implying less bank risk.[5] However, a positive relationship between capital and risk may also exist. Increasing leverage can reduce agency conflicts between managers and

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1   This special feature draws on Y. Altunbas, S. Manganelli and D. Marques-Ibanez, "Bank risk during the financial crisis: Do business models matter?", *ECB Working Paper Series*, No 1394, November 2011.

2   D.W. Diamond, "Financial Intermediation and Delegated Monitoring", *Review of Economic Studies*, 51, 1984.

3   A. Boot and A.V. Thakor, "The Accelerating Integration of Banks and Markets and its Implications for Regulation", in A. Berger, P. Molyneux and J. Wilson (eds.), *The Oxford Handbook of Banking*, 2010.

4   S. Bhattacharya and A.V. Thakor, "Contemporary banking theory", *Journal of Financial Intermediation*, 3, 1993.

5   H. Mehran and A.V. Thakor, "Bank Capital and Value in the Cross-Section", *Review of Financial Studies*, forthcoming.

shareholders, since informed debt-holders could intensify the pressure on bank managers to become more efficient.[6]

A positive empirical relationship between bank capital and risk can exist if regulators (or the markets) force riskier banks to build up capital. Overall, the empirical literature tends to find that higher capital levels increase bank soundness. In this respect, higher quality (i.e. core) forms of capital are found to be particularly helpful during crisis periods.[7]

Another influential determinant of bank risk is the funding structure. The years preceding the crisis saw a rapid growth in off-balance-sheet financing by banks following the massive expansion of securitisation markets. This changed the role of banks and their business models, dramatically altering their incentives to hedge and take on new risks.[8] From the perspective of individual banks, securitisation allowed banks to manage and diversify their credit risk portfolio more easily.

However, banks might also have responded to the static reduction in risks resulting from securitisation by taking on new ones, for instance by loosening their lending standards, increasing their leverage, or becoming systemically riskier.[9]

Leading up to the crisis, banks also borrowed more intensively from wholesale markets through instruments such as covered bonds, repurchase agreements and commercial paper. Prior to the crisis, most of the earlier literature pointed to the benefits derived from the use of market financing. Banks could, in the wholesale markets, raise large new amounts of funding swiftly and at relatively low cost. Compared with depositors, financial market investors were expected to provide more market discipline.[10] The recent financial crisis has illustrated that market sources of funding are heavily dependent on market perceptions, raising concerns about the monitoring role of wholesale investors. By contrast, retail deposits tend to be more stable in periods of crisis since they are typically insured by the government.

A further element has been a geographical expansion, which usually coincides with high rates of credit growth. Historically, most systemic banking crises have been preceded by periods of excessive lending growth.[11] Microeconomic evidence from large international banks suggests that loan growth represents an important driver of risk.[12]

The other business aspect that can have a major impact on bank risk is the trend towards more diversification in sources of bank income and an expansion of non-interest income revenues which can provide banks with supplementary sources of revenue. Such diversification could, in principle, bring about stability in overall income. However, as this category of income tends to be a relatively unstable source of revenue compared with interest rate income, there could, in periods of financial stress, be a drop in traditional sources of revenue, coupled with a larger decline in income from non-interest rate income.

The empirical evidence for the impact of diversification on bank risk in the United States and around the world is mixed. A broad conclusion from these studies is that the mounting reliance on non-interest income cannot be linked to diminished volatility in earnings.[13]

6 D.W. Diamond and R.G. Rajan, "Liquidity Risk, Liquidity Creation, and Financial Fragility: a Theory of Banking", *Journal of Political Economy*, 109, 2001.
7 A. Berger and C. Bouwman, "How Does Capital Affect Bank Performance During Financial Crises?", *Wharton Financial Institutions Center Working Paper Series*, 11-22, 2011.
8 D. Marques-Ibanez and M. Scheicher, "Securitization: Instruments and Implications", in A. Berger, P. Molyneux and J. Wilson (eds.), *The Oxford Handbook of Banking*, 2010.
9 B. Keys, T. Mukherjee, A. Seru and V. Vig, "Did Securitization Lead to Lax Screening? Evidence from Subprime Loans", *Quarterly Journal of Economics*, 125, 2010.
10 C. Calomiris and C. Kahn, "The Role of Demandable Debt in Structuring Optimal Banking Arrangements", *American Economic Review*, 81 (3), 1991.
11 C.M. Reinhart and K.S. Rogoff, *This Time Is Different: Eight Centuries of Financial Folly*, Princeton University Press, 2009.
12 D. Foos, L. Norden and M. Weber, "Loan Growth and Riskiness of Banks", *Journal of Banking and Finance*, 34, (12), 2010.
13 K. J. Stiroh, "Diversification in Banking", in A. Berger, P. Molyneux and J. Wilson (eds.), *The Oxford Handbook of Banking*, 2010.

THE BUILD-UP: DEREGULATION, FINANCIAL INNOVATION AND RISING STOCK MARKET PRICES

The future validity of the evidence documented above relating to the pre-crisis period is subject to distortions if structural developments in the banking industry in the decades before the crisis have led to alterations in banks' business models and their incentives as regards greater risk-taking, which could only become apparent in a financial crisis.

The first major structural development was deregulation. Over the past two decades deregulation in the banking sector aimed to achieve economic benefits from greater competition. In the United States, this liberalisation dismantled most barriers to the geographical expansion of banks and included an extensive deregulation of investment banking activities. There was an analogous experience in the European Union, supported by the creation of the Single Market in 1992 and the introduction of the euro which, in effect, removed some of the lingering regulation that limited the ability of banks to conduct certain activities and expand geographically.

Financial innovation was the other major structural change, particularly large increases in the use of direct funding via the financial markets and securitisation activity. An important implication of this financial innovation is that banks became more closely linked to financial markets and increased the share of non-interest income as a proportion of total revenues derived from own-trading, brokerage and investment banking activities.

Deregulation and financial innovation led to a profound overhaul of banks' activities and business models while altering banks' incentives to take on risks. These changes took place along several dimensions, such as size, recourse to non-interest income revenues, corporate governance and funding practices, all of which were affected by the macroeconomic environment.

The deregulatory process was partly counterbalanced by regulators giving bank capital a more important role in the prudential regulatory and supervisory processes. Indeed, the international regulatory response to these enhanced incentives to take on risk concentrated on the Basel recommendations, which focused on capital requirements as the basis of prudential regulations for banks. In this respect, the Basel II Accord, initially published in June 2004, aimed to more tightly connect capital requirements to underlying bank risks. It also favoured best practices within financial markets. For instance, it allowed a stronger reliance on capital requirements within banks' internal risk assessment models and encouraged a greater role for financial markets as a supervisory disciplining device. A side effect of the Basel II Accord was to compound problems of cyclicality within the financial system, which were already exacerbated by the ongoing changes in the financial system.

Despite the likely significant build-up of risks arising from these factors, the majority of the most commonly used indicators of bank risk showed a fairly benign picture in the years preceding

Chart E.1 Expected default frequencies of banks in selected regions

(1998 – 2008; one-year ahead estimated percentage probability of default)

euro area
United Kingdom
United States
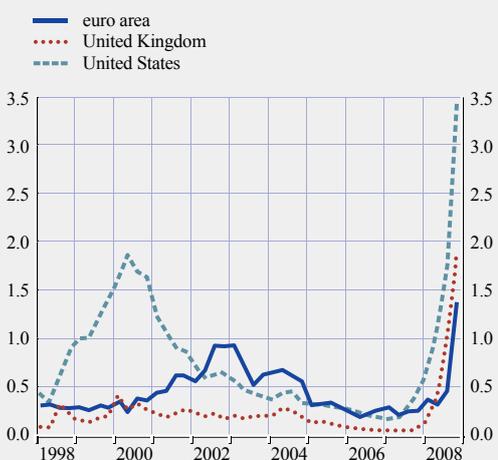
Source: Moody's KMV.
Notes: Expected default frequency (EDF) is the probability that a bank will default within a given time horizon (one year ahead in this case). EDF is a well-known, forward-looking indicator of risk computed by Moody's KMV. It builds on Merton's model for pricing corporate bond debt. The EDF value, expressed as a percentage, is calculated by combining banks' financial statements with stock market information and Moody's proprietary default base.

Chart E.2 Bank stock price indices in the United States and the European Union

(Jan. 1990 – Feb. 2011; index: Jan. 1973 = 100)

- —— EU banks
- ..... US banks
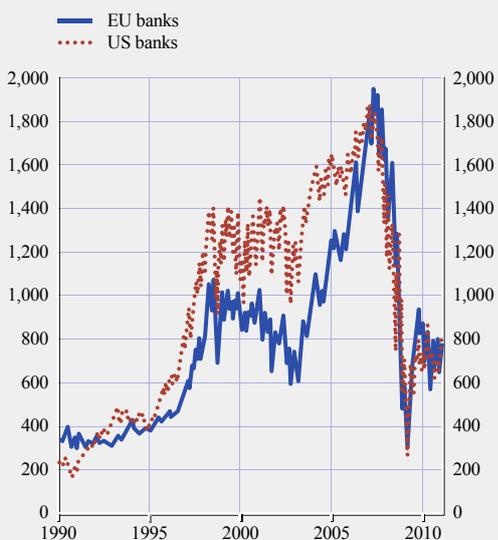
Source: Thomson Reuters Datastream.

Chart E.3 Distribution of the stock market returns of individual European and US banks

(percentages)

Source: Thomson Reuters Datastream.
Notes: The chart presents the cross-sectional distribution of stock market returns for the listed European and US banks. It is based on data for monthly stock market prices. The 10%, 25%, 50%, 75% and 90% quantiles of the distribution of average stock market returns for the pre-crisis (first quarter of 2002 to the second quarter of 2007) and crisis (third quarter of 2007 to the fourth quarter of 2009) periods are presented. The "box plot" consists of a "box" that moves from the first to the third quartile. Within the box itself, the blue shaded horizontal line represents the median. The area below the bottom whisker moves from the 25% to the 10% quantile, while the area above the top whisker moves from the 75% to the 90% quantile of the distribution.

the crisis. Indeed, even the forward-looking measures of bank risk regularly used by investors to monitor the health of the financial system remained at very low levels (see Chart E.1).

EVIDENCE FROM THE CRISIS

During the financial crisis the contrast in the behaviour of indicators of bank risk was stark when compared with the pre-crisis period, as the build-up of hidden risks materialised. For instance, between May 2007 and March 2009 there was an unprecedented decimation of stock market value as European and American banks lost in the region of €3 trillion in stock market capitalisation. This corresponded to an 82% decline in their aggregate stock market capitalisation and represented the largest materialisation of bank risk since the Great Depression (see Chart E.2).

This realisation of bank risk has been used to shed light on the effect of business models on banks' performance. The idea is to use the crisis as a basis for analysis by looking at the risks related to certain bank business models that were not apparent in bank risk indicators prior to the crisis, but which manifested themselves during the crisis. In other words, evidence relating to the diverse manner in which banks performed during the crisis is connected back to differences in bank characteristics prior to the crisis (i.e. before those risks materialised). The effects of this unprecedented realisation of risk were extremely varied, as already indicated. The wide dispersion of cross-sectional stock market returns prior to and during the crisis suggests a high degree of heterogeneity in risk-taking in the pre-crisis period (see Chart E.3).

As a result, a number of recent studies have focused on the determinants of performance using stock market information from large banks.

There is strong evidence that banks' capital enhanced the performance of all sizes of banks during the crisis.[14] The relationship between

14 A. Berger and C. Bouwman, op. cit.

stock returns and capital is stronger when higher quality forms of capital, such as Tier 1 capital, are measured, rather than the risk-adjusted capital ratio.[15]

Funding fragility also seems to have been a major determinant of performance during the crisis. Recent evidence suggests that when funding from financial markets became unavailable, or prohibitively expensive, the market valued more positively those institutions that were more heavily funded via customer deposits. As a result, a larger deposit base and more liquid assets were also associated with higher returns.

A strong and independent risk management function within the bank also helped to contain bank risk. Recent results show that US bank holding companies that had implemented stronger internal risk controls before the onset of the financial crisis were more prudent in their risk-taking and did relatively better during the crisis. The effects of corporate governance are more mixed.[16] At the same time, banks with more shareholder-friendly boards performed worse during the crisis.[17]

Turning to measures of materialised risk during the crisis (as opposed to stock market performance), Altunbas, Manganelli and Marques-Ibanez[18] analyse several aspects of bank risk during the crisis. In other words, information from the crisis period is exploited to capture the various dimensions of bank risk that manifested itself at this time by using different measures of bank distress – including the likelihood of a bank rescue and systematic risk.

For a large panel of listed international institutions, these measures are related to the business models employed by banks in the pre-crisis period. Bank size, undercapitalisation and the degree of credit expansion in the years preceding the crisis are found to be important factors behind the distress eventually experienced. The interaction of banks with financial markets also influenced bank distress, with those banks relying on

Table E.I The effects of bank business models on bank risk: OLS estimates for systematic risk

Undercapitalised	-0.0487***
	(0.0180)
Short-term market funding	0.0087***
	(0.0030)
Deposit funding	-0.0149***
	(0.0030)
Excessive loan growth	0.1405***
	(0.0280)
Non-interest income	-0.0043*
	(0.0020)

Sources: Extract from Altunbas, Manganelli and Marques-Ibanez, op. cit.
Notes: The table provides the OLS estimates for bank distress, measured as individual bank systematic risk during the crisis period, calculated using stock market information. A selection of the main results are presented. *, **, *** indicate statistical significance at the 10%, 5% and 1% levels respectively. Standard errors are in parentheses.

a large deposit base (and less on short-term market funding) suffering to a lesser extent (see Table E.I).

The results indicate that business models had a significant influence on banks' performance during the recent crisis. Banks with a lower risk profile or banks that followed a more traditional business model with stronger reliance on deposit funding and interest rate income had lower returns in the pre-crisis period, but came through the crisis with significantly lower losses.

Interestingly, those banks that did particularly well prior to the crisis – i.e. those banks with the highest stock market returns in 2006 – were also more likely to have the worst returns during the crisis. This calls for a better understanding of risk-taking incentives, particularly for those banks experiencing rapid increases in their stock market valuations.

15 A. Demirguc-Kunt, E. Detragiache and O. Merrouche, "Bank Capital: Lessons from the Financial Crisis", *The World Bank Policy Research Working Paper Series*, No 5473, 2010
16 A. Ellul and V. Yerramilli, "Stronger Risk Controls, Lower Risk: Evidence from U.S. Bank Holding Companies", *NBER Working Papers*, No 16178, 2010.
17 A. Beltratti and R.M. Stulz, "Why Did Some Banks Perform Better During the Credit Crisis? A Cross-country Study of the Impact of Governance and Regulation", *Journal of Financial Economics,* forthcoming.
18 Y. Altunbas, S. Manganelli and D. Marques-Ibanez, op. cit.

Recent evidence also suggests that banks that did badly in the previous crisis were also the ones that performed the worst in the recent crisis. In fact, there is a statistically significant relationship between banks' performance in 1998, when the latest period of stress occurred, and their performance in 2007/08.[19]

CONCLUDING REMARKS

One of the major reasons for the existence of banks is that they are better at managing risks than other institutions. In the recent financial crisis, however, banks encountered risk on a scale not witnessed since the Great Depression. Structural changes brought about by deregulation and financial innovation made the industry significantly more complex, larger, more global and dependent on financial markets. A number of recent analytical studies take advantage of the evidence provided by the crisis to analyse whether the differences in bank business models and capital levels can be related to banks' performance during the crisis period.

Lower capitalisation and a high degree of credit expansion in the years preceding the crisis were linked to a worse performance during the crisis. The bank funding structure also seems to be of significance, with those banks relying on a large deposit base suffering less than those more dependent on market funding. Stock value creation in the run-up to the crisis also seems to be related to a worse performance during the crisis.

Overall, the results support the prudential regulatory initiatives of Basel III, which aim to raise the core capital levels of institutions, particularly undercapitalised ones. They also provide support for efforts directed at reducing the cyclicality of credit provided by banks and increasing the capital charges for those institutions relying more strongly on short-term market funding.

19 R. Fahlenbrach, R. Prilmeier and R.M. Stulz, "This Time is the Same: Using Bank Performance in 1998 to Explain Bank Performance During the Recent Financial Crisis", *NBER Working Papers,* No 17038, 2011.

STATISTICAL ANNEX

I MACRO-FINANCIAL ENVIRONMENT

Chart S1 Real GDP growth in the euro area

(Q1 1999 - Q3 2011; percentage change)

- quarterly growth
- annual growth

Sources: Eurostat and ECB calculations.

Chart S2 Survey-based estimates of the four-quarter-ahead downside risk of weak real GDP growth in the euro area

(Q1 2000 - Q2 2012; percentages)

- probability of GDP growth below 0%
- probability of GDP growth below 1%
- probability of GDP growth below 2%
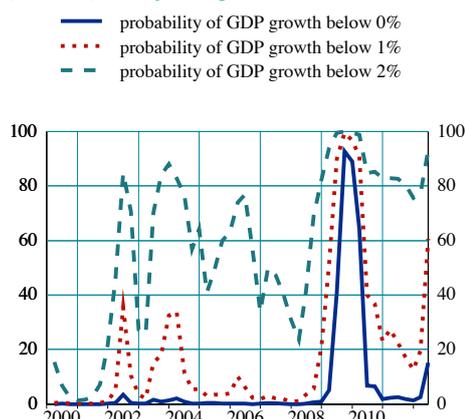
Sources: ECB Survey of Professional Forecasters (SPF) and ECB calculations.
Notes: The indicators measure the probability of real GDP growth expectations being below the indicated threshold in each reference period. Estimates are calculated four quarters ahead after each official release of GDP figures.

Chart S3 Unemployment rate in the euro area and in selected euro area countries

(Jan. 1999 - Sep. 2011; percentage of workforce)

- euro area
- Germany
- France
- Italy
- Netherlands
- Spain
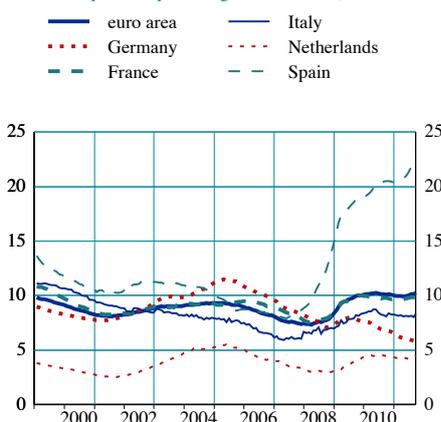
Source: Eurostat.

Chart S4 Gross fixed capital formation and housing investment in the euro area

(Q1 1999 - Q2 2011; percentage of GDP)

- gross fixed capital formation (left-hand scale)
- housing investment (right-hand scale)
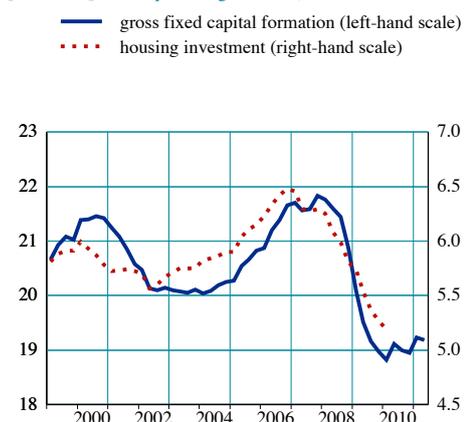
Sources: Eurostat and ECB calculations.

Chart S5 Annual growth in MFI loans to non-financial corporations in the euro area

(Jan. 2001 - Sep. 2011; percentage change per annum)

- total loans
- up to one year
- over one and up to five years
- over five years
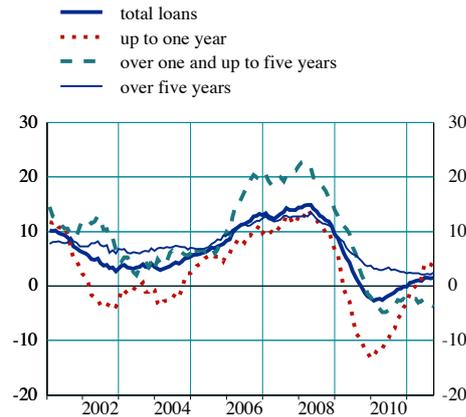
Sources: ECB and ECB calculations.
Notes: Data are based on financial transactions relating to loans provided by monetary financial institutions (MFIs) and are not corrected for the impact of securitisation. For further details, see ECB, "Securitisation in the euro area", *Monthly Bulletin*, February 2008.

Chart S6 Annual growth in debt securities issued by non-financial corporations in the euro area

(Jan. 2001 - Sep. 2011; percentage change per annum)

- all debt securities
- fixed rate long-term debt securities
- variable rate long-term debt securities
- short-term debt securities
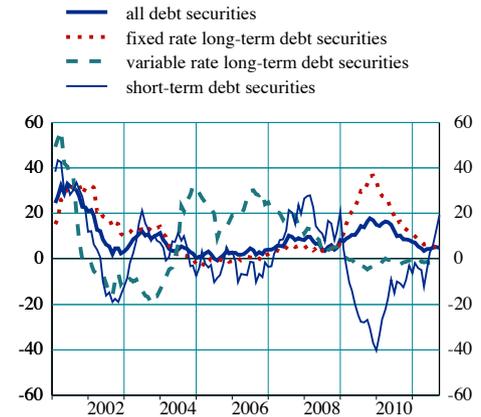
Source: ECB.

Chart S7 Real cost of the external financing of euro area non-financial corporations

(Jan. 2001 - Oct. 2011; percentages)

- overall cost of financing
- real short-term MFI lending rates
- real long-term MFI lending rates
- real cost of market-based debt
- real cost of quoted equity
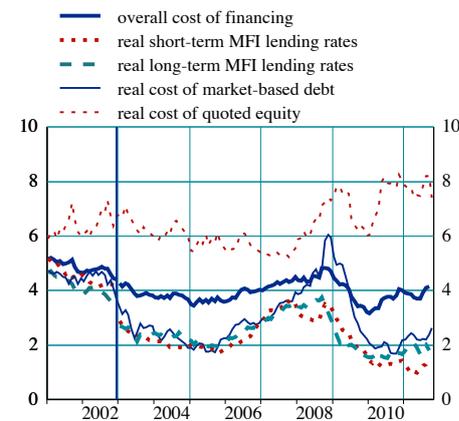
Sources: ECB, Thomson Reuters, Merrill Lynch, Consensus Economics forecasts and ECB calculations.
Notes: The real cost of external financing is calculated as the weighted average of the cost of bank lending, the cost of debt securities and the cost of equity, based on their respective amounts outstanding and deflated by inflation expectations. The introduction of MFI interest rate statistics at the beginning of 2003 led to a statistical break in the series.

Chart S8 Net lending/borrowing of non-financial corporations in the euro area

(Q1 2000 - Q2 2011; percentage of gross value added of non-financial corporations; four-quarter moving sum)
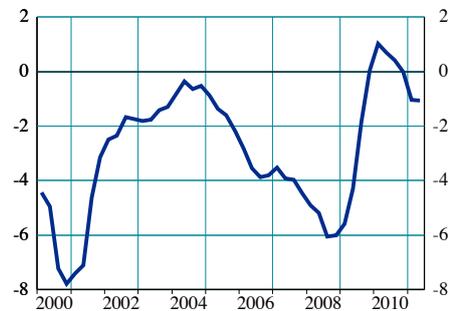
Sources: ECB and ECB calculations.

Chart S9 Total debt of non-financial corporations in the euro area

(Q1 1999 - Q2 2011; percentages)

— debt-to-GDP ratio (left-hand scale)
···· debt-to-financial assets ratio
      (left-hand scale)
– – – debt-to-equity ratio (right-hand scale)
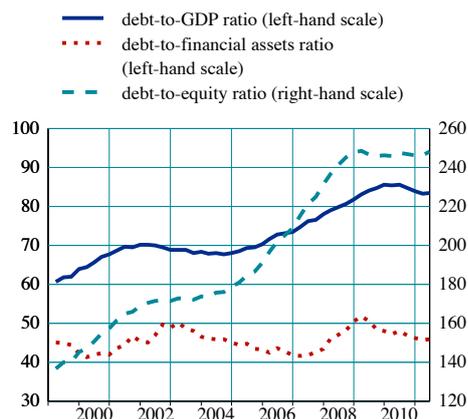
Sources: ECB, Eurostat and ECB calculations.
Notes: Debt includes loans, debt securities issued and pension fund reserves. The debt-to-equity ratio is calculated as a percentage of outstanding quoted shares issued by non-financial corporations, excluding the effect of valuation changes.

Chart S10 Growth of earnings per share (EPS) and 12-month-ahead growth forecast for euro area non-financial corporations

(Jan. 2005 - Oct. 2012; percentage change per annum)

— actual EPS growth
⊙ 12-month ahead forecast of
   October 2011
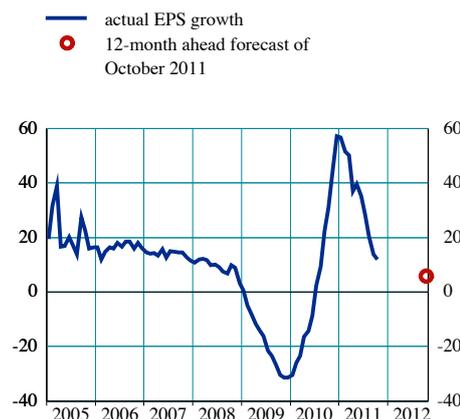
Sources: Thomson Reuters and ECB calculations.
Note: Growth rates are derived on the basis of aggregated EPS of Dow Jones STOXX indices for euro area non-financial corporation sub-sectors, using 12-month-trailing EPS for actual figures and 12-month-ahead EPS for the forecast.

Chart S11 Euro area and European speculative-grade corporations' actual and forecast default rates

(Jan. 1999 - Sep. 2012; percentages; 12-month trailing sum)

— euro area corporations
···· European corporations
— European corporations, forecast of
   September 2011
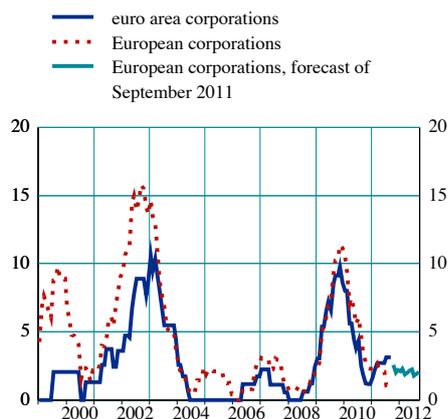
Source: Moody's.

Chart S12 Euro area non-financial corporations' rating changes

(Q1 1999 - Q3 2011; number)

— upgrades
— downgrades
– – – balance
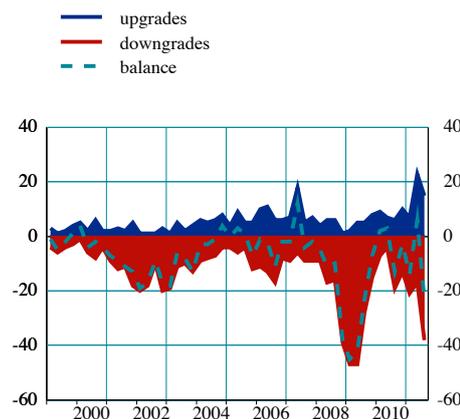
Sources: Moody's and ECB calculations.

Chart S13 Expected default frequency (EDF) of euro area non-financial corporations
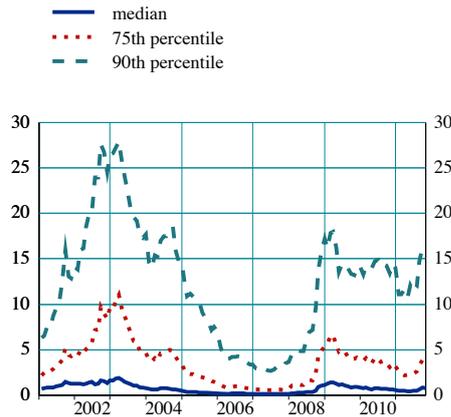
(Jan. 2001 - Oct. 2011; percentage probability)

— median
······ 75th percentile
– – – 90th percentile

Sources: Moody's KMV and ECB calculations.
Notes: The EDF provides an estimate of the probability of default over the following year. Due to measurement considerations, the EDF values are restricted by Moody's KMV to the interval between 0.01% and 35%.

Chart S14 Expected default frequency (EDF) distributions for euro area non-financial corporations

— October 2011
······ April 2011

expected default frequency (% probability)
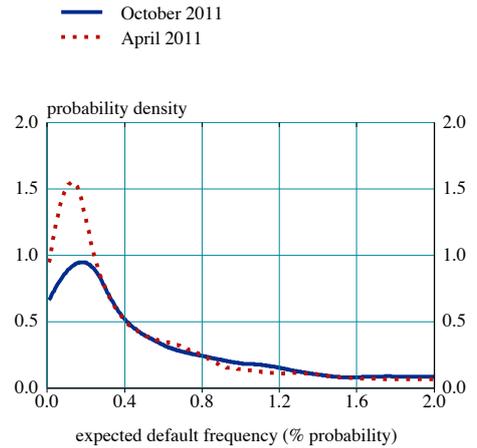
Sources: Moody's KMV and ECB calculations.

Chart S15 Expected default frequency (EDF) distributions for large euro area non-financial corporations
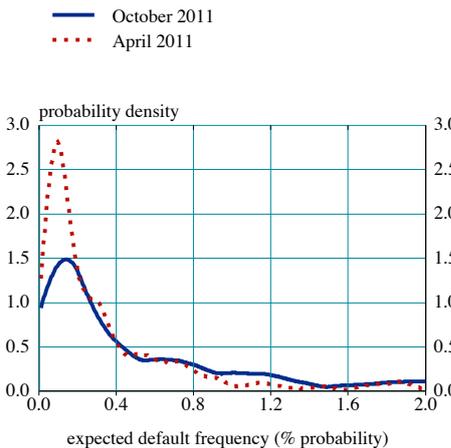
— October 2011
······ April 2011

expected default frequency (% probability)

Sources: Moody's KMV and ECB calculations.
Note: The sample covers euro area non-financial corporations with a value of liabilities that is in the upper quartile of the distribution.

Chart S16 Expected default frequency (EDF) distributions for small euro area non-financial corporations
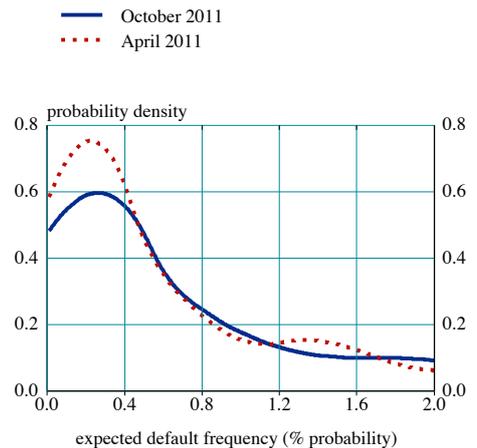
— October 2011
······ April 2011

expected default frequency (% probability)

Sources: Moody's KMV and ECB calculations.
Note: The sample covers euro area non-financial corporations with a value of liabilities that is in the lower quartile of the distribution.

Chart S17 Euro area country distributions of commercial property capital value changes

(2001 - 2010; capital values; percentage change per annum;
minimum, maximum and interquantile distribution)

•••• weighted average
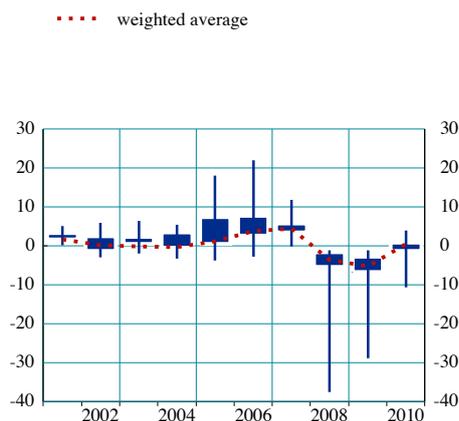
Sources: Investment Property databank and ECB calculations.
Notes: Distribution of country-level data, covering ten euro area
countries. The coverage of the total property sector within
countries ranges from around 20% to 80%. Capital values are
commercial property prices adjusted downwards for capital
expenditure, maintenance and depreciation. The values of the
national commercial property markets are used as weights for
the cross-country weighted averages.

Chart S18 Euro area commercial property capital value changes in different sectors

(2001 - 2010; capital values; percentage change per annum;
cross-country weighted average)

—— all property
•••• retail
– – office
—— residential (to let)
----- industrial
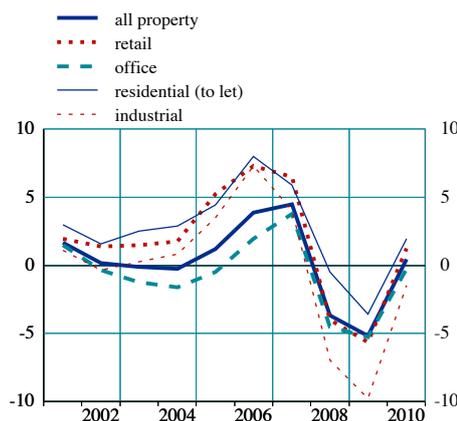
Sources: Investment Property databank and ECB calculations.
Notes: The data cover ten euro area countries. The coverage of the
total property sector within countries ranges from around 20% to
80%. Capital values are commercial property prices adjusted
downwards for capital expenditure, maintenance and depreciation.
The values of the national commercial property markets are used
as weights for the cross-country weighted averages.

Chart S19 Annual growth in MFI loans to households in the euro area
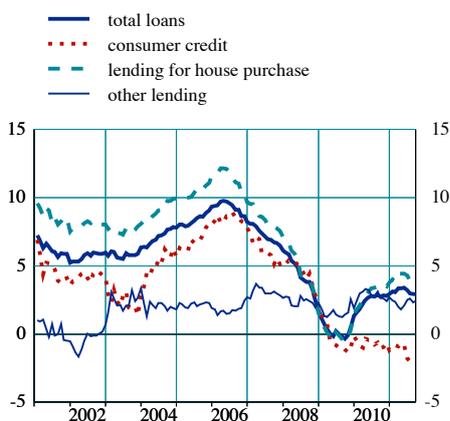
(Jan. 2001 - Sep. 2011; percentage change per annum)

—— total loans
•••• consumer credit
– – lending for house purchase
—— other lending

Sources: ECB and ECB calculations.
Notes: Data are based on financial transactions relating to loans
provided by MFIs and are not corrected for the impact of
securitisation. For more details, see the note of Chart S5.

Chart S20 Household debt-to-disposable income ratios in the euro area

(Q1 2000 - Q2 2011; percentage of disposable income)

—— total debt
•••• lending for house purchase
– – consumer credit
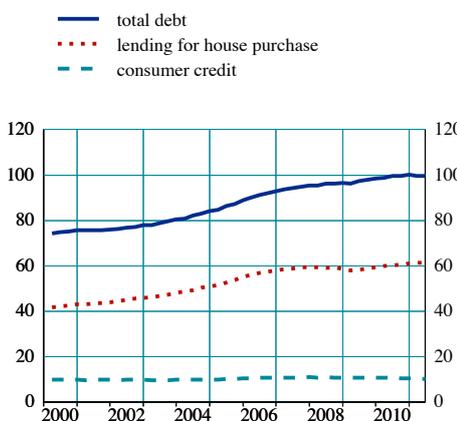
Sources: ECB and ECB calculations.
Note: These series are the raw series for the respective quarter
divided by the fourth-quarter moving sum of the disposable
income.

Chart S21 Household debt-to-GDP ratio in the euro area

(Q1 1999 - Q2 2011; percentages)
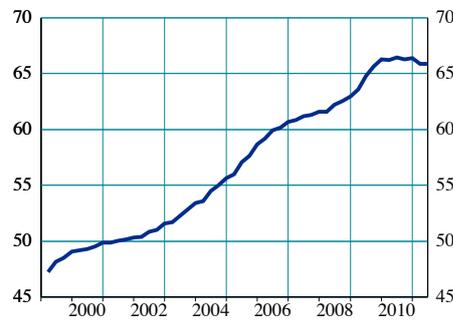
Sources: ECB, Eurostat and ECB calculations.

Chart S22 Household debt-to-assets ratios in the euro area

(Q1 1999 - Q2 2011; percentages)

- household debt-to-wealth ratio (right-hand scale)
- household debt-to-financial assets ratio (right-hand scale)
- household debt-to-housing wealth ratio (right-hand scale)
- household debt-to-liquid financial assets ratio (left-hand scale)

Sources: ECB and ECB calculations.

Chart S23 Interest payment burden of the euro area household sector

(Q1 2000 - Q2 2011; percentage of disposable income)
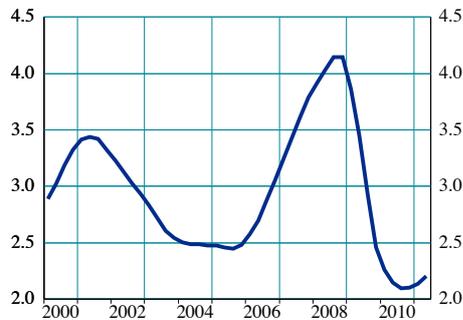
Source: ECB.

Chart S24 Narrow housing affordability and borrowing conditions in the euro area

(Jan. 2001 - Sep. 2011)

- ratio of disposable income to house prices (index: 2001 = 100; left-hand scale)
- lending rates on loans for house purchase (percentage; right-hand scale)
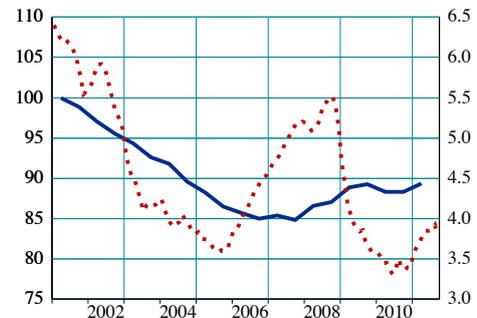
Sources: ECB and ECB calculations.
Note: The narrow measure of housing affordability given above is defined as the ratio of the gross nominal disposable income to the nominal house price index.

Chart S25 Residential property price changes in the euro area

(Q1 1999 - Q2 2011; percentage change per annum)

- nominal
- real
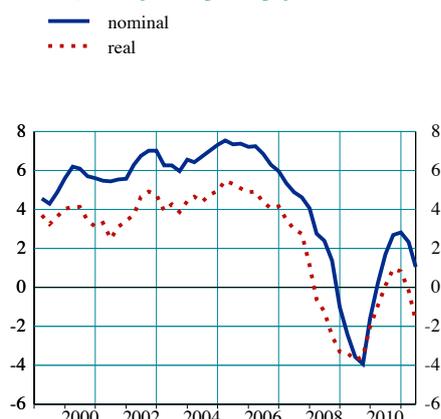
Sources: Eurostat and ECB calculations based on national sources.
Note: The real price series has been deflated by the Harmonised Index of Consumer Prices (HICP).

Chart S26 House price-to-rent ratio for the euro area and selected euro area countries

(1996 - 2010; index: 1996 = 100)

- euro area
- Germany
- France
- Italy
- Spain
- Netherlands
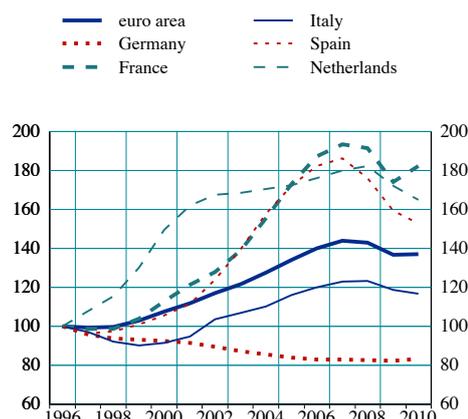
Sources: Eurostat and ECB calculations based on national sources.
Note: For information on the sources and coverage of the series displayed, refer to Table S1. For Spain, data prior to 2007 refer to another national source.

Table S1   Changes in residential property prices in the euro area countries

(percentage change per annum)

	Weight	1999 2007	2008	2009	2010	2010 H2	2011 H1	2010 Q4	2011 Q1	2011 Q2	2011 Q3
Belgium[1]	3.9	8.1	4.9	-0.4	5.4	5.9	3.1	5.9	3.2	3.0	-
Germany[2]	27.0	-0.3	0.6	0.6	2.3	-	-	-	-	-	-
Estonia[4), 6)]	0.2	-	-13.4	-35.9	0.1	5.1	6.4	4.0	2.2	10.7	-
Ireland[2), 6)]	1.7	-	-5.9	-18.3	-13.1	-11.2	-11.8	-11.0	-11.1	-12.4	-13.5
Greece[4]	2.5	-	1.7	-3.7	-4.7	-6.1	-4.8	-7.0	-5.3	-4.4	-4.1
Spain[2), 6)]	11.6	-	-1.5	-6.7	-2.0	-2.0	-5.5	-1.9	-4.1	-6.8	-
France[1), 6)]	21.1	10.3	1.2	-7.1	6.4	9.0	8.3	9.6	8.9	7.7	-
Italy[2]	16.9	5.9	2.6	-0.4	0.1	0.4	0.9	-	-	-	-
Cyprus[2), 7)]	0.2	-	16.7	-4.1	-2.5	-4.3	-4.9	-6.2	-5.0	-4.8	-
Luxembourg[4), 6)]	0.4	-	2.7	-2.1	4.5	5.4	4.0	5.1	2.4	5.7	-
Malta[2]	0.1	8.0	-2.7	-5.0	1.1	-0.2	-1.3	-2.0	-2.6	0.0	-
Netherlands[1), 6)]	6.4	7.9	2.9	-3.3	-2.0	-0.8	-1.6	-1.0	-1.2	-1.9	-2.7
Austria[2), 8)]	3.1	1.1	1.2	3.6	5.7	5.9	2.6	6.8	3.9	1.4	5.7
Portugal[2), 3)]	1.9	3.3	3.9	0.4	1.8	2.2	0.4	1.6	0.6	0.2	-
Slovenia[2), 6)]	0.4	-	7.1	-9.5	0.1	0.6	3.7	-0.2	4.1	3.2	-
Slovakia[1]	0.7	-	22.1	-11.1	-3.9	-1.7	-2.7	-2.1	-2.5	-2.8	-4.3
Finland[1), 6)]	2.0	-	0.6	-0.3	8.7	6.6	3.6	5.2	4.1	3.1	2.7
Euro area	100.0	6.1	1.4	-2.9	1.8	2.8	1.7	2.8	2.3	1.1	-

Sources: National sources and ECB calculations.
Notes: Weights are based on 2010 nominal GDP and are expressed as a percentage. The estimates of the euro area aggregate include quarterly contributions for Germany and Italy based on interpolation or temporal disaggregation of annual or semi-annual data, respectively. For Germany from 2008 on, quarterly estimates take into account early information from seven cities.
1) Existing dwellings (houses and flats); whole country.
2) All dwellings (new and existing houses and flats); whole country.
3) Series compiled by national private institutions.
4) All flats; whole country.
5) Series compiled by other national official sources.
6) Series compiled by the national statistical institutes.
7) The property price index is estimated by the Central Bank of Cyprus, using data on valuations of property received from several MFIs and other indicators relevant to the housing market.
8) Up to 2000, data are for Vienna only.

Chart S27 US non-farm, non-financial corporate sector business liabilities

(Q1 1980 - Q2 2011; percentages)

- ——— ratio of liabilities to financial assets
- ········· ratio of liabilities to GDP
- – – – ratio of credit market liabilities to GDP
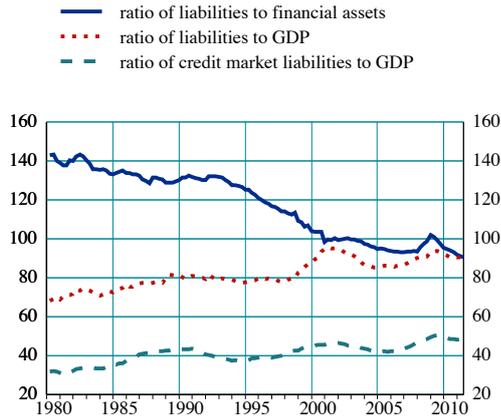
Sources: Thomson Reuters, Bank for International Settlements (BIS), Eurostat and ECB calculations.

Chart S28 US non-farm, non-financial corporate sector business net equity issuance

(Q1 1980 - Q2 2011; USD billions; seasonally adjusted and annualised quarterly data)
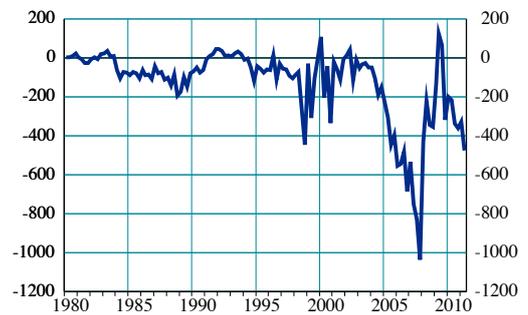
Source: BIS.

Chart S29 US speculative-grade corporations' actual and forecast default rates

(Jan. 1990 - Sep. 2012; percentages; 12-month trailing sum)

- ——— actual default rate
- ——— September 2011 forecast default rate
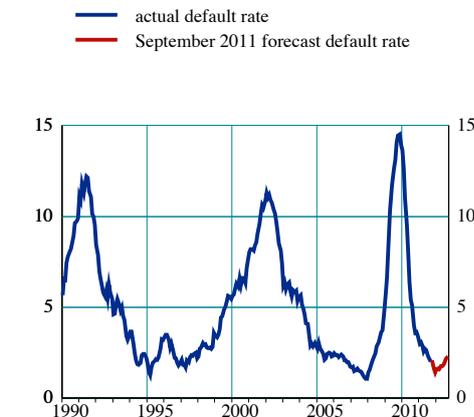
Source: Moody's.

Chart S30 US corporate sector rating changes

(Q1 1999 - Q3 2011; number)

- ——— upgrades
- ——— downgrades
- – – – balance
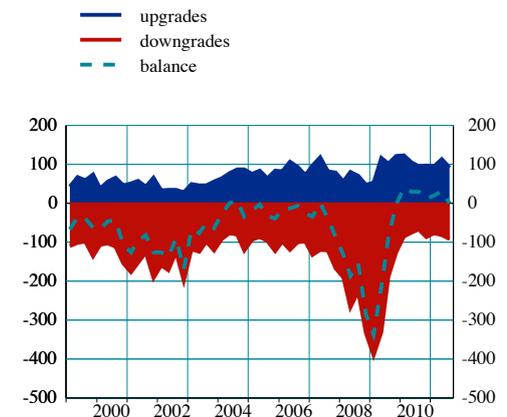
Sources: Moody's and ECB calculations.

Chart S31 US household sector debt

(Q1 1980 - Q2 2011; percentage of disposable income)

― total liabilities
····· residential mortgages
– – consumer credit
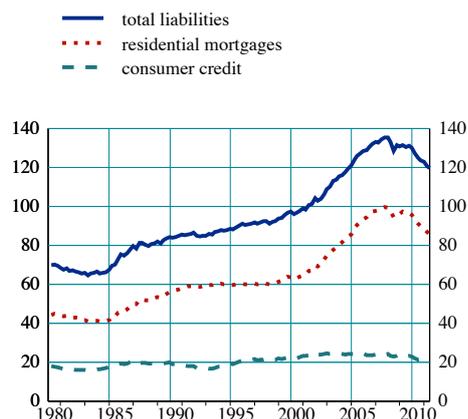
Sources: Thomson Reuters, BIS and ECB

Chart S32 US household sector debt burden

(Q1 1980 - Q2 2011; percentage of disposable income)

― debt servicing ratio
····· financial obligations ratio
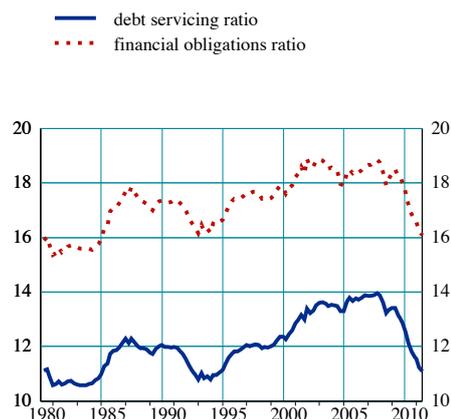
Source: Thomson Reuters.
Notes: The debt servicing ratio represents the amount of debt payments as a percentage of disposable income. The financial obligations ratio also includes automobile lease payments, rental payments on tenant-occupied property, homeowners' insurance and property tax payments.

Chart S33 Share of adjustable rate mortgages in the United States

(Jan. 2001 - Oct. 2011; percentage of total new mortgages)

― number of loans
····· dollar volume
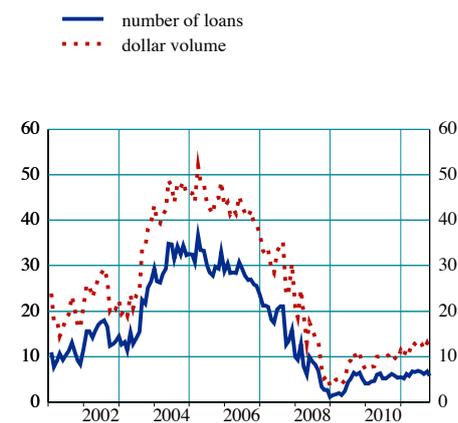
Source: Thomson Reuters.

Chart S34 US general government and federal debt

(Q1 1980 - Q3 2011; percentage of GDP)

― general government gross debt
····· federal debt held by the public
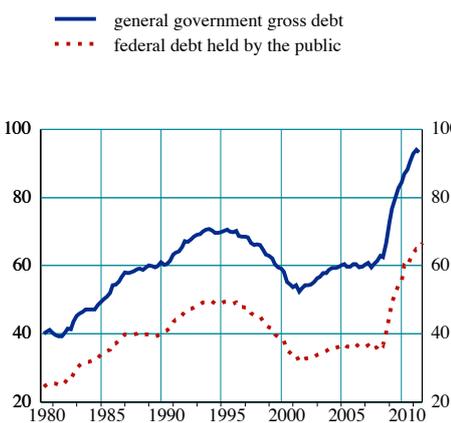
Sources: Board of Governors of the Federal Reserve System, Eurostat, Thomson Reuters and ECB calculations.
Note: General government gross debt comprises federal, state and local government gross debt.

Chart S35 International positions of all BIS reporting banks vis-à-vis emerging markets

(Q1 1999 - Q2 2011; USD billions)

— loans and deposits (left-hand scale)
····· holdings of securities (right-hand scale)
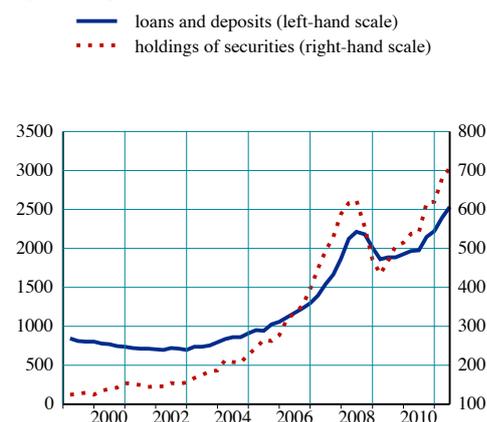
Sources: BIS and ECB calculations.

Table S2   Financial vulnerability indicators for selected emerging market economies

	Real GDP growth (% change per annum)			Inflation (% change per annum)			Current account balance (% of GDP)		
	2010	2011	2012	2010	2011	2012	2010	2011	2012
Asia									
China	10.3	9.5	9.0	4.7	5.1	3.0	5.2	5.2	5.6
Hong Kong	7.0	6.0	4.3	3.1	4.0	4.5	6.2	5.4	5.5
India	10.1	7.8	7.5	9.5	8.9	8.5	-2.6	-2.2	-2.2
Indonesia	6.1	6.4	6.3	7.0	5.0	6.4	0.8	0.2	-0.4
Korea	6.2	3.9	4.4	3.5	4.1	3.0	2.8	1.5	1.4
Malaysia	7.2	5.2	5.1	2.1	3.2	2.5	11.5	11.3	10.8
Singapore	14.5	5.3	4.3	4.0	1.8	5.1	22.2	19.8	18.5
Taiwan	10.9	5.2	5.0	7.6	2.3	1.8	9.3	11.0	11.0
Thailand	7.8	3.5	4.8	3.0	4.2	5.6	4.6	4.8	2.5
Emerging Europe									
Russia	4.0	4.3	4.1	8.8	7.5	7.1	4.8	5.5	3.5
Turkey	8.9	6.6	2.2	6.4	8.0	5.7	-6.6	-10.3	-7.4
Ukraine	4.2	4.7	4.8	9.1	10.7	8.5	-2.1	-3.9	-5.3
Latin America									
Argentina	9.2	8.0	4.6	10.9	11.0	11.0	0.8	-0.3	-0.9
Brazil	7.5	3.8	3.6	5.9	6.3	4.5	-2.3	-2.3	-2.5
Chile	5.2	6.5	4.7	3.0	3.6	3.1	1.9	0.1	-1.5
Colombia	4.3	4.9	4.5	3.2	3.1	3.1	-3.1	-2.6	-2.5
Mexico	5.4	3.8	3.6	4.4	3.3	3.0	-0.5	-1.0	-0.9
Venezuela	-1.5	2.8	3.6	27.2	24.5	24.0	4.9	7.3	5.8

Sources: International Monetary Fund (IMF).
Notes: Data for 2011 and 2012 are estimates. In the case of real GDP for Colombia and current account balance for Argentina, Colombia and Mexico, the data for 2010 are estimates.

2 FINANCIAL MARKETS AND GLOBAL FINANCIAL INSTITUTIONS

Chart S36 Bid-ask spreads for EONIA swap rates

(Jan. 2003 - Nov. 2011; basis points; 20-day moving average; transaction-weighted)

— one month
···· three months
– – one year
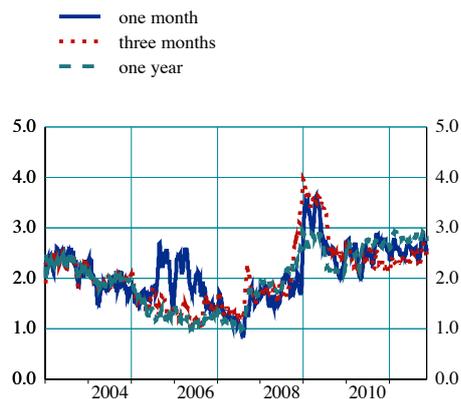
Sources: Thomson Reuters and ECB calculations.

Chart S37 Spreads between euro area interbank deposit and repo interest rates

(Jan. 2003 - Nov. 2011; basis points; 20-day moving average)

— one week
···· one month
– – one year
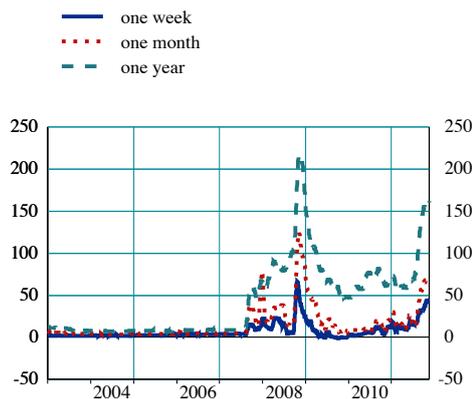
Sources: Thomson Reuters and ECB calculations.

Chart S38 Implied volatility of three-month EURIBOR futures

(Jan. 2001 - Nov. 2011; percentages; 60-day moving average)
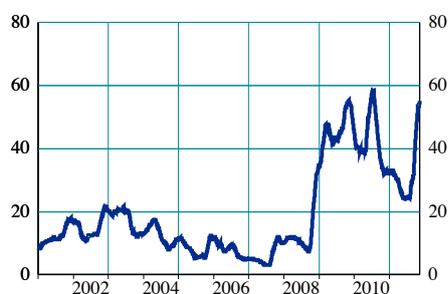
Sources: Bloomberg and ECB calculations.
Note: Weighted average of the volatility of the two closest options.

Chart S39 Monthly gross issuance of short-term securities (other than shares) by euro area non-financial corporations

(Jan. 2001 - Sep. 2011; EUR billions; maturities up to one year)

— monthly gross issuance
···· 12-month moving average
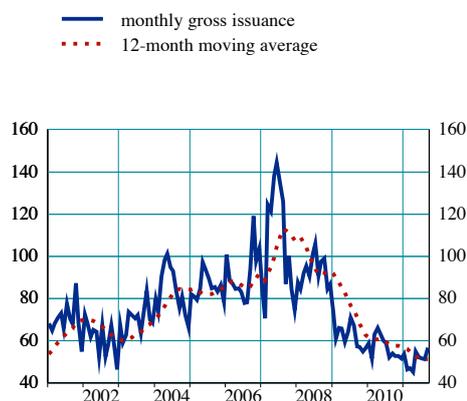
Sources: ECB and ECB calculations.

Chart S40 Euro area government bond yields and the term spread

(Jan. 2001 - Nov. 2011; weekly averages)

—— two-year yield (percentage)
····· five-year yield (percentage)
– – ten-year yield (percentage)
—— term spread (percentage points)
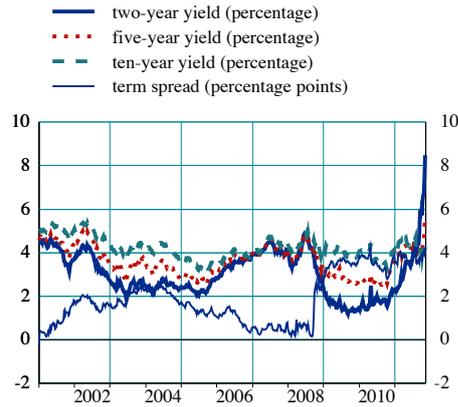
Sources: ECB, Thomson Reuters, Bloomberg and ECB calculations.
Note: The term spread is the difference between the yield on ten-year bonds and that on three-month T-bills.

Chart S41 Option-implied volatility for ten-year government bond yields in Germany

(Jan. 2001 - Nov. 2011; percentages; implied volatility; 20-day moving average)
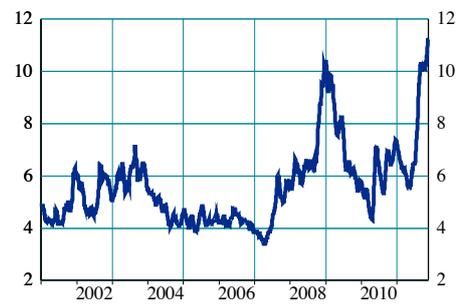
Sources: Bloomberg and ECB calculations.

Chart S42 Stock prices in the euro area

(Jan. 2001 - Nov. 2011; index: Jan. 2001 = 100)

—— Dow Jones EURO STOXX index
····· Dow Jones EURO STOXX 50 index
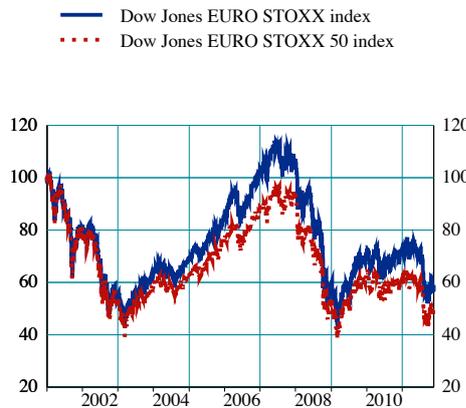
Sources: Bloomberg and ECB calculations.

Chart S43 Implied volatility for the Dow Jones EURO STOXX 50 index

(Jan. 2001 - Nov. 2011; percentages)
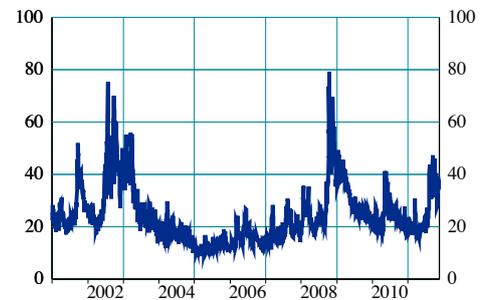
Sources: Bloomberg and ECB calculations.

Chart S44 Risk reversal and strangle of the Dow Jones EURO STOXX 50 index

(Jan. 2006 - Nov. 2011; percentages; implied volatility; 20-day moving average)
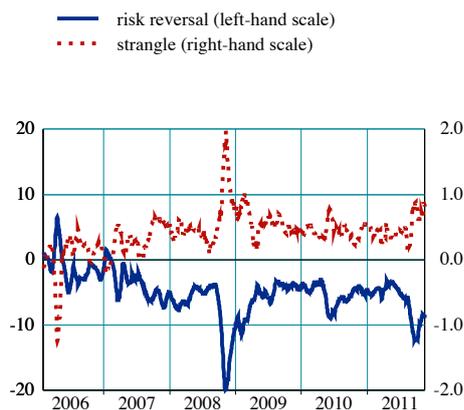
— risk reversal (left-hand scale)
· · · · strangle (right-hand scale)

Sources: Bloomberg and ECB calculations.
Notes: The risk-reversal indicator is calculated as the difference between the implied volatility of an out-of-the-money (OTM) call with 25 delta and the implied volatility of an OTM put with 25 delta. The strangle is calculated as the difference between the average implied volatility of OTM calls and puts, both with 25 delta, and the at-the-money volatility of calls and puts with 50 delta.

Chart S45 Price/earnings (P/E) ratio for the euro area stock market

(Jan. 1985 - Oct. 2011; ten-year trailing earnings)
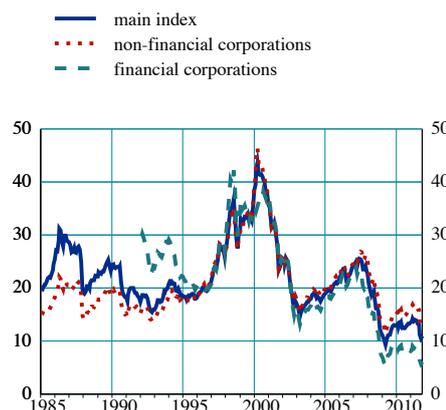
— main index
· · · · non-financial corporations
– – financial corporations

Sources: Thomson Reuters and ECB calculations.
Note: The P/E ratio is based on prevailing stock prices relative to an average of the previous ten years of earnings.

Chart S46 Open interest in options contracts on the Dow Jones EURO STOXX 50 index

(Jan. 2001 - Oct. 2011; millions of contracts)

Sources: Eurex and Bloomberg.

Chart S47 Gross equity issuance in the euro area

(Jan. 2001 - Oct. 2011; EUR billions; 12-month moving sum)

— secondary public offerings - planned
— secondary public offerings - completed
— initial public offerings - planned
— initial public offerings - completed
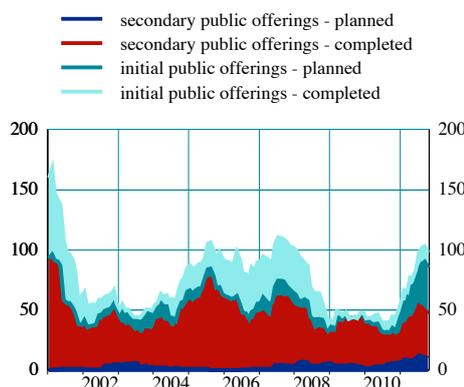
Source: Thomson ONE Banker.

Chart S48 Investment-grade corporate bond spreads in the euro area

(Jan. 2001 - Nov. 2011; basis points)

— AAA
···· AA
– – A
— BBB
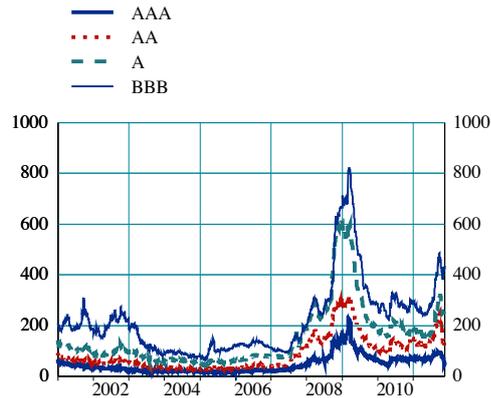
Source: Merrill Lynch.
Note: Options-adjusted spread of seven to ten-year corporate bond indices.

Chart S49 Speculative-grade corporate bond spreads in the euro area

(Jan. 2001 - Nov. 2011; basis points)
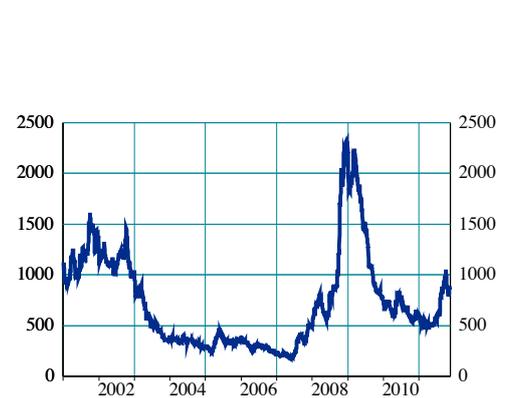
Source: Merrill Lynch.
Note: Options-adjusted spread of euro area high-yield index (average rating BB3, average maturity of around 6 years).

Chart S50 iTraxx Europe five-year credit default swap indices

(June 2004 - Nov. 2011; basis points)

— main index
···· high volatility index
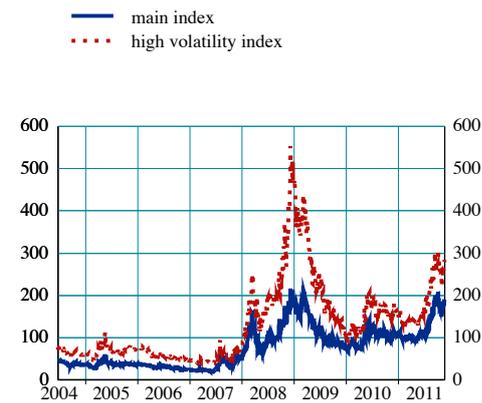
Sources: Bloomberg.

Chart S51 Term structures of premiums for iTraxx Europe and HiVol

(basis points)

— iTraxx Europe, 19 May 2011
···· iTraxx Europe, 17 November 2011
– – iTraxx HiVol, 19 May 2011
— iTraxx HiVol, 17 November 2011
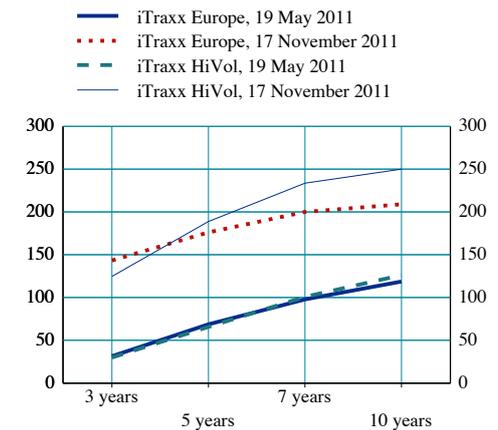
Source: Bloomberg.

Chart S52 Global risk aversion indicator

(Jan. 2001 - Nov. 2011)
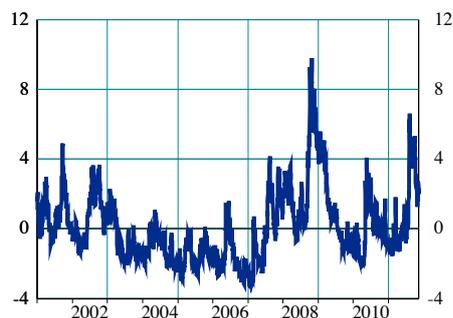
Sources: Bloomberg, Bank of America Merrill Lynch, UBS, Commerzbank and ECB calculations.
Notes: The indicator is constructed as the first principal component of five risk aversion indicators currently available. A rise in the indicator denotes an increase of risk aversion. For further details about the methodology used, see ECB, "Measuring investors' risk appetite", *Financial Stability Review*, June 2007.

Chart S53 Real broad USD effective exchange rate index

(Jan. 2001 - Oct. 2011; index: Jan. 2001 = 100)
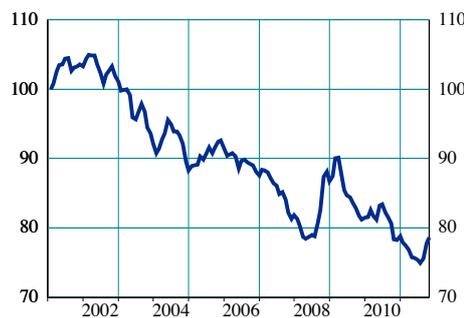
Source: Thomson Reuters.
Notes: Weighted average of the foreign exchange values of the US dollar against the currencies of a large group of major US trading partners, deflated by the US consumer price index. For further details, see "Indexes of the foreign exchange value of the dollar", *Federal Reserve Bulletin*, Winter 2005.

Chart S54 Selected nominal effective exchange rate indices

(Jan. 2001 - Nov. 2011; index: Jan. 2001 = 100)

— USD
···· EUR
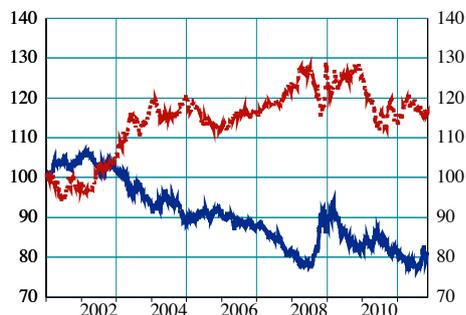
Sources: Bloomberg and ECB.
Notes: Weighted averages of bilateral exchange rates against major trading partners of the euro area and the United States. For further details in the case of the euro area, see ECB, "The effective exchange rates of the euro", *Occasional Paper Series,* No 2, February 2002. For the United States see the note of Chart S53.

Chart S55 Selected bilateral exchange rates

(Jan. 2001 - Nov. 2011)

— USD/EUR (left-hand scale)
···· JPY/USD (right-hand scale)
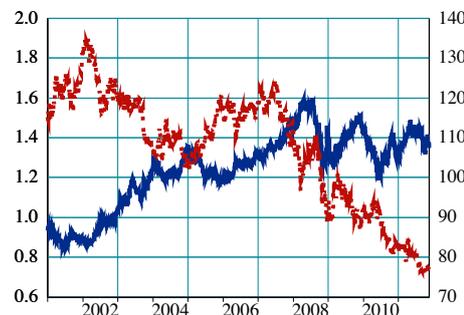
Source: ECB.

Chart S56 Selected three-month implied foreign exchange market volatility

(Jan. 2001 - Nov. 2011; percentages)

USD/EUR
JPY/USD
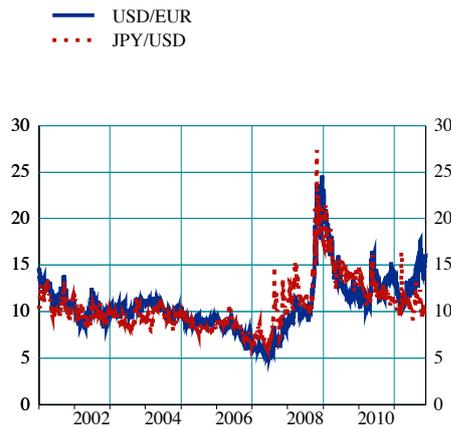
Source: Bloomberg.

Chart S57 Three-month money market rates in the United States and Japan

(Jan. 2001 - Nov. 2011; percentages)

United States
Japan
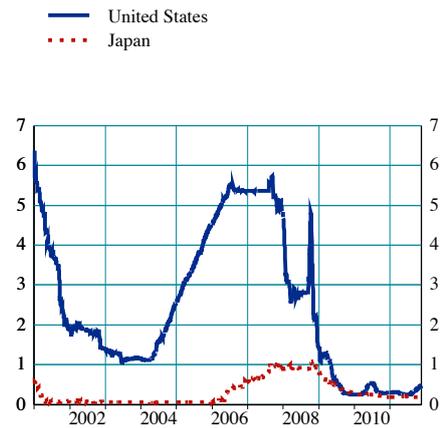
Source: Thomson Reuters.
Note: USD and JPY 3-month LIBOR.

Chart S58 Government bond yields and term spreads in the United States and Japan
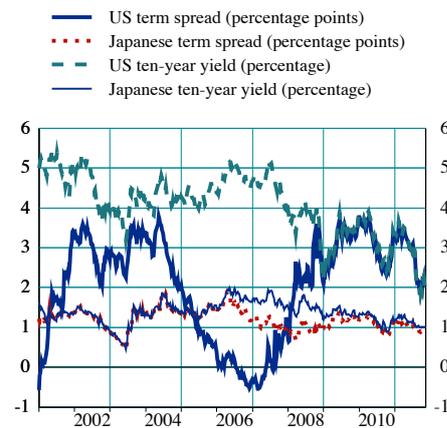
(Jan. 2001 - Nov. 2011)

US term spread (percentage points)
Japanese term spread (percentage points)
US ten-year yield (percentage)
Japanese ten-year yield (percentage)

Sources: Bloomberg, Thomson Reuters and ECB calculations.
Note: The term spread is the difference between the yield on ten-year bonds and that on three-month T-bills.

Chart S59 Net non-commercial positions in ten-year US Treasury futures

(Jan. 2001 - Nov. 2011; thousands of contracts)

Sources: Bloomberg and ECB calculations.
Notes: Futures traded on the Chicago Board of Trade.
Non-commercial futures contracts are contracts bought for purposes other than hedging.

Chart S60 Stock prices in the United States

(Jan. 2001 - Nov. 2011; index: Jan. 2001 = 100)

——— S&P 500
· · · · NASDAQ
– – – Dow Jones Wilshire 5000
- - - - S&P 500 Banks
· · · · KBW Bank Sector Index
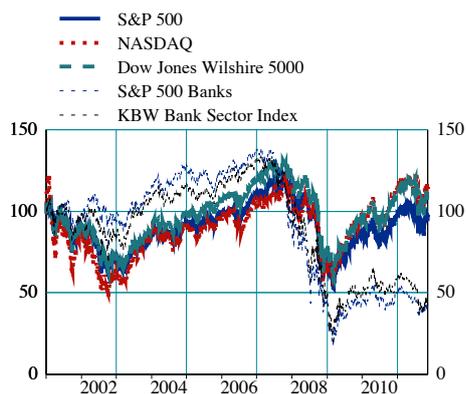
Sources: Bloomberg, Thomson Reuters and ECB calculations.

Chart S61 Implied volatility for the S&P 500 index and KBW Bank Index

(Jan. 2001 - Nov. 2011; percentages)

——— S&P 500
· · · · KBW Bank Sector Index
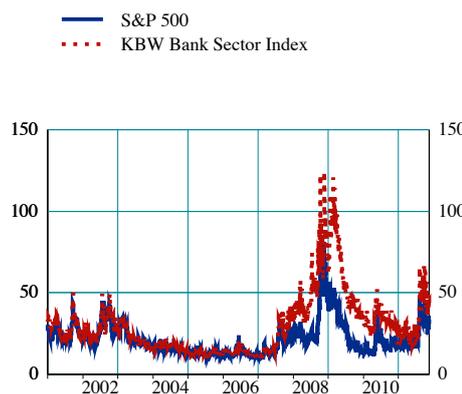
Source: Thomson Reuters, Bloomberg and ECB calcualtions.
Notes: The data on S&P 500 is the Chicago Board Options Exchange (CBOE) SPX Volatility Index (VIX). Data calculated as a weighted average of the two closest options.

Chart S62 Risk reversal and strangle of the S&P 500 index

(Feb. 2002 - Nov. 2011; percentages; implied volatility; 20-day moving average)
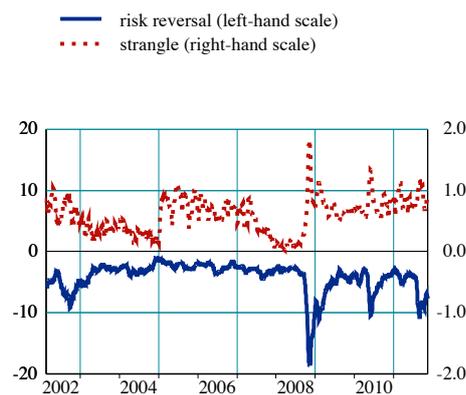
——— risk reversal (left-hand scale)
· · · · strangle (right-hand scale)

Sources: Bloomberg and ECB calculations.
Notes: The risk-reversal indicator is calculated as the difference between the implied volatility of an out-of-the-money (OTM) call with 25 delta and the implied volatility of an OTM put with 25 delta. The strangle is calculated as the difference between the average implied volatility of OTM calls and puts, both with 25 delta, and the at-the-money volatility of calls and puts with 50 delta.

Chart S63 Price/earnings (P/E) ratio for the US stock market

(Jan. 1985 - Oct. 2011; percentages; ten-year trailing earnings)
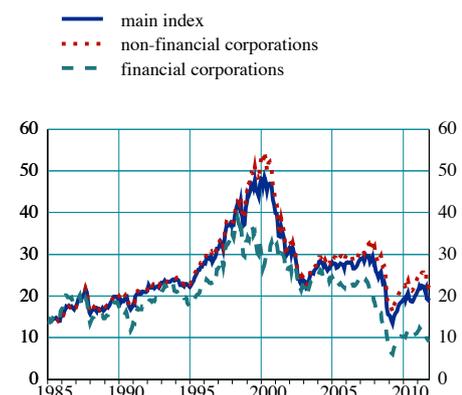
——— main index
· · · · non-financial corporations
– – – financial corporations

Sources: Thomson Reuters and ECB calculations.
Note: The P/E ratio is based on prevailing stock prices relative to an average of the previous ten years of earnings.

Chart S64 US mutual fund flows

(Jan. 2001 - Sep. 2011; USD billions; three-month moving average)

stock funds
bond funds
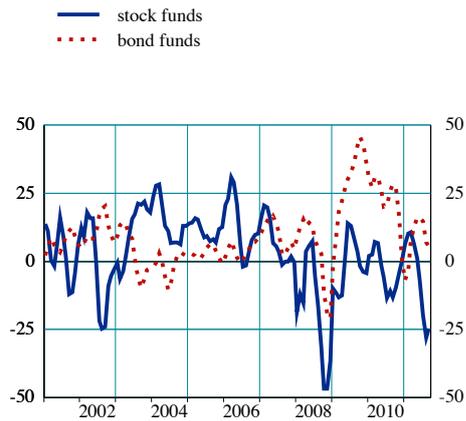
Source: Thomson Reuters.

Chart S65 Debit balances in New York Stock Exchange margin accounts

(Jan. 2001 - Sep. 2011; USD billions)

Source: Bloomberg.
Note: Borrowing to buy stocks "on margin" allows investors to use loans to pay for up to 50% of the price of a stock.

Chart S66 Open interest in options contracts on the S&P 500 index

(Jan. 2001 - Oct. 2011; millions of contracts)

Source: Bloomberg.

Chart S67 Gross equity issuance in the United States

(Jan. 2001 - Oct. 2011; USD billions)

secondary public offerings - planned
secondary public offerings - completed
initial public offerings - planned
initial public offerings - completed
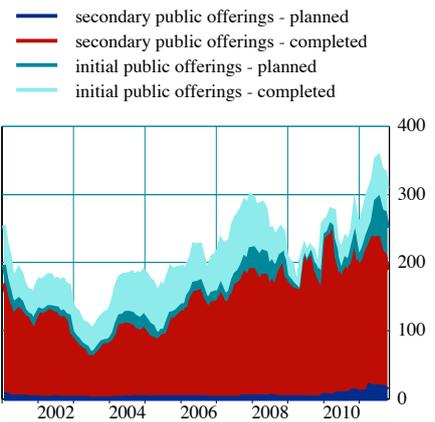
Source: Thomson ONE Banker.

Chart S68 US investment-grade corporate bond spreads

(Jan. 2001 - Nov. 2011; basis points)

—— AAA
····· AA
– – A
—— BBB
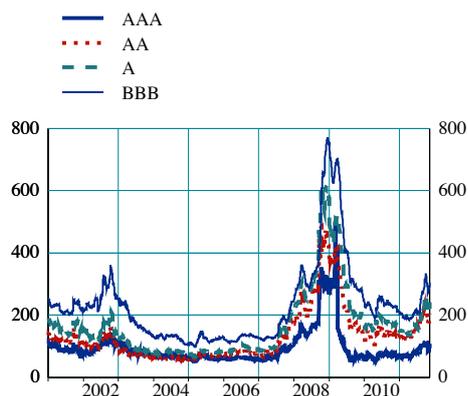
Source: Merrill Lynch.
Note: Options-adjusted spread of the seven to ten-year corporate bond indices.

Chart S69 US speculative-grade corporate bond spreads

(Jan. 2001 - Nov. 2011; basis points)
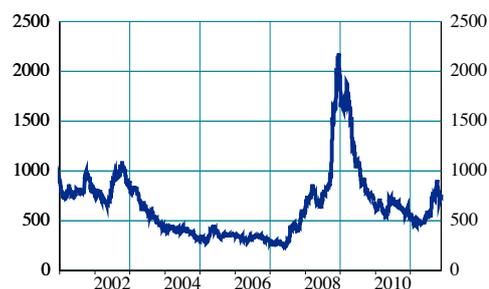
Source: Merrill Lynch.
Note: Options-adjusted spread of the US domestic high-yield index (average rating B1, average maturity of 7½ years).

Chart S70 US credit default swap indices

(Jan. 2004 - Nov. 2011; basis points; five-year maturity)

—— investment grade
····· investment grade, high volatility
– – crossover
—— high yield
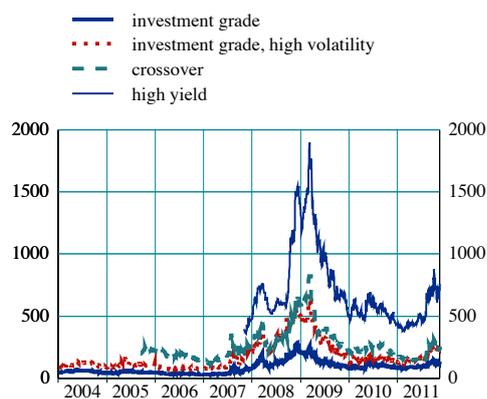
Sources: Bloomberg and ECB calculations.

Chart S71 Emerging market sovereign bond spreads

(Jan. 2001 - Nov. 2011; basis points)

—— EMBI Global
····· EMBIG Asia
– – EMBIG Europe
—— EMBIG Latin America
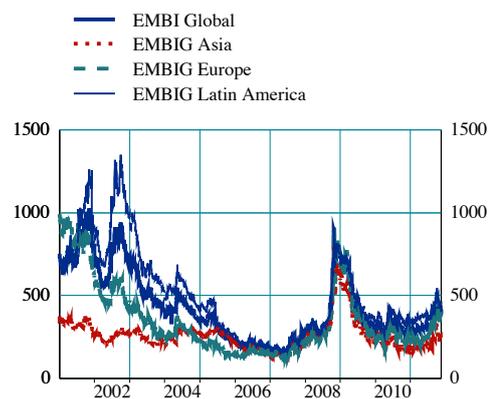
Sources: Bloomberg and ECB calculations.

Chart S72 Emerging market sovereign bond yields, local currency

(Jan. 2002 - Nov. 2011; percentages)

— GBI emerging markets
···· GBI emerging Latin America
– – GBI emerging Europe
— GBI emerging Asia
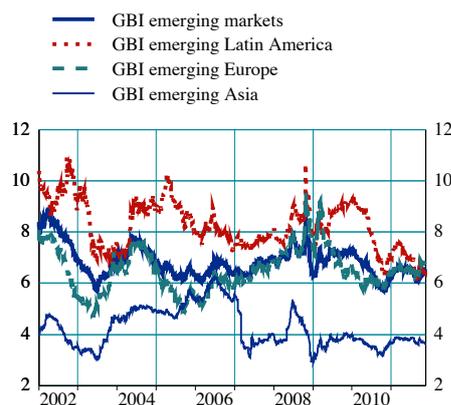
Source: Bloomberg.
Note: GBI stands for "Government Bond Index".

Chart S73 Emerging market stock price indices

(Jan. 2002 - Nov. 2011; index: Jan. 2002 = 100)

— MSCI emerging markets
···· MSCI Latin America
– – MSCI Eastern Europe
— MSCI Asia
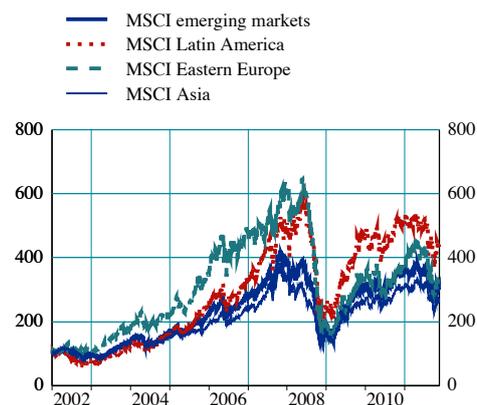
Sources: Bloomberg and ECB calculations.
Note: MSCI stands for "Morgan Stanley Capital International".

Table S3   Total international bond issuance (private and public) in selected emerging markets

(USD millions)

	2004	2005	2006	2007	2008	2009	2010	2011
Asia	**63,256**	**47,533**	**44,143**	**68,387**	**40,984**	**38,928**	**63,822**	**66,835**
of which								
China	4,484	5,830	1,945	2,196	0	925	8,320	12,430
Hong Kong	7,680	6,500	800	4,570	1,020	0	4,900	4,300
India	6,529	4,634	7,001	15,182	12,101	4,088	9,000	10,000
Indonesia	1,540	4,456	2,074	1,911	4,448	5,700	5,600	6,000
Malaysia	4,132	2,765	1,620	0	0	4,500	3,350	3,310
Singapore	1,841	1,948	2,293	2,401	1,300	800	2,000	2,000
South Korea	26,000	15,250	20,800	39,111	20,600	15,205	21,810	24,415
Taiwan	4,962	530	1,049	1,203	416	2,200	5,742	2,030
Thailand	1,400	2,236	935	765	523	0	570	700
Emerging Europe	**19,952**	**25,242**	**30,929**	**57,725**	**32,150**	**17,252**	**36,800**	**45,600**
of which								
Russia	10,140	15,620	21,342	46,283	26,520	11,009	26,000	34,000
Turkey	6,439	8,355	7,236	6,163	4,150	3,889	7,050	6,500
Ukraine	1,457	1,197	1,877	4,525	1,230	789	2,500	2,500
Latin America	**35,143**	**41,085**	**42,652**	**48,357**	**44,175**	**59,205**	**54,611**	**57,153**
of which								
Argentina	918	2,734	5,123	5,504	2,025	568	3,000	2,000
Brazil	10,943	14,831	15,446	16,907	17,008	23,115	31,000	34,800
Chile	2,375	1,200	1,463	250	100	2,300	2,300	1,500
Colombia	1,545	2,304	2,866	1,762	1,000	7,391	2,000	3,300
Mexico	12,024	8,804	12,575	17,572	19,155	15,964	9,500	10,000
Venezuela	4,260	6,143	100	1,250	4,650	4,992	3,050	4,400

Source: Thomson Reuters Datastream.
Notes: Data for 2010 are mainly estimates and for 2011 are forecasts. Series include gross public and private placements of bonds denominated in foreign currency and held by non-residents. Bonds issued in the context of debt restructuring operations are not included. Regions are defined as follows: Asia: China, Special Administrative Region of Hong Kong, India, Indonesia, Malaysia, South Korea, the Philippines, Singapore, Taiwan,Thailand and Vietnam; Emerging Europe: Croatia, Russia, Turkey and Ukraine; and Latin America: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Panama, Paraguay, Peru, Uruguay and Venezuela.

Chart S74 The oil price and oil futures prices

(Jan. 2001 - Dec. 2012; USD per barrel)

—— historical price
····· futures prices on 17 November 2011
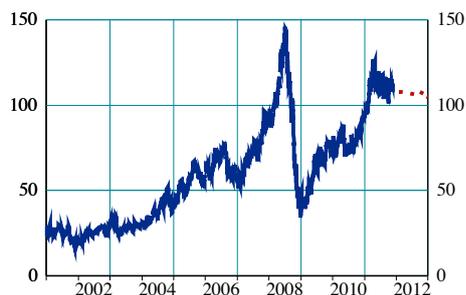
Sources: Thomson Reuters, Bloomberg and ECB calculations.

Chart S75 Crude oil futures contracts

(Jan. 2001 - Nov. 2011; thousands of contracts)

—— total futures contracts
····· non-commercial futures contracts
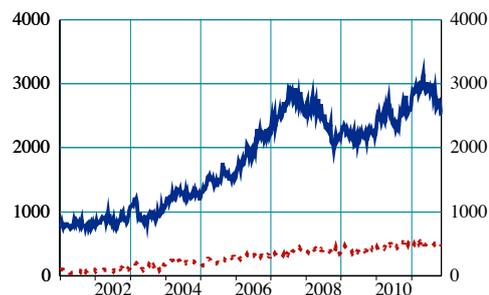
Source: Bloomberg.
Notes: Futures traded on the New York Mercantile Exchange.
Non-commercial futures contracts are contracts bought for
purposes other than hedging.

Chart S76 Precious metal prices

(Jan. 2001 - Nov. 2011; index: Jan. 2001 = 100)

—— gold
····· silver
– – platinum
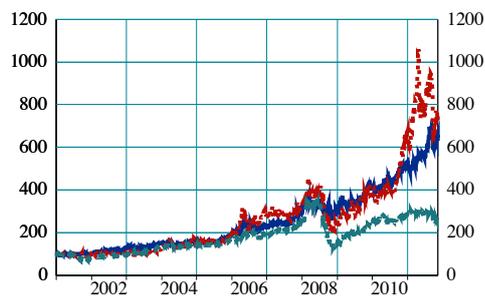
Sources: Bloomberg and ECB calculations.
Note: The indices are based on USD prices.

Table S4 Financial condition of global large and complex banking groups

(2006 - H1 2011)

|	Minimum	First quartile	Median	Average	Weighted average[1]	Third quartile	Maximum
Return on shareholders' equity (%)							
2006	12.47	15.42	19.23	19.25	17.29	23.09	25.14
2007	-11.97	10.21	12.47	11.78	11.52	14.93	27.08
2008	-52.53	-17.40	3.36	-5.57	-6.68	6.12	14.18
2009	-12.98	-3.74	2.71	3.68	4.26	7.09	19.87
2010	-1.50	6.39	7.59	6.84	5.60	9.86	13.82
2011 H1	-10.27	5.81	8.04	5.56	4.55	10.55	12.01
Return on risk-weighted assets (%)							
2006	1.53	1.62	2.00	2.38	1.96	2.96	4.47
2007	-1.40	1.22	1.46	1.25	1.15	1.83	2.40
2008	-7.04	-2.78	0.45	-0.67	-0.80	0.61	2.60
2009	-2.78	-0.82	0.44	0.42	0.61	0.98	3.10
2010	-0.24	0.85	1.43	1.42	0.88	2.33	3.60
2011 H1	-1.20	0.64	1.57	1.16	0.66	1.87	2.78
Total operating income (% of total assets)							
2006	2.14	3.06	4.49	4.16	3.65	4.95	6.63
2007	1.61	2.68	3.72	3.63	2.98	4.57	5.85
2008	0.37	1.08	2.66	2.79	2.09	3.76	6.16
2009	1.74	3.04	3.62	3.84	3.61	4.94	6.20
2010	2.16	3.04	4.30	3.98	3.66	4.85	5.98
2011 H1	2.11	2.96	3.56	3.61	3.31	4.12	5.18
Net income (% of total assets)							
2006	0.46	0.71	0.90	1.04	0.88	1.14	2.76
2007	-0.23	0.36	0.81	0.62	0.51	0.93	1.04
2008	-1.43	-0.70	0.22	-0.07	-0.30	0.26	1.04
2009	-1.19	-0.20	0.25	0.17	0.27	0.58	1.58
2010	-0.10	0.24	0.54	0.50	0.37	0.82	1.02
2011 H1	-0.60	0.20	0.52	0.41	0.29	0.82	1.03
Net loan impairment charges (% of total assets)							
2006	-0.02	0.00	0.22	0.21	0.26	0.35	0.57
2007	-0.01	0.01	0.19	0.29	0.34	0.49	0.77
2008	0.00	0.11	0.30	0.60	0.65	0.96	1.74
2009	0.05	0.15	0.82	0.93	1.18	1.57	2.18
2010	-0.01	0.02	0.55	0.55	0.71	0.95	1.32
2011 H1	0.00	0.00	0.33	0.36	0.42	0.62	0.91
Cost-to-income ratio (%)							
2006	26.94	47.89	59.41	56.65	54.30	66.79	71.60
2007	30.55	54.12	59.28	63.45	59.75	70.96	111.32
2008	54.88	62.83	87.03	156.66	101.40	133.20	745.61
2009	35.29	49.72	58.85	65.74	55.55	72.91	119.14
2010	30.53	53.64	62.01	61.32	56.92	73.30	79.46
2011 H1	48.47	62.38	70.49	68.99	33.67	74.93	98.78
Tier 1 ratio (%)							
2006	7.50	8.20	8.64	9.67	8.87	10.65	13.90
2007	6.87	7.45	8.40	8.67	7.98	9.31	11.20
2008	8.00	9.15	11.00	12.17	10.57	13.30	20.30
2009	9.60	11.10	13.00	13.29	11.92	15.30	17.70
2010	11.24	12.10	13.40	14.40	12.91	16.10	20.50
2011 H1	11.00	12.40	13.60	14.51	13.15	16.80	18.90
Overall solvency ratio (%)							
2006	10.70	11.70	12.30	13.17	12.44	14.10	18.40
2007	10.70	11.11	12.20	12.18	11.83	12.98	14.50
2008	11.20	13.60	15.00	16.24	14.58	17.90	26.80
2009	12.40	14.80	16.30	16.45	15.26	18.20	20.60
2010	14.00	15.50	16.50	17.34	16.18	19.10	22.00
2011 H1	14.40	15.33	16.80	17.35	16.33	18.65	23.70

Sources: Bloomberg, individual institutions' financial reports and ECB calculations.
Notes: Based on available figures for 13 global large and complex banking groups. Figures for H1 2011 are annualised.
1) The respective denominators are used as weights, i.e. the total operating income is used in the case of the "Cost-to-income ratio", while the risk-weighted assets are used for the "Tier 1 ratio" and the "Overall solvency ratio".

**Chart S77 Expected default frequency (EDF)
for global large and complex banking
groups**
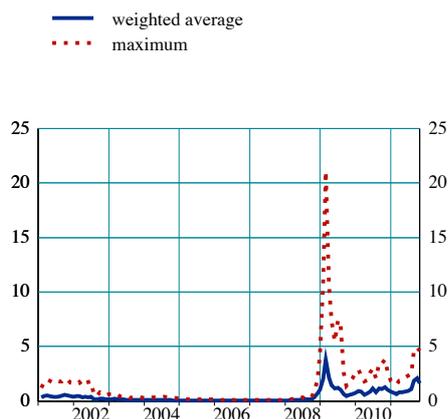
(Jan. 2001 - Oct. 2011; percentage probability)

——— weighted average
· · · · maximum

Sources: Moody's KMV and ECB calculations.
Notes: The EDF provides an estimate of the probability of default
over the following year. Due to measurement considerations,
the EDF values are restricted by Moody's KMV to the interval
between 0.01% and 35%. The weighted average is based on the
amounts of non-equity liabilities outstanding.

**Chart S78 Distance to default for global
large and complex banking groups**
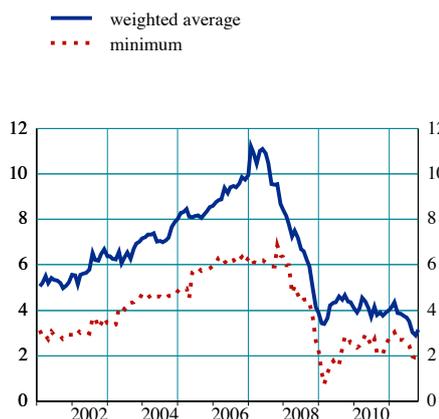
(Jan. 2001 - Oct. 2011)

——— weighted average
· · · · minimum

Sources: Moody's KMV and ECB calculations.
Notes: An increase in the distance to default reflects an improving
assessment. The weighted average is based on the amounts of
non-equity liabilities outstanding.

**Chart S79 Equity prices for global large
and complex banking groups**

(Jan. 2004 - Nov. 2011; index: Jan. 2004 = 100)

——— maximum
· · · · median
– – – minimum
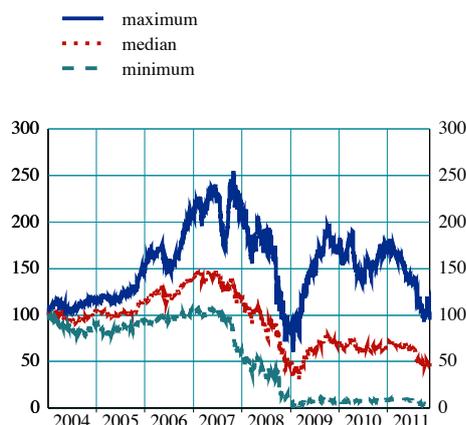
Sources: Bloomberg and ECB calculations.

**Chart S80 Credit default swap spreads for
global large and complex banking groups**

(Jan. 2004 - Nov. 2011; basis points; senior debt; five-year
maturity)

——— maximum
· · · · median
– – – minimum

Sources: Bloomberg and ECB calculations.

(Q1 1994 - Q2 2011; USD billions; quarterly data)

all reporting banks
euro area banks
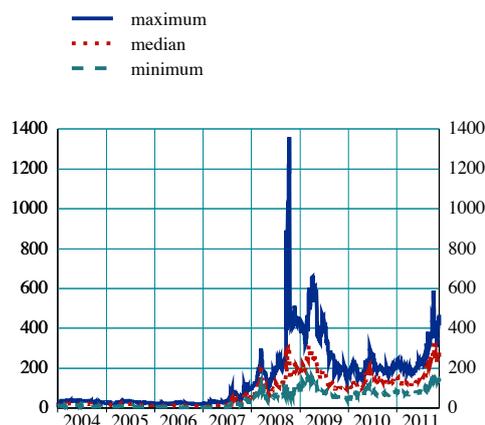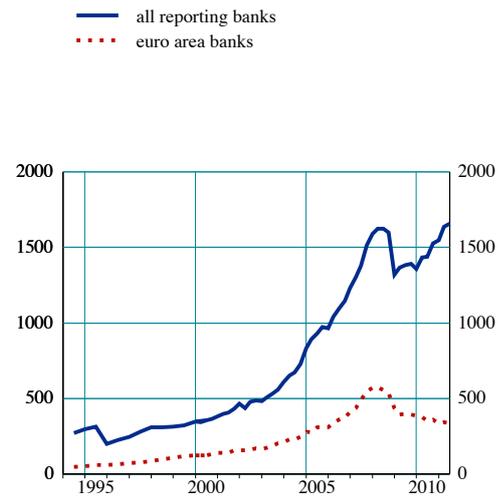
Sources: BIS and ECB calculations.
Note: Aggregate for euro area banks derived as the sum of claims on non-banks in offshore financial centres of euro area 12 countries (i.e. euro area excluding Cyprus, Malta, Slovakia, Slovenia and Estonia).

3 EURO AREA FINANCIAL INSTITUTIONS AND FINANCIAL SYSTEM INFRASTRUCTURES

Table S5   Financial condition of large and complex banking groups in the euro area

(2006 - H1 2011)

	Minimum	First quartile	Median	Average	Weighted average [1]	Third quartile	Maximum
Return on Tier 1 capital (%)							
2006	7.66	12.69	16.34	17.35	17.77	21.71	30.46
2007	0.77	9.45	12.51	15.32	15.71	22.82	31.26
2008	-32.15	-13.27	2.22	-1.31	2.42	9.11	22.43
2009	-17.70	-0.91	4.81	2.30	4.64	9.23	15.76
2010	-2.52	4.58	8.26	8.17	8.78	11.19	14.88
2011 H1	2.98	7.34	10.58	10.39	10.90	13.51	16.42
Return on shareholders' equity (%)							
2006	7.51	12.26	14.02	14.34	13.86	17.49	26.01
2007	0.85	9.22	13.46	12.32	12.47	17.08	24.69
2008	-84.93	-13.85	2.26	-8.46	2.19	5.68	18.88
2009	-19.15	-1.02	3.55	1.44	4.12	9.92	14.34
2010	-3.49	5.05	8.26	8.11	7.83	10.58	22.44
2011 H1	-113.09	6.53	9.16	2.89	8.19	12.97	16.15
Return on risk-weighted assets (%)							
2006	0.55	1.09	1.35	1.42	1.43	1.83	2.66
2007	0.05	0.81	1.02	1.20	1.21	1.76	2.55
2008	-2.57	-1.16	0.20	-0.13	0.21	0.67	1.77
2009	-1.93	-0.09	0.44	0.24	0.47	0.94	1.82
2010	-0.29	0.57	0.87	0.91	0.96	1.35	1.61
2011 H1	0.35	0.84	1.27	1.23	1.24	1.61	2.08
Net interest income (% of total assets)							
2006	0.33	0.53	0.84	0.96	0.93	1.28	2.03
2007	0.26	0.53	0.79	0.93	0.88	1.22	1.95
2008	0.52	0.64	0.87	1.08	1.02	1.48	2.19
2009	0.62	0.85	1.25	1.32	1.31	1.62	2.68
2010	0.58	0.82	1.25	1.29	1.30	1.49	2.51
2011 H1	0.66	0.86	1.17	1.29	1.34	1.59	2.46
Net trading income (% of total assets)							
2006	0.04	0.09	0.25	0.32	0.34	0.49	1.08
2007	-0.14	0.07	0.17	0.26	0.31	0.46	0.96
2008	-0.98	-0.43	-0.14	-0.15	-0.13	0.06	0.43
2009	-1.07	0.03	0.18	0.11	0.18	0.29	0.47
2010	-0.17	0.04	0.13	0.15	0.17	0.26	0.47
2011 H1	-1.64	0.14	0.22	0.11	0.19	0.34	0.40
Fees and commissions (% of total assets)							
2006	0.12	0.30	0.52	0.57	0.61	0.84	1.10
2007	0.09	0.29	0.54	0.56	0.59	0.70	1.10
2008	0.12	0.28	0.46	0.49	0.50	0.68	0.90
2009	0.13	0.29	0.52	0.51	0.55	0.76	0.84
2010	0.08	0.29	0.52	0.53	0.59	0.80	0.91
2011 H1	0.08	0.28	0.47	0.50	0.56	0.73	0.93
Other income (% of total assets)							
2006	0.00	0.05	0.15	0.18	0.16	0.23	0.71
2007	-0.05	0.05	0.11	0.16	0.15	0.22	0.51
2008	-0.54	-0.14	0.10	0.05	0.11	0.25	0.54
2009	-0.35	-0.09	0.04	0.02	0.02	0.11	0.33
2010	-0.30	0.00	0.04	0.06	0.04	0.12	0.32
2011 H1	-0.20	-0.02	0.09	0.10	0.12	0.13	0.49
Total operating income (% of total assets)							
2006	0.77	1.62	1.97	2.04	2.04	2.68	3.81
2007	0.51	1.36	1.82	1.90	1.93	2.76	3.61
2008	-0.18	0.61	1.34	1.47	1.49	2.01	3.66
2009	0.79	1.28	1.91	1.95	2.05	2.33	3.86
2010	0.61	1.50	2.01	2.03	2.11	2.52	3.79
2011 H1	-0.73	1.75	2.24	2.11	2.30	2.71	3.67

Table S5	Financial condition of large and complex banking groups in the euro area (continued)

(2006 - H1 2011)

	Minimum	First quartile	Median	Average	Weighted average [1]	Third quartile	Maximum
			Net income (% of total assets)				
2006	0.19	0.39	0.51	0.56	0.54	0.66	1.15
2007	0.02	0.26	0.40	0.49	0.46	0.64	1.22
2008	-1.21	-0.27	0.08	0.01	0.07	0.38	0.93
2009	-0.77	-0.03	0.17	0.09	0.17	0.33	0.81
2010	-0.09	0.19	0.35	0.35	0.33	0.47	0.83
2011 H1	-1.52	0.29	0.40	0.33	0.37	0.54	0.91
			Net loan impairment charges (% of total assets)				
2006	0.02	0.05	0.07	0.11	0.10	0.14	0.36
2007	0.01	0.03	0.06	0.11	0.10	0.09	0.38
2008	0.04	0.20	0.27	0.29	0.27	0.39	0.57
2009	0.17	0.32	0.43	0.49	0.47	0.59	0.97
2010	0.07	0.16	0.27	0.34	0.33	0.46	0.85
2011 H1	0.05	0.09	0.17	0.30	0.32	0.44	0.79
			Cost-to-income ratio (%) [2]				
2006	42.56	54.70	57.25	57.75	59.24	61.10	70.20
2007	41.25	54.76	62.35	61.71	60.60	68.50	84.70
2008	41.86	63.30	75.70	166.75	71.20	115.80	1,503.40
2009	40.44	55.56	61.75	63.84	60.66	72.00	103.31
2010	42.88	55.93	59.60	60.66	59.62	69.30	81.60
2011 H1	43.96	53.61	58.95	58.91	59.16	64.10	73.89
			Tier 1 ratio (%)				
2006	6.70	7.42	7.80	8.18	8.02	8.90	10.10
2007	6.40	6.90	7.56	7.83	7.69	8.60	10.70
2008	6.90	7.80	8.79	8.80	8.63	9.70	12.70
2009	8.40	9.70	10.15	10.41	10.15	10.76	13.80
2010	8.58	10.30	11.00	11.25	10.91	12.20	15.70
2011 H1	9.12	10.50	11.60	11.78	11.38	11.96	16.20
			Overall solvency ratio (%)				
2006	9.50	10.50	11.06	11.21	11.10	11.80	12.90
2007	8.80	9.70	10.60	10.78	10.64	11.60	13.00
2008	9.00	10.20	11.95	11.61	11.41	12.30	13.90
2009	10.90	12.72	13.60	13.42	13.23	14.20	15.70
2010	11.70	12.90	14.10	14.10	13.71	15.30	16.50
2011 H1	9.60	13.05	14.63	14.47	13.71	16.15	17.70

Sources: Bloomberg, individual institutions' financial reports and ECB calculations.
Notes: Based on available figures for 18 IFRS-reporting large and complex banking groups in the euro area. Figures for H1 2011 are annualised.
1) The respective denominators are used as weights, i.e. the total operating income is used in the case of the "Cost-to-income ratio", while the risk-weighted assets are used for the "Tier 1 ratio" and the "Overall solvency ratio".
2) The cost-to-income ratio does not consider the banking groups with negative operating income.

Chart S82 Frequency distribution of returns on shareholders' equity for large and complex banking groups in the euro area
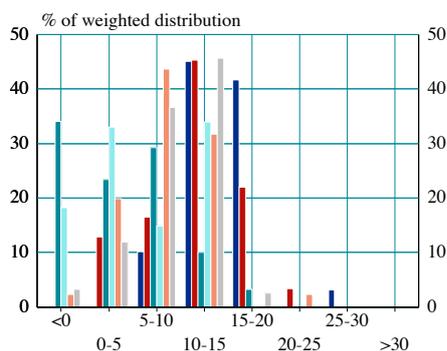
(2006 - H1 2011; percentages)

- 2006
- 2007
- 2008
- 2009
- 2010
- H1 2011

% of weighted distribution

Sources: Bloomberg, individual institutions' financial reports and ECB calculations.
Notes: Distribution weighted by total assets. Based on available figures for 18 IFRS-reporting large and complex banking groups in the euro area. Figures for H1 2011 are annualised.

Chart S83 Frequency distribution of returns on risk-weighted assets for large and complex banking groups in the euro area
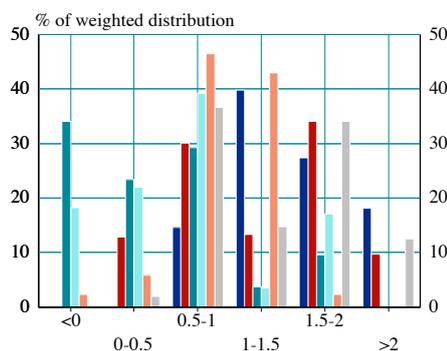
(2006 - H1 2011; percentages)

- 2006
- 2007
- 2008
- 2009
- 2010
- H1 2011

% of weighted distribution

Sources: Bloomberg, individual institutions' financial reports and ECB calculations.
Notes: Distribution weighted by total assets. Based on available figures for 18 IFRS-reporting large and complex banking groups in the euro area. Figures for H1 2011 are annualised.

Chart S84 Frequency distribution of net interest income for large and complex banking groups in the euro area

(2006 - H1 2011; percentage of total assets)

- 2006
- 2007
- 2008
- 2009
- 2010
- H1 2011

% of weighted distribution
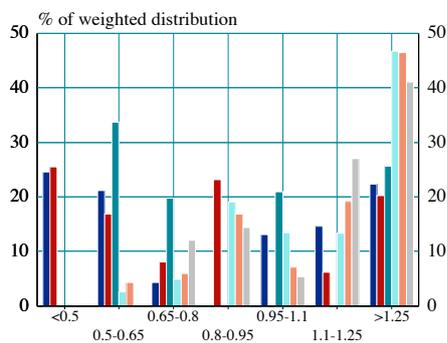
Sources: Bloomberg, individual institutions' financial reports and ECB calculations.
Notes: Distribution weighted by total assets. Based on available figures for 18 IFRS-reporting large and complex banking groups in the euro area. Figures for H1 2011 are annualised.

Chart S85 Frequency distribution of net loan impairment charges for large and complex banking groups in the euro area

(2006 - H1 2011; percentage of total assets)

- 2006
- 2007
- 2008
- 2009
- 2010
- H1 2011

% of weighted distribution
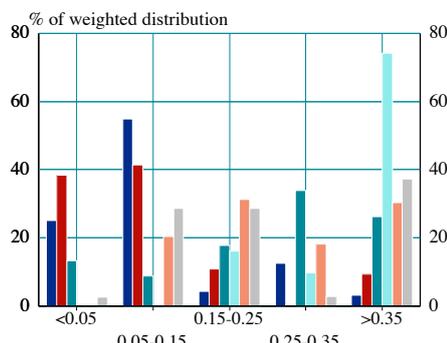
Sources: Bloomberg, individual institutions' financial reports and ECB calculations.
Notes: Distribution weighted by total assets. Based on available figures for 18 IFRS-reporting large and complex banking groups in the euro area. Figures for H1 2011 are annualised.

Chart S86 Frequency distribution of cost-to-income ratios for large and complex banking groups in the euro area
(2006 - H1 2011; percentages)

2006
2007
2008
2009
2010
H1 2011

% of weighted distribution
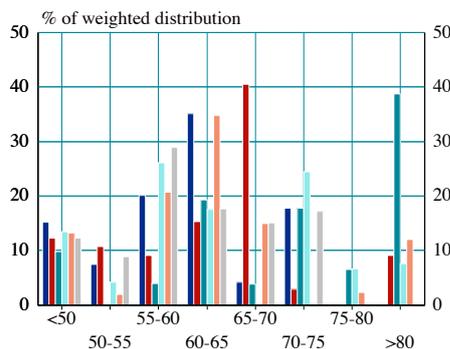
Sources: Bloomberg, individual institutions' financial reports and ECB calculations.
Notes: Distribution weighted by total assets. Based on available figures for 18 IFRS-reporting large and complex banking groups in the euro area.

Chart S87 Frequency distribution of Tier I ratios for large and complex banking groups in the euro area
(2006 - H1 2011; percentages)

2006
2007
2008
2009
2010
H1 2011

% of weighted distribution
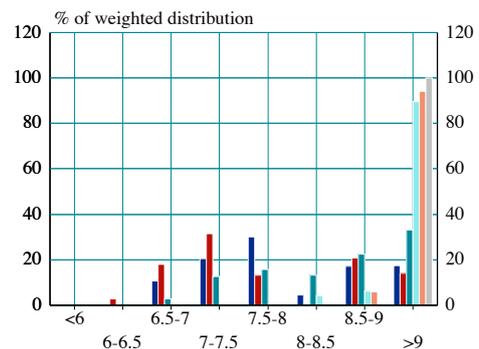
Sources: Bloomberg, individual institutions' financial reports and ECB calculations.
Notes: Distribution weighted by total assets. Based on available figures for 18 IFRS-reporting large and complex banking groups in the euro area.

Chart S88 Frequency distribution of overall solvency ratios for large and complex banking groups in the euro area
(2006 - H1 2011; percentages)

2006
2007
2008
2009
2010
H1 2011

% of weighted distribution
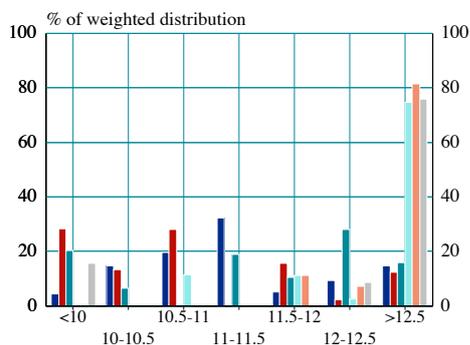
Sources: Bloomberg, individual institutions' financial reports and ECB calculations.
Notes: Distribution weighted by total assets. Based on available figures for 18 IFRS-reporting large and complex banking groups in the euro area.

Chart S89 Annual growth in euro area MFI loans, broken down by sectors
(Jan. 2001 - Sep. 2011; percentage change per annum)

households
non-financial corporations
MFIs
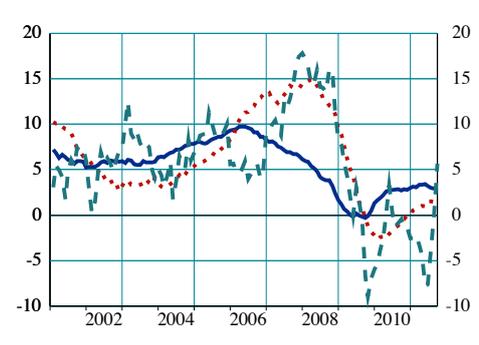
Sources: ECB and ECB calculations.
Notes: Data are based on financial transactions of MFI loans, not corrected for the impact of securitisation. For more details, see the note of Chart S5.

Chart S90 Lending margins of euro area MFIs

(Jan. 2003 - Sep. 2011; percentage points)

— lending to households
···· lending to non-financial corporations
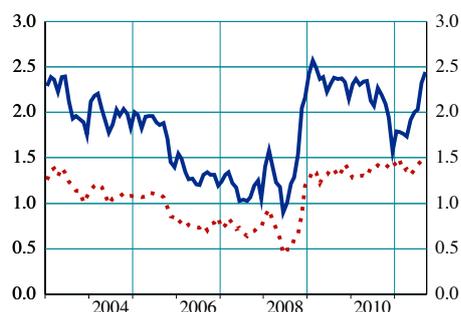
Sources: ECB, Thomson Reuters and ECB calculations.
Notes: Margins are derived as the average of the spreads for the relevant breakdowns of new business loans, using volumes as weights. The individual spreads are the difference between the MFI interest rate for new business loans and the swap rate with a maturity corresponding to the loan category's initial period of rate fixation.

Chart S91 Euro area MFI loan spreads

(Jan. 2003 - Sep. 2011; basis points)

— spread on large loans
···· spread on small loans
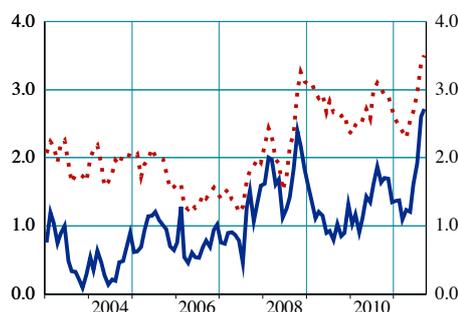
Sources: ECB, Thomson Reuters and ECB calculations.
Notes: The spread is the difference between the rate on new business loans to non-financial corporations with an initial period of rate fixation of one to five years and the three-year government bond yield. Loans are categorised as small for amounts of up to EUR 1 million and as large for amounts above EUR 1 million.

Chart S92 Write-off rates on euro area MFI loans

(Jan. 2003 - Sep. 2011; 12-month moving sums; percentage of the outstanding amount of loans)

— household consumer credit
···· household lending for house purchase
– – other lending to households
— lending to non-financial corporations

Sources: ECB and ECB calculations.

Chart S93 Annual growth in euro area MFIs' issuance of securities and shares

(Jan. 2003 - Sep. 2011; percentage change per annum)

— securities other than shares (all currencies)
···· securities other than shares (EUR)
– – quoted shares
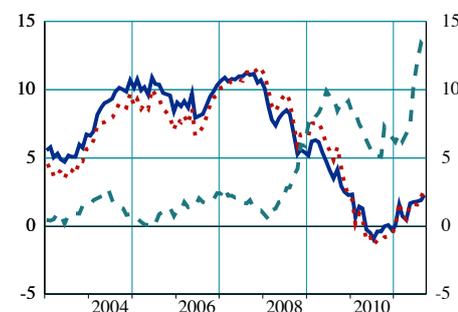
Source: ECB.

Chart S94 Deposit margins of euro area MFIs

(Jan. 2003 - Sep. 2011; percentage points)

— overnight deposits by non-financial corporations
····· overnight deposits by households
– – – deposits with agreed maturity by non-financial corporations
— deposits with agreed maturity by households
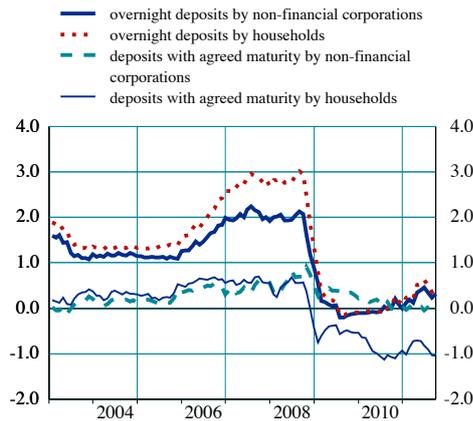
Sources: ECB, Thomson Reuters and ECB calculations.
Notes: For overnight deposits, margins are derived as the difference between MFI interest rates and the EONIA. For deposits with agreed maturity, margins are derived as the average of the spreads for the relevant breakdowns by maturity, using new business volumes as weights. The individual spreads are the difference between the swap rate and the MFI interest rate for new deposits, where both have corresponding maturities.

Chart S95 Euro area MFI foreign currency-denominated assets, selected balance sheet items

(Q1 2001 - Q2 2011)

— USD securities other than shares (percentage of total foreign currency-denominated securities other than shares)
····· USD loans (percentage of total foreign currency-denominated loans)
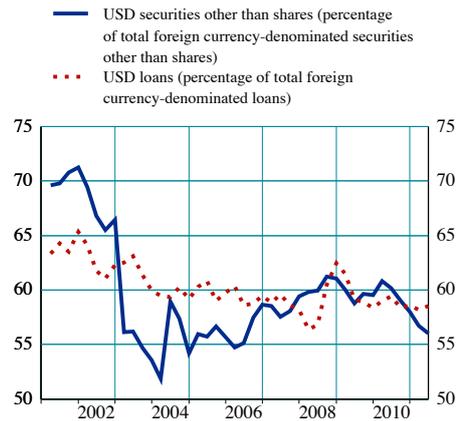
Sources: ECB and ECB calculations.

Chart S96 Consolidated foreign claims of domestically owned euro area banks on Latin American countries

(Q1 1999 - Q2 2011; USD billions)

— Mexico
····· Brazil
– – – Chile
— Argentina
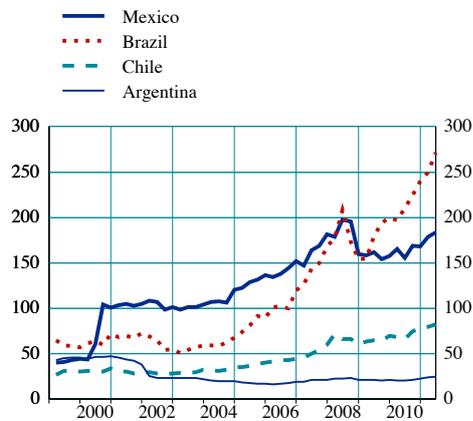
Sources: BIS and ECB calculations.

Chart S97 Consolidated foreign claims of domestically owned euro area banks on Asian countries

(Q1 1999 - Q2 2011; USD billions)

— South Korea
····· India
– – – China
— Thailand
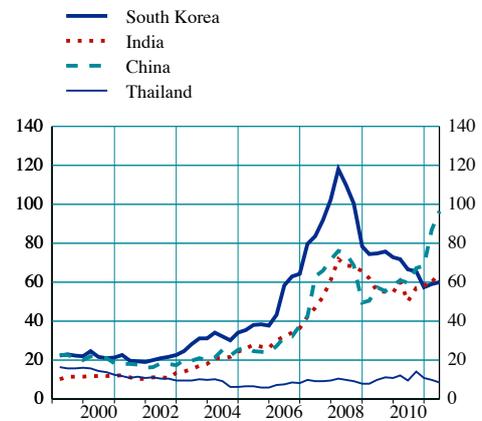
Sources: BIS and ECB calculations.

Table S6 Consolidated foreign claims of domestically owned euro area banks on individual countries

(percentage of total consolidated foreign claims)

	2009 Q1	2009 Q2	2009 Q3	2009 Q4	2010 Q1	2010 Q2	2010 Q3	2010 Q4	2011 Q1	2011 Q2
Total offshore centres	**7.1**	**7.0**	**6.7**	**7.0**	**7.1**	**7.3**	**7.0**	**6.9**	**6.5**	**6.5**
of which										
Hong Kong	0.7	0.7	0.7	0.7	0.9	0.8	0.8	0.9	1.0	0.9
Singapore	0.9	0.9	0.9	0.9	1.0	1.0	1.0	1.2	1.0	1.0
Total Asia and Pacific EMEs	**3.9**	**3.9**	**4.0**	**4.2**	**4.5**	**4.3**	**4.6**	**4.7**	**4.9**	**4.9**
of which										
China	0.7	0.7	0.7	0.8	0.8	0.9	0.9	1.0	1.2	1.3
India	0.8	0.7	0.7	0.7	0.8	0.7	0.8	0.8	0.9	0.8
Indonesia	0.2	0.2	0.2	0.2	0.3	0.2	0.3	0.3	0.3	0.3
Malaysia	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2
Philippines	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
South Korea	1.0	1.0	1.0	1.0	1.0	1.0	0.9	0.8	0.8	0.8
Taiwan	0.2	0.2	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.4
Thailand	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.2	0.1	0.1
Total European EMEs and new EU Member States	**13.1**	**13.5**	**13.9**	**14.4**	**14.5**	**13.9**	**14.6**	**15.1**	**15.5**	**15.6**
of which										
Czech Republic	2.0	2.2	2.4	2.3	2.3	2.2	2.4	2.6	2.8	2.8
Hungary	1.7	1.8	1.8	1.8	1.8	1.7	1.7	1.6	1.7	1.7
Poland	2.7	2.9	3.1	3.4	3.5	3.2	3.6	3.7	3.7	3.7
Russia	2.0	1.9	1.7	1.7	1.7	1.6	1.7	1.7	1.6	1.7
Turkey	1.2	1.2	1.2	1.3	1.3	1.3	1.4	1.5	1.9	1.8
Total Latin America	**6.2**	**6.4**	**6.4**	**6.9**	**7.0**	**7.4**	**7.6**	**8.4**	**8.3**	**8.6**
of which										
Argentina	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Brazil	2.0	2.3	2.5	2.7	2.7	3.1	3.1	3.5	3.5	3.7
Chile	0.8	0.8	0.8	0.9	0.9	1.0	1.0	1.1	1.1	1.1
Colombia	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.2	0.3
Ecuador	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Mexico	2.1	2.1	2.0	2.1	2.3	2.3	2.3	2.5	2.5	2.5
Peru	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3
Uruguay	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.1	0.1	0.1
Venezuela	0.4	0.4	0.2	0.3	0.2	0.2	0.2	0.2	0.2	0.2
Total Middle East and Africa	**3.1**	**3.0**	**3.0**	**3.2**	**3.2**	**3.0**	**3.3**	**3.5**	**3.3**	**3.3**
of which										
Iran	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Morocco	0.3	0.3	0.3	0.4	0.4	0.3	0.4	0.4	0.4	0.4
South Africa	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Total non-developed countries	**33.5**	**33.9**	**34.1**	**35.7**	**36.4**	**35.9**	**37.0**	**38.5**	**38.4**	**39.0**

Sources: BIS and ECB calculations.
Notes: Aggregates derived as the sum of foreign claims of euro area 12 countries (i.e. euro area excluding Cyprus, Malta, Slovakia, Slovenia and Estonia) on the specified counterpart areas.

Chart S98 Credit standards applied by euro area banks to loans and credit lines to enterprises, and contributing factors

(Q1 2006 - Q3 2011; net percentage)

bank capital position
competition from other banks
expectations regarding general economic activity
industry-specific outlook
realised credit standards
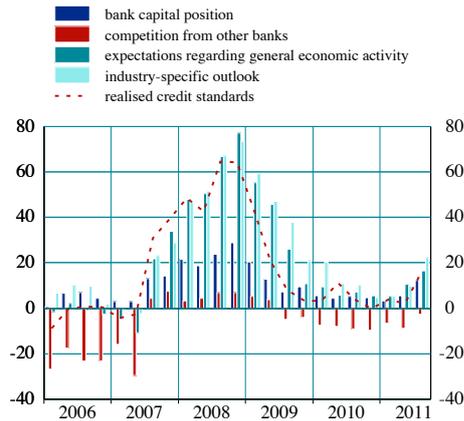
Sources: ECB and ECB calculations.
Notes: For credit standards, the net percentages refer to the difference between those banks reporting that they have been tightened in comparison with the previous quarter and those reporting that they have been eased. For the contributing factors, the net percentages refer to the difference between those banks reporting that the given factor has contributed to a tightening compared with the previous quarter and those reporting that it contributed to an easing.

Chart S99 Credit standards applied by euro area banks to loans and credit lines to enterprises, and terms and conditions

(Q1 2006 - Q3 2011; net percentage)

margins on average loans
margins on riskier loans
collateral requirements
maturity
realised credit standards
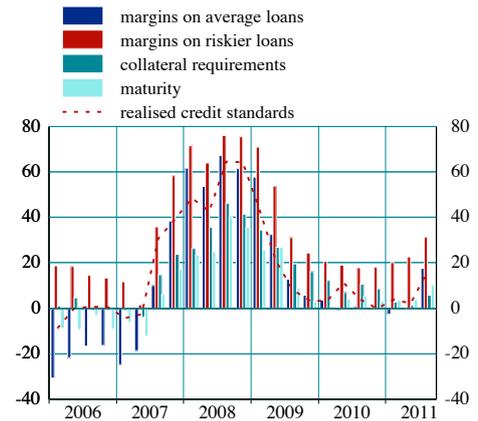
Sources: ECB and ECB calculations.
Notes: The net percentages refer to the difference between those banks reporting that credit standards, terms and conditions have been tightened in comparison with the previous quarter and those reporting that they have been eased.

Chart S100 Credit standards applied by euro area banks to loans to households for house purchase, and contributing factors

(Q1 2006 - Q3 2011; net percentage)

expectations regarding general economic activity
housing market prospects
competition from other banks
competition from non-banks
realised credit standards
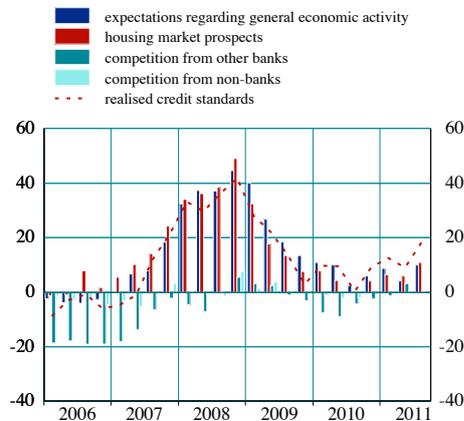
Sources: ECB and ECB calculations.
Note: See the note of Chart S98.

Chart S101 Credit standards applied by euro area banks to consumer credit, and contributing factors

(Q1 2006 - Q3 2011; net percentage)

expectations regarding general economic activity
creditworthiness of consumers
competition from other banks
competition from non-banks
realised credit standards
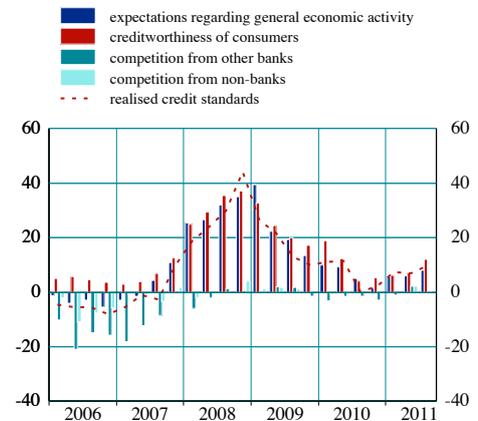
Sources: ECB and ECB calculations.
Note: See the note of Chart S98.

Chart S102 Expected default frequency (EDF) for large and complex banking groups in the euro area

(Jan. 2001 - Oct. 2011; percentage probability)
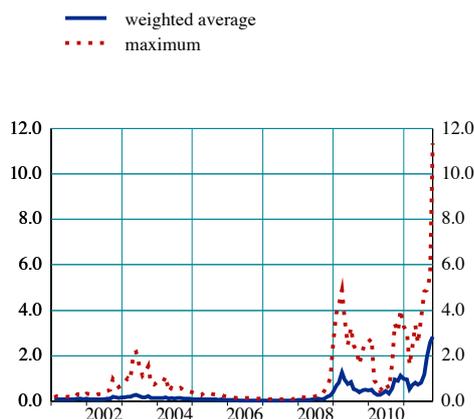
  ──── weighted average
  ····· maximum

Sources: Moody's KMV and ECB calculations.
Notes: The EDF provides an estimate of the probability of default over the following year. Due to measurement considerations, the EDF values are restricted by Moody's KMV to the interval between 0.01% and 35%. The weighted average is based on the amounts of non-equity liabilities outstanding.

Chart S103 Distance to default for large and complex banking groups in the euro area
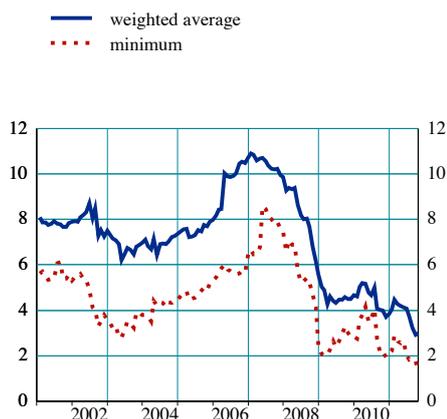
(Jan. 2001 - Oct. 2011)

  ──── weighted average
  ····· minimum

Sources: Moody's KMV and ECB calculations.
Notes: An increase in the distance to default reflects an improving assessment. The weighted average is based on the amounts of non-equity liabilities outstanding.

Chart S104 Credit default swap spreads for European financial institutions and euro area large and complex banking groups

(Jan. 2004 - Nov. 2011; basis points; five-year maturity)

  ──── financial institutions' senior debt
  ····· financial institutions' subordinated debt
  ──── euro area LCBGs' senior debt (average)
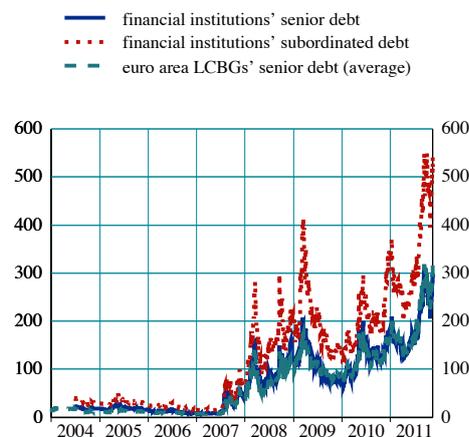
Sources: Bloomberg and ECB calculations.

Chart S105 Earnings and earnings forecasts for large and complex banking groups in the euro area

(Q1 2000 - Q4 2012; percentage change per annum; weighted average)

  ──── weighted average
  ◎ April 2011 forecast for end-2011 and end-2012
  ✚ October 2011 forecast for end-2012
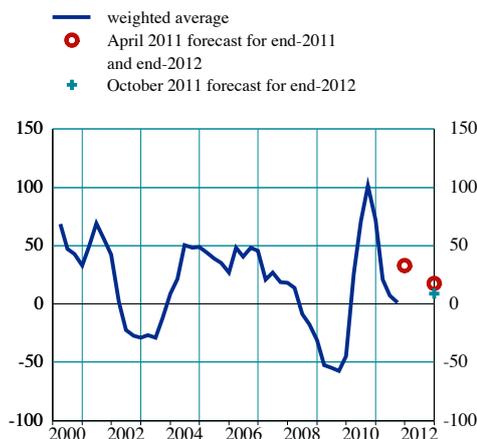
Sources: Thomson Reuters, I/B/E/S and ECB calculations.
Notes: Growth rates of weighted average earnings for euro area large and complex banking groups, using their market capitalisations at September 2011 as weights. Actual earnings are derived on the basis of historical net income; forecasts are derived from IBES estimates of earnings per share.

Chart S106 Dow Jones EURO STOXX total market and bank indices

(Jan. 2001 - Nov. 2011; index: Jan. 2001 = 100)

——— Dow Jones EURO STOXX 50 index
······· Dow Jones EURO STOXX bank index
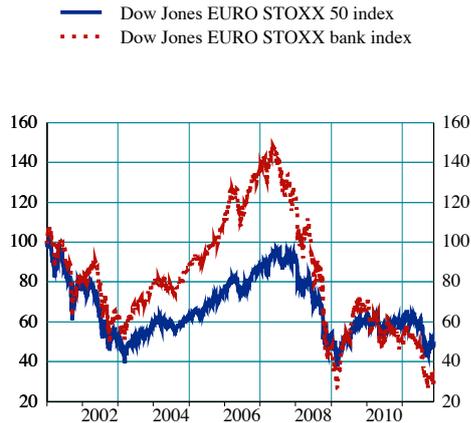
Sources: Bloomberg and ECB calculations.

Chart S107 Implied volatility for Dow Jones EURO STOXX total market and bank indices

(Jan. 2001 - Nov. 2011; percentages)

——— Dow Jones EURO STOXX 50 index
······· Dow Jones EURO STOXX bank index
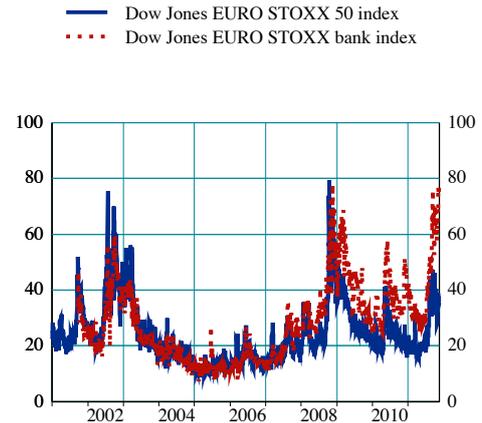
Sources: Bloomberg and ECB calculations.
Note: Weighted average of the volatility of the two closest options.

Chart S108 Risk reversal and strangle of the Dow Jones EURO STOXX bank index

(Jan. 2003 - Nov. 2011; percentages; implied volatility; 20-day moving average)
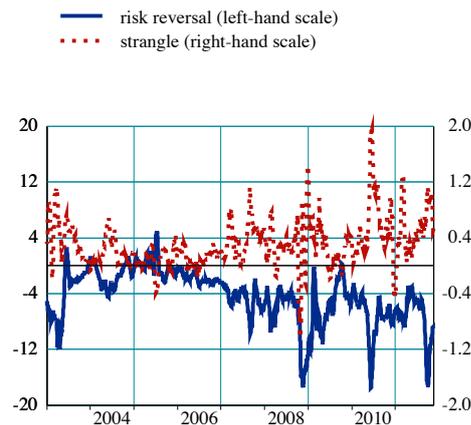
——— risk reversal (left-hand scale)
······· strangle (right-hand scale)

Sources: Bloomberg and ECB calculations.
Notes: The risk-reversal indicator is calculated as the difference between the implied volatility of an out-of-the-money (OTM) call with 25 delta and the implied volatility of an OTM put with 25 delta. The strangle is calculated as the difference between the average implied volatility of OTM calls and puts, both with 25 delta, and the at-the-money volatility of calls and puts with 50 delta.

Chart S109 Price/earnings (P/E) ratios for large and complex banking groups in the euro area

(Jan. 1999 - Oct. 2011; ten-year trailing earnings)

——— simple average
······· weighted average
– – – 25th percentile
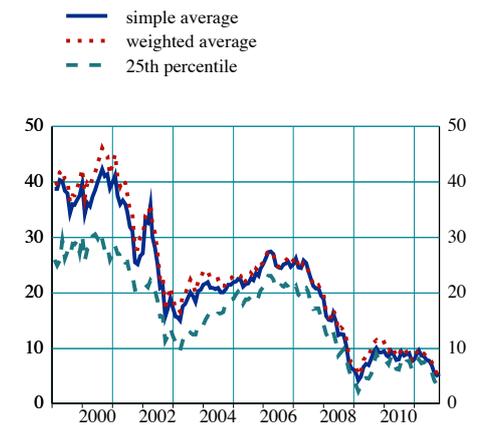
Sources: Thomson Reuters, I/B/E/S and ECB calculations.
Notes: The P/E ratio is based on prevailing stock prices relative to an average of the previous ten years of earnings. The weighted average is based on the market capitalisation in October 2011.

Chart S110 Changes in the ratings of large and complex banking groups in the euro area

(Q2 2000 - Q3 2011; number)

— upgrades
— downgrades
-- balance
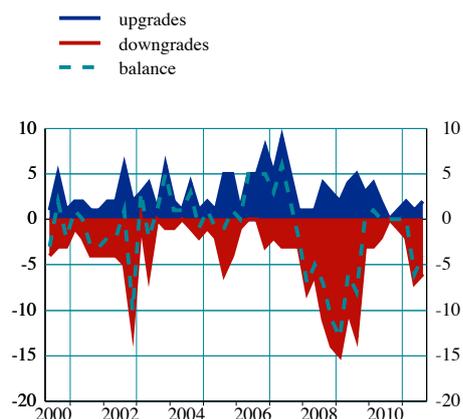
Sources: Bloomberg and ECB calculations.
Note: These include both outlook and rating changes.

Chart S111 Distribution of ratings for large and complex banking groups in the euro area

(number of banks)

■ Q1 2010
■ Q3 2010
■ Q1 2011
■ Q3 2011
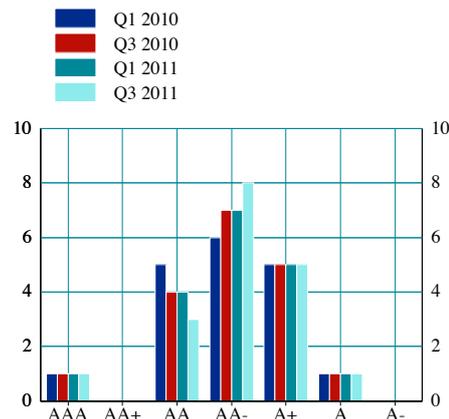
Sources: Moody's, Fitch Ratings, Standard and Poor's and ECB calculations.

Table S7   Rating averages and outlook for large and complex banking groups in the euro area

(October 2011)

	Moody's	S&P	Fitch	Total
Ratings available out of sample	17	15	18	50
Outlook available	17	17	18	52
Rating average	Aa3	AA-	AA-	4.6
Outlook average	-0.6	-0.4	-0.5	-0.5
Number of positive outlooks	0	0	0	0
Number of negative outlooks	10	6	9	25

Rating codes	Moody's	S&P	Fitch	Numerical equivalent
	Aaa	AAA	AAA	1
	Aa1	AA+	AA+	2
	Aa2	AA	AA	3
	Aa3	AA-	AA-	4
	A1	A+	A+	5
	A2	A	A	6
	A3	A-	A-	7

Outlook	Stable	Positive	Negative
Numerical equivalent	0	1	-1

Sources: Moody's, Fitch Ratings, Standard and Poor's and ECB calculations.

Chart S112 Value of mergers and acquisitions by euro area banks

(2001 - 2010; EUR billions)

- domestic
- euro area other than domestic
- rest of the world
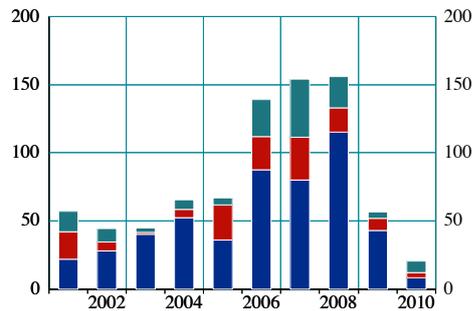
Sources: Bureau van Dijk (ZEPHIR database) and ECB calculations.
Note: All completed mergers and acquisitions (including institutional buyouts, joint ventures, management buyout/ins, demergers, minority stakes and share buybacks) where a bank is the acquirer.

Chart S113 Number of mergers and acquisitions by euro area banks

(2001 - 2010; total number of transactions)

- domestic
- euro area other than domestic
- rest of the world
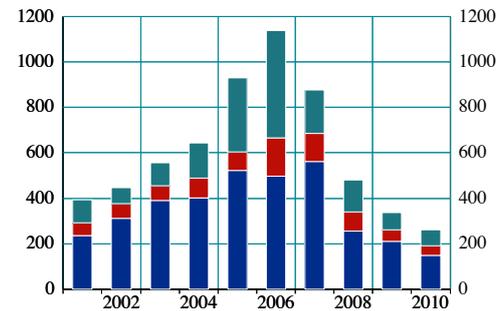
Sources: Bureau van Dijk (ZEPHIR database) and ECB calculations.
Note: All completed mergers and acquisitions (including institutional buyouts, joint ventures, management buyout/ins, demergers, minority stakes and share buybacks) where a bank is the acquirer.

Chart S114 Distribution of gross-premium-written growth for a sample of large euro area primary insurers

(2007 - Q3 2011; percentage change per annum; nominal values; maximum, minimum, interquantile distribution)
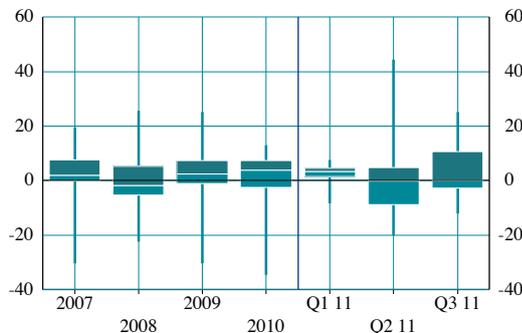

Sources: Bloomberg, individual institutions' financial reports and ECB calculations.
Note: Based on the figures for 20 large euro area insurers.

Chart S115 Distribution of combined ratios in non-life business for a sample of large euro area primary insurers

(2007 - Q3 2011; percentage of premiums earned; maximum, minimum, interquantile distribution)
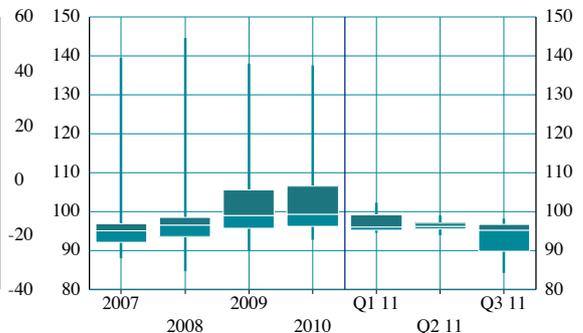
Sources: Bloomberg, individual institutions' financial reports and ECB calculations.
Note: Based on the figures for 20 large euro area insurers.

Chart S116 Distribution of investment income, return on equity and capital for a sample of large euro area primary insurers

(2009 - Q3 2011; maximum, minimum, interquantile distribution)
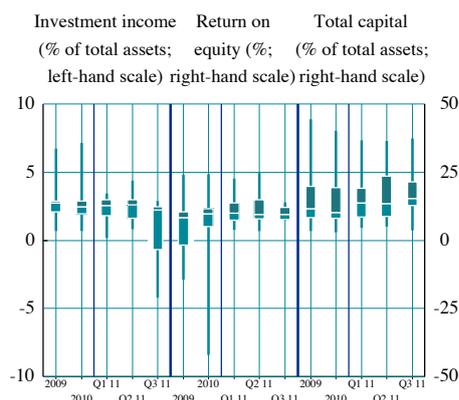
Sources: Bloomberg, individual institutions' financial reports and ECB calculations.
Note: Based on the figures for 20 large euro area insurers.

Chart S117 Distribution of gross-premium-written growth for a sample of large euro area reinsurers

(2007 - Q3 2011; percentage change per annum; maximum-minimum distribution)
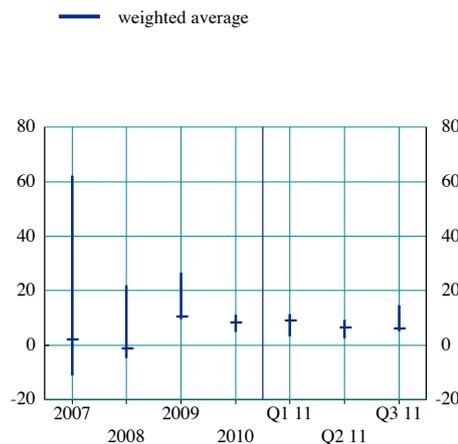
— weighted average

Sources: Bloomberg, individual institutions' financial reports and ECB calculations.
Notes: Based on the figures for four large euro area reinsurers.
The weighted average is based on the amounts of total assets outstanding.

Chart S118 Distribution of combined ratios for a sample of large euro area reinsurers

(2007 - Q3 2011; percentage change per annum; nominal values; maximum-minimum distribution)
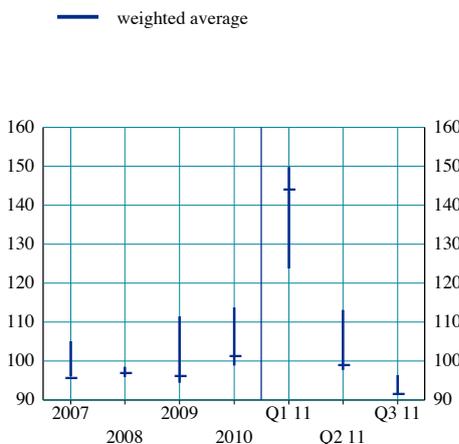
— weighted average

Sources: Bloomberg, individual institutions' financial reports and ECB calculations.
Notes: Based on the figures for four large euro area reinsurers.
The weighted average is based on the amounts of total assets outstanding.

Chart S119 Distribution of investment income, return on equity and capital for a sample of large euro area reinsurers

(2009 - Q3 2011; percentage of premiums earned; maximum-minimum distribution)
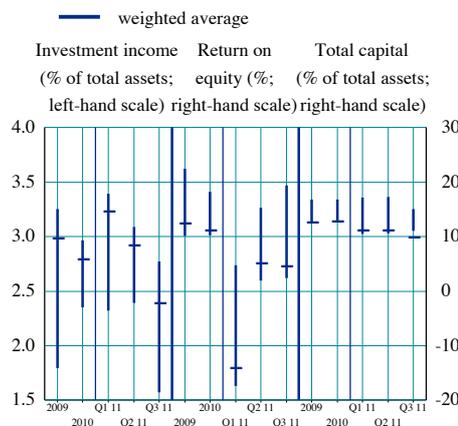
— weighted average

Sources: Bloomberg, individual institutions' financial reports and ECB calculations.
Notes: Based on the figures for four large euro area reinsurers.
The weighted average is based on the amounts of total assets outstanding.

**Chart S120 Distribution of shares and other equity of insurance companies across euro area countries**

(2008 - Q2 2011; percentage of total financial assets; maximum, minimum, interquantile distribution across countries)
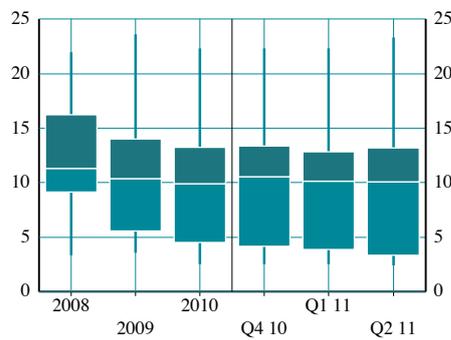
Source: ECB and ECB calculations.
Note: The data refers to solo data and host country approach.

Chart S121 Distribution of securities other than shares and other equity of insurance companies across euro area countries

(2008 - Q2 2011; percentage of total financial assets; maximum, minimum, interquantile distribution across countries)
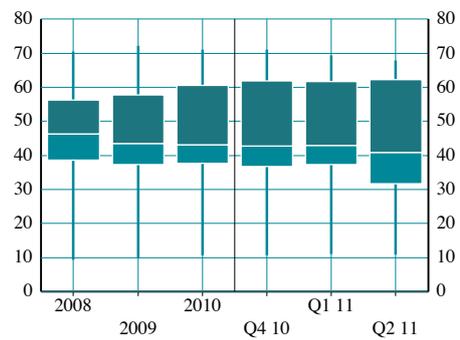
Source: ECB and ECB calculations.
Note: The data refers to solo data and host country approach.

Chart S122 Expected default frequency (EDF) for the euro area insurance sector

(Jan. 2001 - Oct. 2011; percentage probability)

median
75th percentile
90th percentile
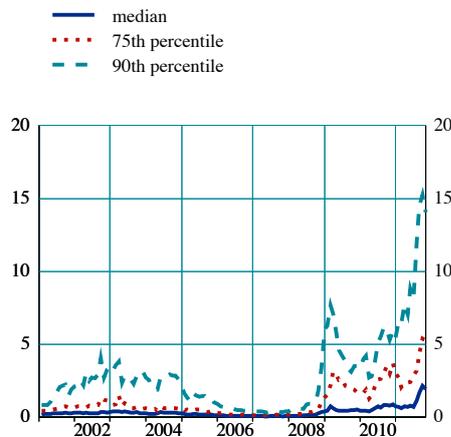
Source: Moody's KMV.
Note: The EDF provides an estimate of the probability of default over the following year. Due to measurement considerations, the EDF values are restricted by Moody's KMV to the interval between 0.01% and 35%.

**Chart S123 Credit default swap spreads for a sample of large euro area insurers and the iTraxx Europe main index**

(Jan. 2005 - Nov. 2011; basis points; five-year maturity)

euro area insurers' average CDS spread
iTraxx Europe
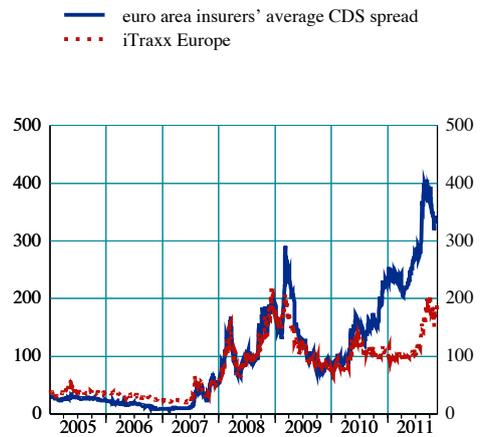
Sources: Bloomberg and ECB calculations.

Chart S124 Dow Jones EURO STOXX total market and insurance indices

(Jan. 2001 - Nov. 2011; index: Jan. 2001 = 100)

— Dow Jones EURO STOXX 50 index
···· non-life insurers
– – life insurers
— reinsurers
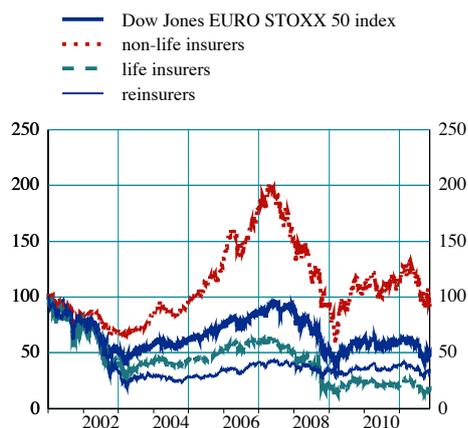
Source: Thomson Reuters.

Chart S125 Implied volatility for Dow Jones EURO STOXX total market and insurance indices

(Jan. 2001 - Nov. 2011; percentages)

— Dow Jones EURO STOXX 50 index
···· Dow Jones EURO STOXX insurance index
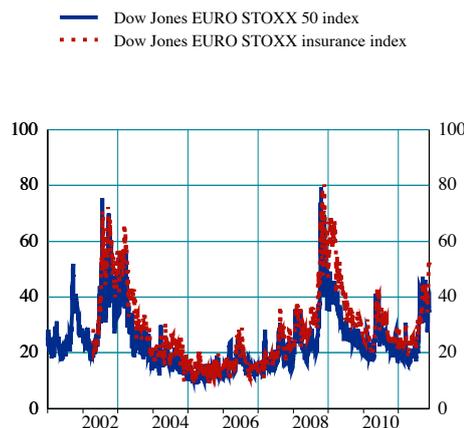
Sources: Bloomberg and ECB calculations.
Note: Weighted average of the volatility of the two closest options.

**Chart S126 Risk reversal and strangle of the Dow Jones EURO STOXX insurance index**

(Jan. 2003 - Nov. 2011; ten-year trailing earnings)
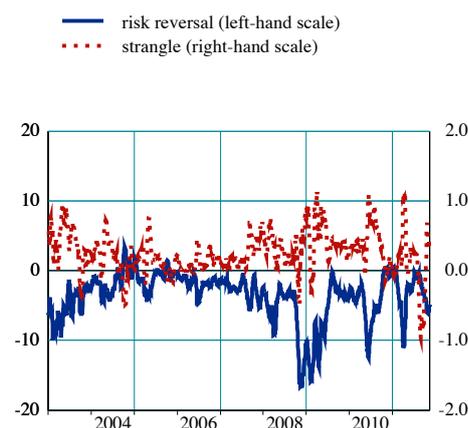
— risk reversal (left-hand scale)
···· strangle (right-hand scale)

Sources: Bloomberg and ECB calculations.
Notes: The risk-reversal indicator is calculated as the difference between the implied volatility of an out-of-the-money (OTM) call with 25 delta and the implied volatility of an OTM put with 25 delta. The strangle is calculated as the difference between the average implied volatility of OTM calls and puts, both with 25 delta, and the at-the-money volatility of calls and puts with 50 delta.

Chart S127 Price/earnings (P/E) ratios for euro area insurers

(Jan. 1999 - Oct. 2011; ten-year trailing earnings)
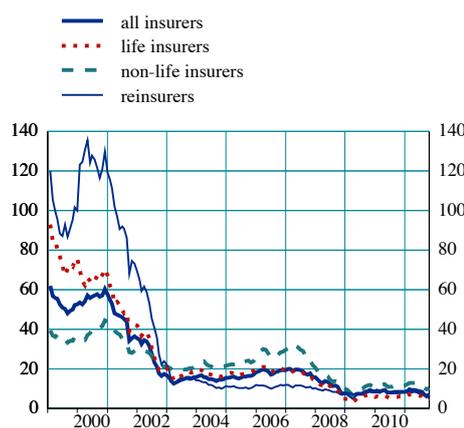
— all insurers
···· life insurers
– – non-life insurers
— reinsurers

Sources: Thomson Reuters and ECB calculations.
Note: The P/E ratio is based on prevailing stock prices relative to an average of the previous ten years of earnings.

Chart S128 Non-settled payments on the Single Shared Platform (SSP) of TARGET2

(July 2008 - Oct. 2011)

■ volume (left-hand scale, number of transactions)
···· value (right-hand scale, EUR billions)
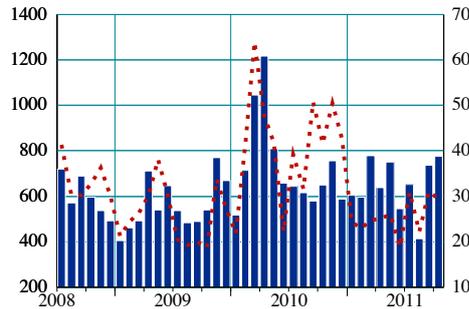
Source: ECB.
Note: Monthly averages of daily observations.

Chart S129 Value of transactions settled in TARGET2 per time band

(Q4 2010 - Q3 2011; EUR billions)

—— Q4 2010
···· Q1 2011
– – Q2 2011
—— Q3 2011
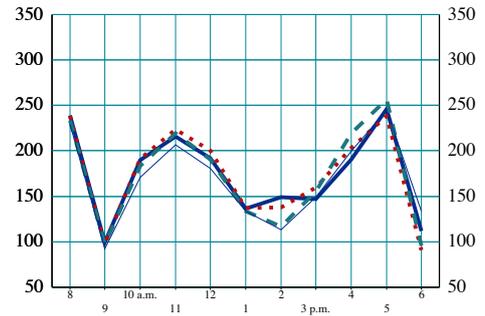
Source: ECB.
Note: Averages based on TARGET2 operating days.

Chart S130 TARGET and TARGET2 availability

(Mar. 1999 - Oct. 2011; percentages; three-month moving average)
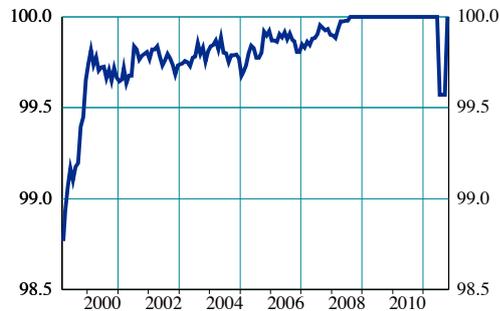
Source: ECB.

Chart S131 Volumes and values of foreign exchange trades settled via Continuous Linked Settlement (CLS)

(Jan. 2003 - Oct. 2011)

—— volume in thousands (left-hand scale)
···· value in USD billions (right-hand scale)

Source: ECB.