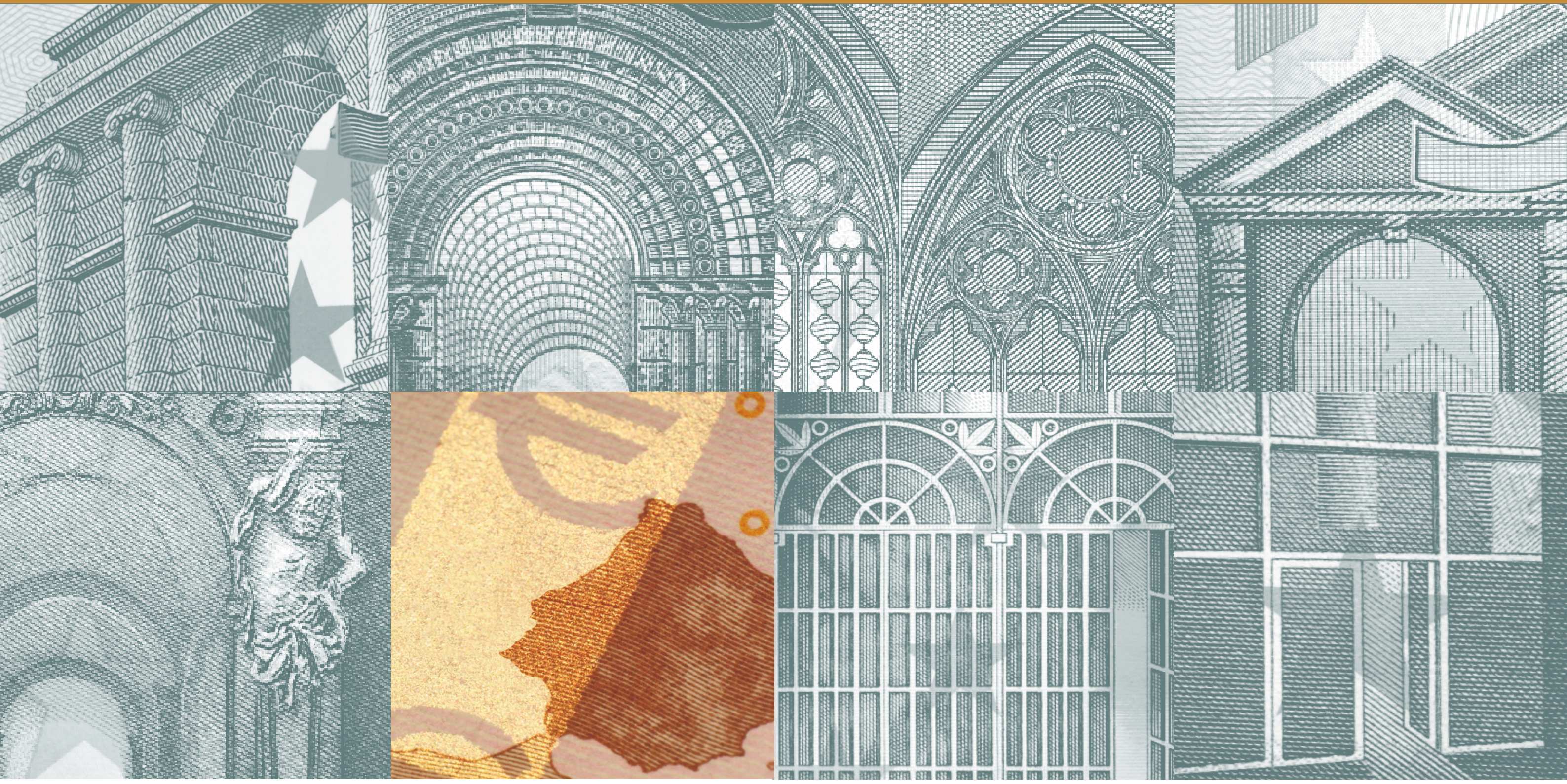

FINANCIAL STABILITY REPORT

November 2013

Banco de Portugal
EUROSYSTEM

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OVERVIEW

Financial stability is a key factor for balanced and sustained economic growth, and thus should be preserved and fostered. It corresponds to the smooth functioning of the financial system, without disruptions that may jeopardise its efficient intermediation role in the economy. Therefore, it is important to identify the risks that impair such smooth functioning, in order to mitigate them, using for that purpose those instruments that are deemed more effective to avoid or ease the respective effects. There are several risks that may compromise financial stability, some arising from the overall macroeconomic conditions, others more directly related to markets developments or to structural or cyclical specificities of the financial sector.

The evolution of the Portuguese economy is an essential conditioning factor of financial sector's stability and soundness. Uncertainty as to future domestic macroeconomic developments is thus an important risk. In 2013, despite the recent favourable developments, the Portuguese economy continued to be considerably limited by the macroeconomic imbalance correction process, which continued against an international financial background characterised by an accommodative monetary policy stance, high levels of uncertainty and financial market fragmentation. Despite some recent signs of a pickup, euro area activity contracted, and economic conditions continued to be rather different across countries. This is a result of idiosyncratic weaknesses, also heightened by financial market fragmentation, resulting in high risk premia in stressed economies, and institutional uncertainty as to the implementation of mechanisms allowing for greater financial, economic and fiscal integration in the Economic and Monetary Union.In this context, it is worth highlighting a structural improvement in Portugal in the general government budget balance on the one hand and in the external balance, on the other. In particular, external rebalancing translated into an increase in the Portuguese economy's financing capacity, reflecting a considerable rise in non-financial sector saving and a continued fall in investment. The banking system's credit portfolio declined in the first half of 2013, amid deleveraging of the economy's non-financial sectors. At the same time, credit flows have been reallocated towards the economy's tradable sectors, an evolution that can be assessed as positive.

Despite the progress made in the correction of the Portuguese economy's structural imbalances, there are significant persisting vulnerabilities that need to be corrected, notably excessive indebtedness of resident, private and public sectors. The current levels heighten weaknesses, in terms of both liquidity and solvency, with potential effects on financial stability, and hence it is important to create a multidimensional incentive framework, promoting their reduction. It is also important to stress, in particular, a need to consolidate public accounts, due to externalities generated on the remaining resident sectors. In fact, sound and sustainable public finances are a key element for national and international economic agents' confidence, benefiting financial stability. They are also a necessary factor for decision-making conducive to an efficient allocation of the Portuguese economy's resources, promoting competitiveness, and to ensure its sustainable financing in the medium to long term.

The actual impact of fiscal measures that will eventually be adopted in the short and medium to long term on private expenditure and economic growth is uncertain. In this context, the accommodative stance of the monetary policy plays a relevant role, impacting disposable income of households, especially those more heavily indebted, therefore conditioning defaults in credit operations. It is also important the maintenance of the reallocation of resources towards the economy's tradable sectors, as a means to offset the effects of the depressed internal demand.

GDP developments and the reduction of disposable income have translated into a deterioration of the quality of the banking sector's credit portfolio, and thus this type of developments should continue to materialise into an increase in default by households and non-financial corporations. In the first half of 2013, the credit at risk ratio continued to rise, which was particularly significant in the case of credit granted to non-financial corporations and contained and stable in the segment of loans to households for house purchase. Despite the rise in the credit at risk ratio, its coverage through provisioning remained relatively stable. Banco de Portugal has been undertaking initiatives to guarantee due provisioning of banks' credit portfolios.

The Portuguese banking system's exposure to the real estate sector, be it direct or indirect (notably through the holding of mutual fund units involving real estate risk), is also an important element of uncertainty regarding financial stability. Although there is evidence pointing to the absence of a real estate price 'bubble' in Portugal similar to that observed in other stressed countries, one cannot rule out further price corrections, consistent with the gradual adjustment of the Portuguese housing market following a significant increase in supply in the past, due to the domestic economic situation and the need to reduce household indebtedness, and to a possible fostering of the rental market. So as to avoid possible negative effects associated with such exposure on the financial sector, the National Council of Financial Supervisors recently defined a number of principles aimed at ensuring a prudent assessment of real estate assets. In addition, in the past few years Banco de Portugal conducted several inspections to specific asset classes that are particularly exposed to macroeconomic and market developments, including assets exposed to real estate risk, targeted at guaranteeing correct assessment of real estate value.

The low interest rate levels currently observed affect banks' profitability, insofar as they put pressure on their interest rate margins, despite the positive effect that they nevertheless have on impairments. This is especially relevant in Portugal, where the return on assets is limited by the fact that a significant part of the credit portfolio is remunerated at variable rates with small spreads that are fixed for long maturities, while the cost of funding has decoupled from these rates after being penalised by the unfolding of the financial crisis. Further, the unfavourable economic developments contribute also to depress bank's profitability, either by the reduction in volumes or by the reduction in asset's quality.

Overall, banking sector's profitability was negative in the first half of the year, especially due to a narrowing of the net interest income and impairment developments. The organic capital generation thus remains as one of the main challenges posed to the banking business in the medium term, given that, despite the currently ongoing adjustment in bank's business models, its effects pass through slowly to bank results.

Similarly to most euro area banks, the liquidity position of Portuguese banks has benefited from the ECB's action as regards both conventional and non-conventional monetary policy measures. At the level of conventional measures, it is relevant to note the decrease in key interest rates. Among non-conventional measures, particular attention is drawn to the fixed-rate regime and to the full-allotment regime as adopted for financing operations with the Eurosystem, the conduct of refinancing operations for especially long maturities and the measures with an impact on collateral eligibility rules, which confer on institutions more capacity to accommodate, in the short run, adverse shocks at their liquidity requirement levels. The withdrawal of these measures, particularly those with a non-conventional nature aiming at restoring the adequate monetary policy transmission mechanism at the euro area, must be gradual and foreseeable, as the disturbances and the fragmentation are corrected and fade. It should be mentioned that, when assessed by liquidity gaps, the Portuguese banks' liquidity situation remained relatively comfortable in the course of the first half of 2013.

Deposit growth has played a key role in the adjustment process of the banking system's financing sources, with a view to a more sustainable structure, less sensitive to changes in risk perception by international investors. These developments reflect banking customers' confidence in Portuguese banks. In the first half of 2013, customers' resources increased, reflecting resident households' portfolio shifts and further positive contributions made by international activity. Against a background of uncertain macroeconomic context, confidence is key for financial system stability. It is therefore of the essence that consumers make their financial choices in an informed, educated and responsible manner. It is important to stress in this respect the adoption of legal provisions that increase consumer protection, most notably reporting requirements, as well as financial literacy initiatives aimed at the population, namely under the aegis of the National Council of Financial Supervisors.

Excluding deposits, the Portuguese banking system's financing structure continues to be quite limited by the segmentation of financial markets and of the interbank market, making it more difficult to diversify financing sources, namely access market sources. Recourse by Portuguese banks to financing by Eurosystem, although stabilising, has remained well above the euro area average. Once the constraints that hamper smooth market functioning are overcome, recourse to this financing is expected to be significantly reduced. The deepening of the European Union and, in particular, the conclusion of Banking Union, including not only the Single Supervisory Mechanism, but also resolution and deposit guarantee for all banks, are essential to overcome fragmentation.

Continued low short and long-term interest-rate environments may favour greater preference for assets with longer maturities and/or higher risk. This may also have significant consequences in terms of asset valuation, namely for debt instruments. On the other hand, they underline sensitivity to volatility from sundry sources, including possible surprises in the conduct of monetary policy. The fact that the main central banks have signalled to the market the key elements of their forward guidance, and that the Federal Reserve in particular has ensured that its policy changes will be phased and supported by indicators signalling economic recovery, reduce the probability of sharp movements.

In the same vein, *i.e.* as regards risk mitigation, the Banking Union framework points to a shift towards more balanced and diversified portfolios in terms of exposure to sovereign risk. Growing concentration in national sovereign securities has been observed in different euro area countries, including Portugal, where, in the first half of the year, the weight of Portuguese government debt securities in the banking system portfolio has increased further (followed by a rise in the residual average maturity).

Despite the medium and long-term benefits of regulatory changes in the near future, their implementation poses risks to the financial sector in the short term. These changes are broadly based across the financial sector and may lead to the need for balance-sheet adjustments of financial institutions, given that substantial changes will be introduced in liquidity, capital and asset/liability valuation requirements, inter alia. In this context, it is important to note the risk that regulatory arbitrage opportunities may emerge, namely as regards attempts to optimise results, capital, financing or liquidity, against a background of strong links among the financial institutions of each country and among the financial sectors of the various countries.

With regard to the banking sector, special mention should be made to regulatory changes, which will enter into force on 1 January 2014 and will imply more stringent capital requirements and a wider set of covered risks. These changes are aimed at increasing the quality of banks' own funds, introducing changes as regards own fund definition and requirements and establishing a series of macroprudential instruments to mitigate systemic risk. The forthcoming transition to the new regulatory requirements is expected to be smooth. The solvency levels of Portuguese banks (which rose again in the first half of 2013) reflect a set of measures adopted by Banco de Portugal since 2011, first autonomously and later under the framework of the Financial Assistance Program. These measures have involved, on the one hand, the definition of a new capital ratio – Core Tier 1, calculated only on the basis of better quality capital items – for which a minimum starting level of 8 per cent was defined, aimed at strengthening the institutions' capacity to face adverse situations and the start of convergence to Basel III standards. They have also included a gradual increase in the minimum ratio to be complied with by institutions (10 per cent, with effect as of the end of 2012), in compliance with the provisions of the Financial Assistance Programme. In addition, and on a more localised basis for participating banks, prudential capital has been increased in the framework of the regulatory requirements defined by EBA, in force since mid-2012. Nevertheless, some challenges persist in the medium term, given the prospects as regards income generation by Portuguese banks' domestic activity. In this context, Banco de Portugal shall act so as to ensure that the capital levels of the institutions under its supervision will remain adequate in a sustained manner.

As regards the insurance sector, the Solvency II regime will enter into force in the future, with the aim of enhancing the protection of policyholders through a more robust, risk-sensitive system, in a more harmonised regulatory environment for all insurance companies operating in the European Union. Structural changes are expected in terms of the calculation of capital requirements, the valuation of assets and liabilities, the governance system and information reporting. The effects of these changes have yet to be clearly determined, given that the final provisions are still under development. Their full implementation is forecast to occur in 2016.

Increasing competition, by reducing average rates in non-life insurance, and the depressed macroeconomic environment are contributing to lower profits in the insurance sector. In the first half of 2013, however, there was a significant increase in results, largely influenced by a reinsurance operation tending to anticipate results. The coverage ratios of technical provisions have improved in life and non-life insurance, positively influenced by the behaviour of investment portfolio yields. In turn, the rate of coverage of the solvency margin remained at levels well above the minimum regulatory requirements.

Within the scope of its macroprudential responsibility for the financial system, Banco de Portugal monitors developments in the sector at the domestic level, and, in liaison with the other national supervisory entities, varies the instruments at its disposal in order to the meet the goal of preserving financial stability. At the external level, within its sphere of competence as member of the Eurosystem and the European supervisory authorities, the Bank will continue to play an active role in the definition of European Union's institutional architecture.

RECENT DEVELOPMENTS

1

1.1 MACROECONOMIC AND FINANCIAL ENVIRONMENT
1.2 FINANCIAL POSITION OF NON-FINANCIAL SECTORS
1.3 FINANCIAL SECTOR ASSETS, LIABILITIES AND PRUDENTIAL SITUATION

1. RECENT DEVELOPMENTS

1.1 Macroeconomic and financial environment

The adjustment process of domestic and external imbalances in the Portuguese economy continued in 2013

In 2013 developments in the Portuguese economy continued to be considerably conditioned by the adjustment process of macroeconomic imbalances. The correction of imbalances involves the adoption of a number of fiscal consolidation measures and an orderly and gradual deleveraging in the private sector, which result in a strong contraction in domestic demand. These measures are adopted under the Economic and Financial Assistance Programme (EFAP), which has been implemented in a particularly unfavourable international macroeconomic environment, with the euro area facing a recession it has only started to overcome in mid-2013. In addition, compliance with the EFAP takes place in an international financial environment characterised by euro area fragmentation, despite recent signs of improvement and very high uncertainty related to the ongoing euro area sovereign debt crisis. More recently, it is worth highlighting the institutional uncertainty underlying the fiscal consolidation pace and monetary policy stance in the United States.

Against this background, the Portuguese economy has seen a marked correction in its domestic and external imbalances, in particular a very significant structural fiscal consolidation and an improvement in the external accounts, which resulted in an increase in the net financing capacity of the Portuguese economy and an allocation of resources to sectors that produce tradable goods and services.

Weak growth prospects for the world economy in 2013, despite recent signs of economic recovery in the euro area

The external environment of the Portuguese economy remained unfavourable in 2013, following a slowdown in global economic activity in 2012. The pace of growth has continued to differ across regions, with emerging market economies growing significantly faster than advanced economies (Table 1.1.1). Emerging and developing economies are expected to continue to play a key role in world economic growth. However, these economies have experienced a marked deceleration against an international environment dominated by a slowdown in demand in advanced economies, a drop in commodity prices and the adoption of measures related to existing risks to financial stability by the authorities. Finally, after the slowdown of the past few years, world trade growth stabilised in 2013. OECD projections point to 3.0 per cent growth in the volume of world trade in goods and services in 2013. However, world trade is expected to continue to grow at a pace considerably below that of the period before the international financial crisis.

According to the OECD's projections, GDP is also expected to grow by 1.2 per cent in advanced economies as a whole in 2013, in contrast with the United States and Japan, which are expected to continue to grow moderately, and the euro area, where GDP is projected to contract by 0.4 per cent. Economic conditions in the euro area are also expected to continue to differ considerably across countries. With regard to two of Portugal's main trading partners, GDP is expected to drop in Spain in 2013, while in Germany it is projected to continue to grow at a low rate. However, the euro area has shown signs of a relatively broadly based, albeit still fragile and moderate, economic recovery in the most recent period.

Table 1.1.1

GDP – ANNUAL RATE OF CHANGE | PER CENT

	2011	2012	2013p
World economy	3.7	3.1	2.7
Advanced economies	1.9	1.6	1.2
US	1.8	2.8	1.7
Japan	-0.6	1.9	1.8
Euro area	1.6	-0.6	-0.4
Germany	3.4	0.9	0.5
France	2.0	0.0	0.2
Italy	0.6	-2.6	-1.9
Spain	0.1	-1.6	-1.3
Netherlands	0.9	-1.2	-1.1
United Kingdom	1.1	0.1	1.4
Non-OECD economies	6.3	5.1	4.8
China	9.3	7.7	7.7
Brazil	2.7	0.9	2.5

Source: OECD (*Economic Outlook* no 94, November 2013)

Note: p - projected.

The year-on-year pace of contraction in the Portuguese economy slowed down throughout 2013

Estimates published in the Autumn Economic Bulletin of Banco de Portugal point to a slowdown in the year-on-year contraction in Portuguese economic activity throughout 2013 (Table 1.1.2). More recent data confirm a moderate recovery in the Portuguese economy in the course of 2013.

The smaller fall in economic activity compared with 2012 reflects a gradually smaller decrease in domestic demand and continued favourable evolution of exports. As for domestic demand, private consumption decreased, in line with a decline in real disposable income. This decline is expected to have reflected the impact of fiscal consolidation measures, specifically on direct taxes, and a decrease in labour income, against a background of a sharp drop in employment and ongoing wage moderation. In turn, investment is projected to decrease less sharply than in 2012, with the contraction in 2013 being determined by private investment. These developments take place in a context of continued tight lending standards and ongoing high uncertainty about future economic conditions and demand prospects in domestic and external markets. Residential investment is expected to decrease further, experiencing a more pronounced drop in 2013 than in 2012. The downward trend in residential investment is part of a gradual adjustment of the Portuguese housing stock after a considerable rise in supply in the past. In the current environment, this adjustment is reinforced by cyclical economic developments and a need to reduce household indebtedness levels. Consequently, although evidence points to the absence of a real estate price 'bubble' in Portugal, the risk of additional real estate price corrections cannot be ruled out.

The fiscal policy stance remained restrictive in 2013. The consolidation strategy in 2013 was mainly based on an increase in revenue and in particular in direct taxes.

In 2013 the financing capacity of the Portuguese economy (as measured by the combined current and capital account balance) is expected to increase to around 3 per cent of GDP, largely reflecting developments in the goods and services account. In fact, exports of goods and services have been growing strongly, resulting in considerable market gains, in line with the reorganisation process of the Portuguese corporate sector. One of the most striking aspects of the Portuguese economy's ongoing adjustment process is an increase in its external financing capacity, particularly considering it takes place in a less favourable international environment compared with other crises and with fewer economic policy instruments available, specifically exchange rate policy instruments.

Table 1.1.2

GDP AND MAIN EXPENDITURE COMPONENTS | RATE OF CHANGE, PER CENT

	Weights	Economic Bulletin Autumn 2013		
	2012	2011	2012	2013[p]
GDP	100.0	-1.3	-3.2	-1.6
Private consumption	64.0	-3.3	-5.4	-2.2
Public consumption	20.3	-5.1	-4.8	-2.0
Gross fixed capital formation	16.0	-10.5	-14.3	-8.4
Exports	100.8	-5.1	-6.6	-3.0
Imports	37.2	6.9	3.2	5.8
Domestic demand	38.0	-5.3	-6.6	2.0
Contribution to GDP growth (in p.p.)(a)				
Domestic demand		-5.6	-6.9	-3.1
Net exports		4.4	3.7	1.4
Memo:				
Unemployment rate (% of labour force)		12.7	15.7	17.1(b)
Overall balance of General Government		-4.3	-6.4	-5.9(c)

Sources: ECB, Eurostat, *INE*, 2014 State Budget Report and Banco de Portugal.
Notes: p - projections **(a)** Contributions may not sum to total due to chain-linking and rounding. **(b)** Unemployment rate related to H1 2013. **(c)** According to the 2014 State Budget Report.

Against this background, a considerable and permanent additional effort is needed to conclude and consolidate the adjustment of structural imbalances that have accumulated over the past decades. In this context, uncertainty remains regarding the additional measures to be adopted in the future (whether fiscal or structural) and their impact on economic growth.

Monetary policies remain accommodative with recourse to non-standard measures

2013 has been globally characterised by even more accommodative monetary policies in the absence of both a sustained economic recovery and inflationary pressures (Chart 1.1.1). Although the debate has already started in the United States over a reduction of monetary stimulus, the remaining main central banks worldwide geared their stances towards even more accommodative monetary policies throughout the year, in line with their phase in the economic cycle.

In the United States, the Federal Reserve's stance continues to be geared towards maintaining the federal funds rate at low levels for a long time. However, a gradual reduction of stimulus (specifically a slowdown in the purchase of debt securities) started being debated in May, and continued to be discussed throughout the year, with a significant impact on investor expectations. During the first half of the year, monetary policies became even more accommodative in Japan and the main emerging economies. Nevertheless, these policies were reversed in some of these emerging economies in reaction to capital outflows and currency depreciation, triggered by the debate over a reduction of monetary stimulus in the United States.

In the euro area, the monetary policy stance became even more accommodative throughout 2013. As for the key interest rates, the Governing Council of the European Central Bank (ECB) lowered the interest rate on the main refinancing operations (MROs) by 25 basis points on two occasions: to 0.5 per cent in May and 0.25 per cent in November. In addition, the ECB adopted a new communication strategy on its outlook for interest rates as of July 2013, providing explicit forward guidance,[1] by signalling, for the first

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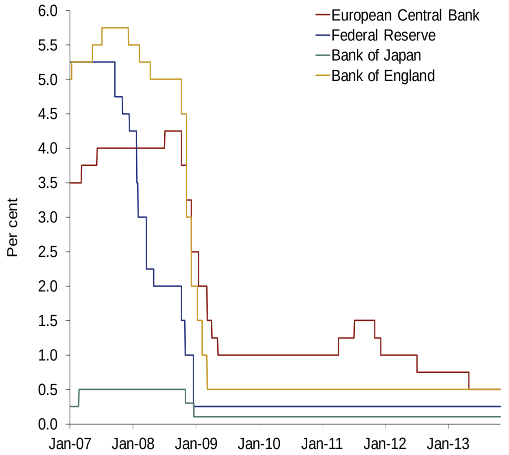
[1] Forward guidance consists of communicating explicit statements on the future stance of monetary policy. This type of communication is adopted to influence economic agents' expectations regarding future policy, in order to increase monetary policy effectiveness. Other monetary authorities are currently also providing forward guidance, such as the Bank of England and the Federal Reserve.

Chart 1.1.1

CENTRAL BANKS RATES



Source: Bloomberg.

time, that interest rates were expected to remain at low levels for an extended period of time. In its most recent meeting in November, the ECB also decided to continue conducting its MROs as fixed rate tender procedures with full allotment at least until July 2015.

In spite of the measures adopted by the ECB, financial market fragmentation has continued, weakening the transmission of monetary policy to euro area economies. In particular, although financing conditions have become less dispersed, there are still significant disparities between high-rated countries and stressed countries.[2] In addition, substantial differences remain in terms of euro area sovereign debt yields. Similarly, interest rates on bank loans and corporate financing costs are considerably higher in stressed countries. This divergence partly reflects different economic developments, leading to a decline in the creditworthiness of borrowers.

Against this background, developments in international capital markets were conditioned by developments in investor perceptions about the monetary policy stance of main economies throughout 2013. In effect, as the United States are debating when to gradually start withdrawing monetary stimulus, other monetary authorities, in particular European authorities, have signalled the possibility of adopting more accommodative monetary policies. In the case of Portugal, developments in sovereign debt yields were also conditioned by domestic institutional tensions.

Investor confidence in financial markets improved up to May 2013

During the first half of 2013, financial markets benefited from a general improvement in economic agents' confidence and continued very favourable monetary conditions, reflected in particular in strong gains and a decrease in equity market volatility, particularly in the United States and Japan (Charts 1.1.2 and 1.1.3). Political uncertainty surrounding the Italian elections earlier this year and later the banking crisis in Cyprus had a relatively limited impact on equity and fixed income markets (Charts 1.1.2, 1.1.3 and 1.1.4).

Risk perception improved regarding a number of fixed income markets, resulting in a decrease in the probability of default implied in the price of Credit Default Swaps (CDS) in stressed sovereign debt markets, which had an impact on interest rate spreads *vis-à-vis* German debt (Charts 1.1.5 and 1.1.6).

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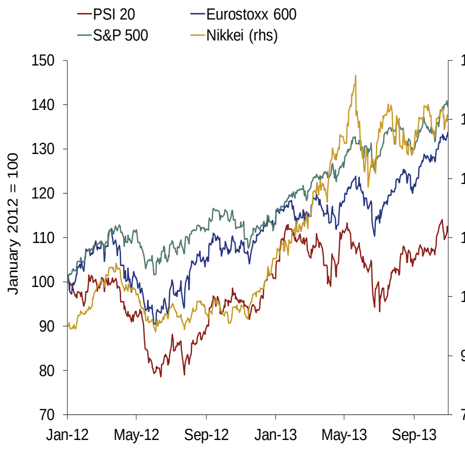
[2] Germany, France, the Netherlands, Finland, Austria and Belgium are considered high-rated countries. Spain, Italy, Portugal, Ireland and Greece are considered stressed countries.

Chart 1.1.2

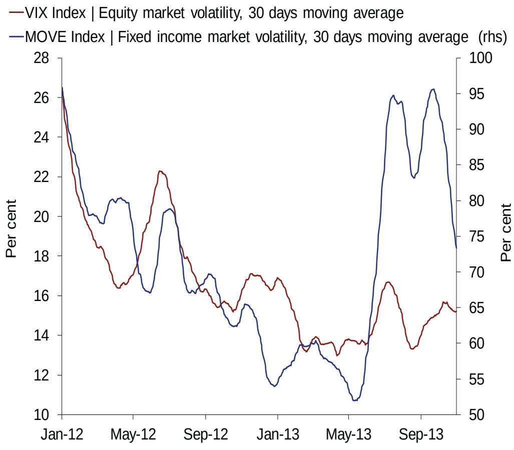
STOCK MARKET INDICES



Source: Bloomberg.

Chart 1.1.3

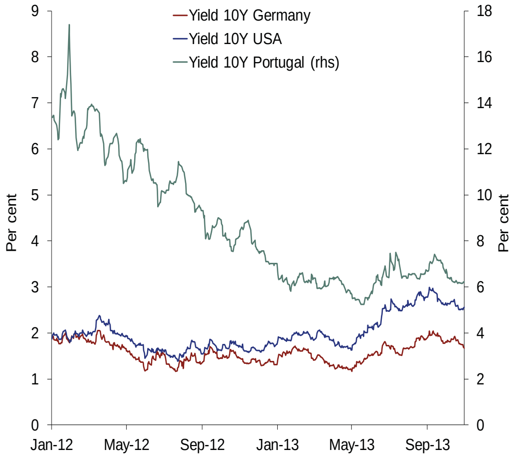
EQUITY AND FIXED INCOME IMPLIED VOLATILITY



Source: Bloomberg.

Chart 1.1.4

SOVEREIGN DEBT 10 YEAR YIELDS



Source: Bloomberg.

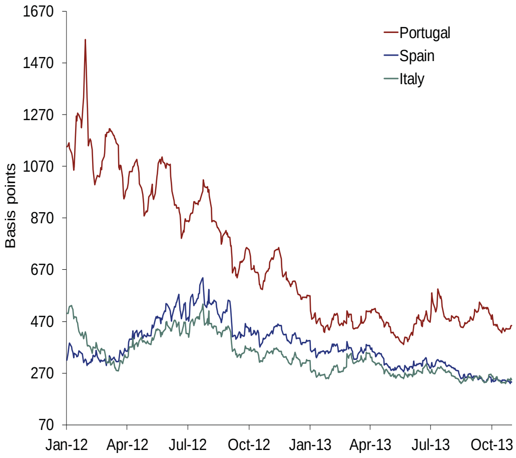
On the domestic side, the start of the year was also characterised by a relative stabilisation of perceived country risk (Chart 1.1.7), followed by a decrease in the risk premium as measured by CDS on Portuguese sovereign debt. Similarly to other stressed countries, Portugal benefited from this improvement, issuing long-term sovereign debt securities in international markets (5 and 10-year syndicated issuances, in January and May respectively).

Increased instability in financial markets during the summer, associated with investor uncertainty about a possible reduction of monetary stimulus in the United States and increased political risk in some countries

From May, expectations that the Federal Reserve might start to reduced its asset purchases in 2013 led to an increase in government debt yields in the US market (which was only interrupted by the Federal

Chart 1.1.5

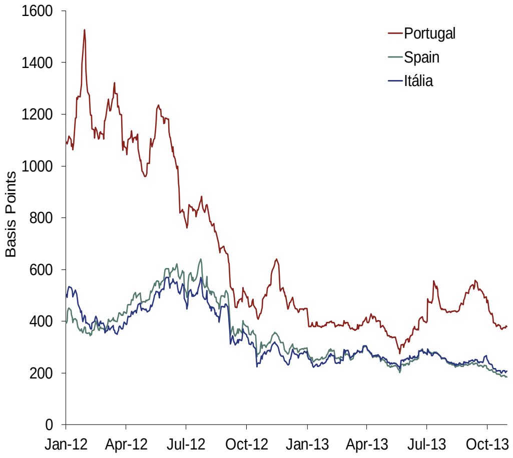
10 YEAR SOVEREIGN BONDS YIELDS | SPREADS *VIS-À-VIS* GERMANY



Source: Bloomberg.

Chart 1.1.6

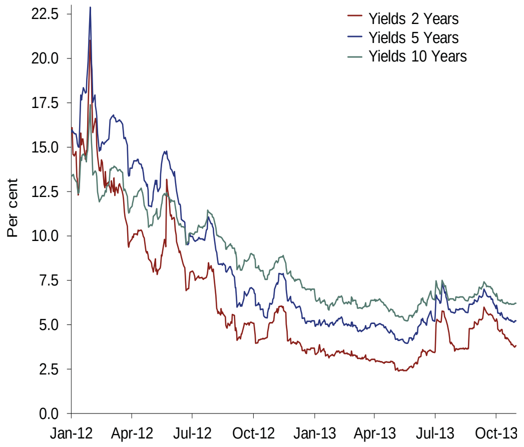
CREDIT DEFAULT SWAPS | 5 YEARS SPREADS ON SOVEREIGN ISSUERS



Source: Bloomberg.

Chart 1.1.7

PORTUGAL SOVEREIGN DEBT YIELDS



Source: Bloomberg.

Reserve's decision at its 18 September meeting to postpone tapering of asset purchases). In emerging markets, capital flows reversed to destinations perceived as safer, which led to sharp declines in asset prices and currency depreciation.

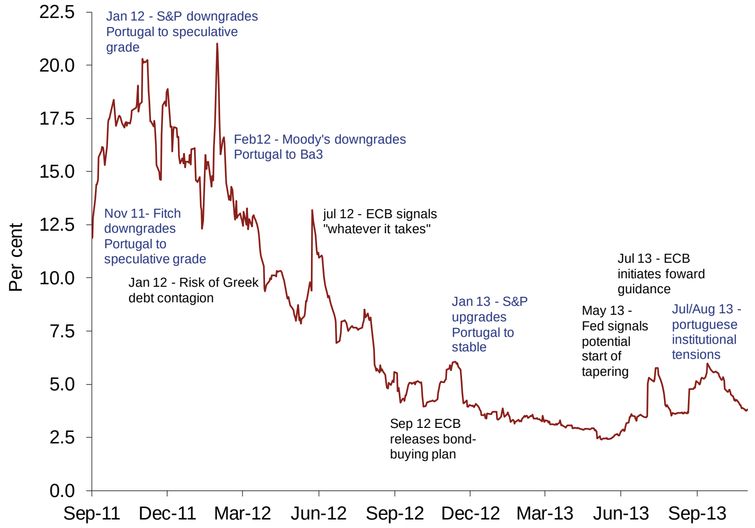
Increases in long-term yields spread to the German bond market, although there were no expectations in Europe of a change in the accommodative monetary policy stance or any macroeconomic support to that effect. The increase in German yields was interrupted in July, following the ECB's announcement of forward guidance, with yields decreasing overall in stressed European markets.

In light of these developments, main equity market indices fell from mid-May to end-June, increasing again since then, although occasionally conditioned by a bout of volatility (specifically associated with geopolitical issues and the political stalemate over the debt ceiling in the United States).

In Portugal, the risk premium was negatively affected by increased market uncertainty derived from domestic institutional tensions, rekindling the debate among investors over the transition process to regain full access to market financing (Chart 1.1.8).

Chart 1.1.8

PORTUGAL 2 YEAR YIELDS



Source: Bloomberg.

In autumn, expected tapering in the United States was postponed and the ECB lowered its interest rate

Following the Federal Reserve meeting of 18 September, which signalled the postponement of tapering of asset purchases, bond market yields experienced a broadly based decrease. In the euro area, the yield spread of stressed countries continued to narrow *vis-à-vis* German yields. These developments are expected to have reflected an improvement in economic growth prospects for these countries, which supported a yield search behaviour. Likewise, expectations of a more accommodative policy stance by the ECB – and its confirmation at the meeting on 7 November – have strengthened the market's buoyancy. This had a positive effect on Portuguese government debt yields, which have experienced a correction of the increases observed during the summer.

The upward trend seen in the equity market has continued to be broadly based, with several equity indices reaching record highs in the United States and Europe. This trend has continued despite peaks of geopolitical tension, political uncertainty and economic prospects.

Constrained access by Portuguese issuers to market funding

Risk premia associated with Portuguese issuers decreased considerably from mid-2012 and in particular the start of 2013, which allowed the issuance of long-term sovereign debt by the Portuguese Republic. However, access to market funding by the Portuguese Republic remains constrained. This situation worsened in recent months following the above-mentioned market reactions to domestic institutional tensions. Therefore, the risk premium on Portuguese sovereign debt still remains above the risk premia of other stressed countries, which have been stabilising. Nevertheless, government debt yields have been following a downward path,albeit gradual and mitigated, since mid-October.

Conditions also remain tight for access by the private sector to market funding. Nevertheless, a number of banks and large non-financial corporations have issued debt at the end of 2012 and in the first half of 2013.

Recent developments in the risk premia on Portuguese debt have been accompanied by developments in the ratings issued by rating agencies. Standard & Poor's placed Portugal on CreditWatch Negative in mid-September, mentioning that increased difficulties implementing austerity measures might jeopardise compliance with the EFAP's objectives and hinder full access to market financing after the programme has ended. At the end of October, Fitch affirmed Portugal's BB+ rating, with a Negative Outlook on Portuguese sovereign debt. At the start of November, Moody's reaffirmed the rating for Portuguese government debt at Ba3, but revised the outlook upwards from 'negative' to 'stable', mentioning, among other factors, the progress made in fiscal consolidation and the improving economic outlook.

1.2 Financial position of non-financial sectors

In the first half of 2013 the process of gradual adjustment of households'[3] balance sheet imbalances continued

In the first six months of 2013 household net lending[4] increased, year on year, standing at 8.5 per cent of disposable income, compared with 5.4 per cent over the same period one year before.[5] This means that the household sector has increasingly provided more funds to the remaining sectors of the economy (Chart 1.2.1).

Developments in household net lending reflected a year-on-year increase in household savings, which continued to peak since the launch of the euro area, both in terms of level and as a percentage of disposable income. In the first half of 2013 the household savings rate amounted to 11.9 per cent of disposable income, compared with 9.2 per cent in the same period of 2012.[6] This increase should reflect a move in households' behaviour to adapt their consumption to a permanent income level below that expected before the crisis. Against a background of high uncertainty, higher savings should also be associated with precautionary reasons.

The composition of disposable income has continued to shift towards a decline in the relative importance of compensations and an increase in the weight of social transfers and net property income (which includes interest received net of interest paid).[7] The increase in the weight of property and capital income was significantly affected by the decrease in interest payable, associated with a decline in money market interest rates since the end of 2011, given that most housing loans (which account for the largest share of household debt) were granted at a floating rate and with low and fixed spreads, which may only be changed by mutual agreement.[8] This is a positive effect of the current accommodative monetary policy, which has been passed through to bank customers. Also the decline in the household debt balance, as a result of the ongoing net repayment, seems to have contributed to a decrease in interest payable.

The increase in household net lending was reflected in the continued net repayment of debt by this sector

Developments in aggregate savings resulted mainly in net repayment of debt by households (Chart 1.2.2). In terms of accumulation of financial assets, Portuguese households should be highly heteroge-

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[3] Households comprise families (including sole traders) and non-profit institutions serving households.

[4] A sector's net lending corresponds to the difference between its gross savings plus net capital transfers and investments made by the sector in real assets.

[5] By comparing year on year, it is possible to cancel out the seasonality effect in some variables. When analysed in annual terms, household net lending, as percentage of disposable income, amounted to 10.3 per cent in the year to June 2013, compared with 8.8 per cent in 2012 as a whole. As a percentage of GDP, household net lending, in the first half of 2013, reached 6.3 per cent, compared with 3.9 per cent over the same period one year before and 7.8 per cent in the year to June 2013 (6.6 per cent in 2012 as a whole).

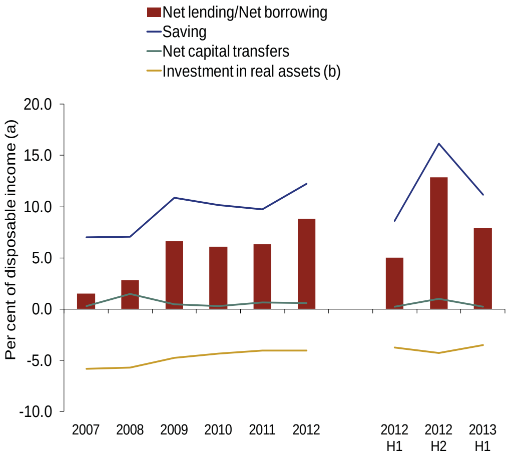
[6] In the year to June 2013, the household savings rate, as a percentage of disposable income, was 13.6 per cent, i.e. higher than 12.2 per cent in 2012. Since 1999 the savings rate, in annual terms, has varied between 5.6 per cent of disposable income (in the first half of 2008) and 13.6 per cent, in the first half of 2013. As a percentage of GDP, household savings , in the first half of 2013, stood at 8.5 per cent, compared with 6.3 per cent in the first six months of 2012 and 10.3 per cent in the year to June 2013 (9.2 per cent in 2012 as a whole).

[7] Compared with the same period in 2012, compensations dropped by 1 percentage point of disposable income in the first half of 2013, to 64 per cent of the total. Social transfers accounted for 28 per cent of disposable income, *i.e.* 1 percentage point higher than one year before, while net property income also increased by 1 percentage point of disposable income, to 12 per cent.

[8] For more information on the level of and developments in mortgage credit market spreads, see Banco de Portugal, *Retail Banking Markets Monitoring Report*, 2012.

Chart 1.2.1

SAVING, INVESTMENT AND NET LENDING OF HOUSEHOLDS

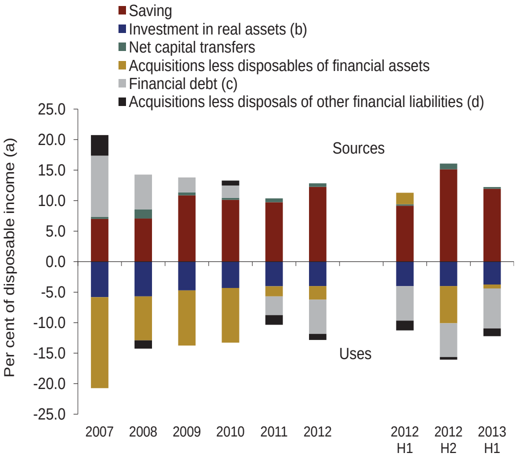


Source: *INE*.

Notes: Semiannual values based on quarterly national accounts. **(a)** Disposable income adjusted for the change in net equity of households on pension funds. **(b)** Corresponds to the sum of gross fixed capital formation, changes in inventories, acquisitions less disposals of valuables and acquisitions less disposals of non-produced non financial assets.

Chart 1.2.2

SOURCES AND USES OF FUNDS BY HOUSEHOLDS



Sources: *INE* and Banco de Portugal.

Notes: Semiannual values based on quarterly national accounts. **(a)** Disposable income adjusted for the change in net equity of households on pension funds. **(b)** Corresponds to the sum of gross fixed capital formation, changes in inventories, acquisitions less disposals of valuables and acquisitions less disposals of non-produced non financial assets. **(c)** Corresponds to the sum of loans and securities other than shares. **(d)** Adjusted for the discrepancy between national non financial accounts' and national financial accounts' net lending.

neous, with a relatively small share of households accumulating financial assets, while other segments face active liquidity constraints. Household investment in real assets, measured as a percentage of disposable income, remained low and broadly unchanged from the same period in 2012.

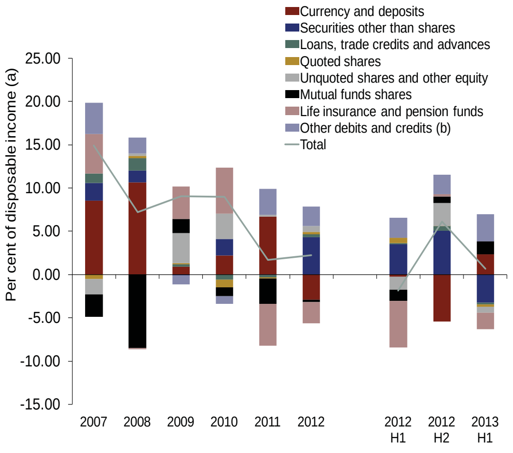
Together with the net repayment of debt, there was a shift in the financial asset portfolio. This shift has taken the form of an increase in deposits (despite the downward path followed by their interest rates) and investment fund units and a decline in the debt securities (mostly issued by financial institutions), capital shares and life insurance portfolio (Chart 1.2.3).

The net repayment of debt by households reflects a drop in loans granted by the resident financial system to this sector, at a pace similar to that seen at the end of 2012 (Chart 1.2.4). Underlying these developments are factors that limit the supply of credit, such as balance sheet constraints, cost of funds and high perceived risk, as well as factors related to a fall in credit demand (for more details on the breakdown of credit growth in terms of the contribution of credit supply and demand, see "Box 1.2.1 *Decomposing credit growth on the basis of the Bank Lending Survey*", in this Report). According to bank lending surveys in Portugal (relating to the five major banks) for the first half of the year, demand for housing loans has continued to decline, albeit less than in previous periods. In turn, demand for consumer credit and other lending seems to have remained virtually unchanged from the last quarter of 2012. According to the responses of the five banks participating in the surveys, factors such as the low consumer confidence, uncertainty about the outlook for the housing market and the level of non-house related consumption expenditure seem to be constraining demand for housing loans. According to the same source, the contraction in durable goods consumption seems to have also contributed to a decline in demand for consumer credit and other lending.

Total household debt stood at 130 per cent of disposable income at the end of June 2013, *i.e.* approximately 3 p.p. below that seen at the end of 2012 and around 14 p.p. below the peak reached

Chart 1.2.3

FINANCIAL ASSETS OF HOUSEHOLDS | TRANSACTIONS

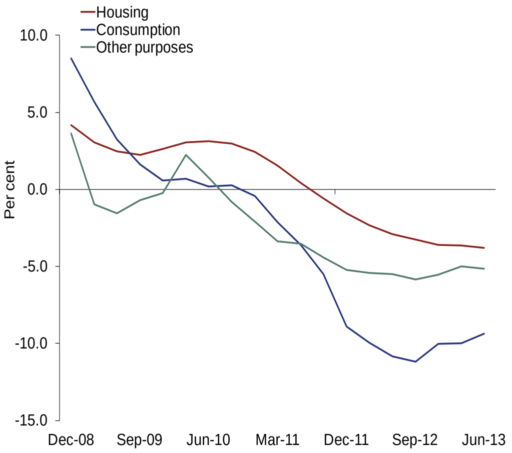


Souces: *INE* and Banco de Portugal.

Notes: Semiannual values based on quarterly national accounts. **(a)** Disposable income adjusted for the change in net equity of households on pension funds. **(b)** Includes other technical insurance reserves and other accounts receivables.

Chart 1.2.4

CREDIT GRANTED TO HOUSEHOLDS BY RESIDENT FINANCIAL SECTOR | ANNUAL RATE OF CHANGE



Source: Banco de Portugal.

in 2009.[9] At the end of June 2013, household financial net worth was 186 per cent of disposable income, which accounted for an increase of approximately 5 p.p. from the end of 2012, chiefly as a result of the net repayment of financial liabilities.[10]

Amid a fall in household disposable income and a high unemployment rate, the default ratio[11] continued to increase in terms of consumer credit and other lending, but remained subdued in terms of housing loans.

Lower household disposable income and a high unemployment rate continued to lead to a significant materialisation of credit risk in bank loans to households for consumption and other purposes, whose non-performing loans ratio has followed an upward path since 2008. In turn, developments in the non-performing housing loans ratio of housing credit were more subdued and remained at modest levels. This was due to the fact that these loans are mostly obtained for the purchase of permanent dwellings, which act as collateral and, therefore, default tends to be lower. Furthermore, according to the Household Finance and Consumption Surveys *(Inquéritos à Situação Financeira das Famílias)*, there is some evidence that Portuguese households with lower income levels, which have a greater default probability, account for a relatively reduced share of the credit market.[12] Also, in line with a decline in money market interest rates, the average mortgage instalment has significantly decreased (although it has gradually slowed down in 2013). Since the first quarter of 2012, new flows of default in loans to households for consumption and other purposes have been on a declining trend. In turn, housing loans have embarked upon a path of relative stabilisation, although with a slight increase in the second quarter of 2013 (Chart 1.2.5).

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[9] As a percentage of GDP, the household indebtedness ratio stood at 98 per cent in June 2013, *i.e.* around 7 p.p. below the peak reached in 2009.

[10] The contribution of the net repayment of financial liabilities to changes in households' financial wealth was almost 4 per cent of disposable income, with value fluctuations of assets contributing around 1 per cent of disposable income.

[11] In this section, the default ratio is defined as total loans overdue for more than 30 days and other non-performing loans expressed as percentage of the outstanding amount of loans adjusted for securitisation. This ratio is calculated on the basis of monetary and financial statistics, compiled by Banco de Portugal.

[12] For more details, see Costa, S., and Farinha, L., "Households' indebtedness; a microeconomic analysis based on the results of the Households' Financial and Consumption Survey", Banco de Portugal, *Financial Stability Report, May 2012*.

With a view to halting the increase in the household default ratio, the regime on prevention and settlement of arrears on credit agreements with household customers, established by Decree-Law No 227/2012 of 25 October 2012, entered into force in early January 2013. This scheme, on the one hand, requires credit institutions to implement procedures allowing for regular monitoring of credit agreements, so as to prevent their customers from entering into arrears (in the scope of the Pre-Arrears Action Plan (PRAP)) and, on the other hand, establishes a negotiation model for out-of--court default resolution (Out-of-court Arrears Settlement Procedure (OASP)).[13] However, this scheme has had a relatively limited impact.

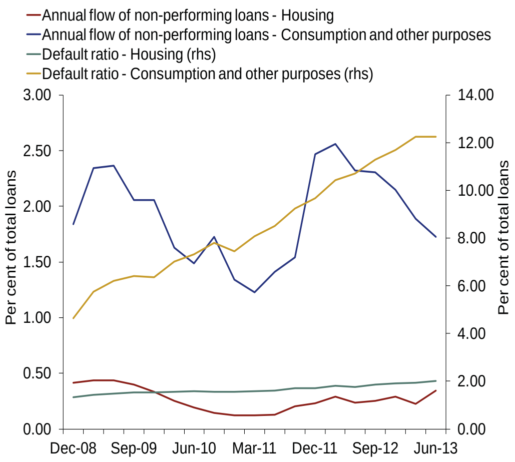
In the first half of 2013, non-financial corporations' net borrowing declined further

Non-financial corporations' net borrowing declined further[14], dropping from 4.2 per cent of GDP in the first half of 2012 to 1.8 per cent of GDP in the first half of 2013, reflecting an increase in saving and a fall in investment (Chart 1.2.6). However, in aggregate terms, the correction of the sector's high indebtedness has overall advanced gradually and orderly. The total debt ratio amounted to 144 per cent of GDP in June 2013, *i.e.* 1 percentage point (p.p.) above the level seen in December 2012. Amid a marked decline in domestic demand, corporate profitability remained low in the first half of 2013.

Developments in non-financial corporations' net borrowing were mostly due to an ongoing recovery in their savings rate, largely due to an increase in gross operating surplus, which received a positive contribution from a fall in compensations. In turn, production continued to decline, in line

Chart 1.2.5

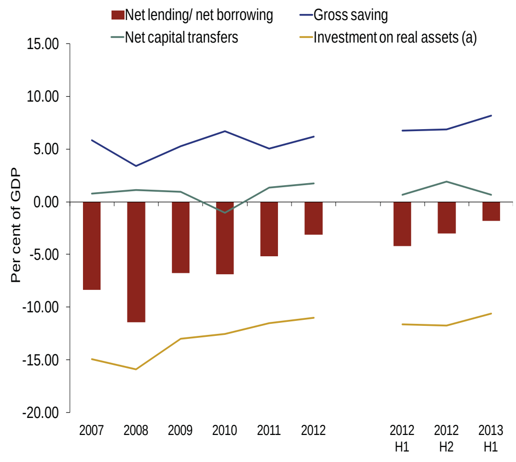
NON-PERFORMING LOANS OF HOUSEHOLDS



Source: Banco de Portugal.

Chart 1.2.6

SAVING, INVESTMENT AND NET BORROWING OF NON-FINANCIAL CORPORATIONS



Source: INE.

Notes: Semiannual values are based on quarterly national accounts. **(a)** It equals the sum of gross fixed capital formation, change in inventories, acquisitions less disposals of valuables and acquisitions less disposals of non-produced non financial assets.

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[13] For a detailed analysis of the implementation of the default general and extraordinary schemes, see Banco de Portugal, Interim report on banking-conduct supervision (Síntese Intercalar de Atividades de Supervisão Comportamental), January through June 2013.

[14] In the year up to June 2013, non-financial corporations' net borrowing stood at 2.4 per cent of GDP, compared with 3.6 per cent in 2012 as a whole.

with a contraction in domestic demand. The decline in distributed income of corporations and the downward path followed by interest rates on loans to non-financial corporations have contributed to more favourable net property income, which also favoured the sector's saving. Nevertheless, the level of interest rates on loans to non-financial corporations remains high, reflecting wide spreads. Available evidence indicates that interest rates differ, inter alia, according to the corporate profile risk, size and maturity of operations as well as bank-specific characteristics (for an in-depth analysis of interest rate spread differentiation, see "Box 1.2.2 *Interest rate dispersion in the corporate lending market*", in this Report).[15]

In a context where non-financial corporate sector profitability has followed an overall declining trend, the interest coverage ratio[16] deteriorated. Nevertheless, this ratio evidenced a turnaround in a number of sectors in the first half of 2013, when, in general, profitability ratios seem to have stabilised as well (Chart 1.2.7).

The non-financial corporate sector's financial leverage remains high, despite the net repayment of debt to the resident financial sector

Overall, financial leverage continues to be substantial across all sectors of activity, although it is particularly high in the case of construction companies. The permanent reduction of corporate indebtedness (*i.e.* the sector's deleveraging) is a pre-requisite for the consolidation of the economic adjustment. This process requires the reduction of corporate debt levels as well a strengthening of own funds, thus fostering a sound capital structure.

In the first half of 2013 net repayment of loans continued, together with an increase in funding through the issuance of debt securities, shares and other equity. Loans from the resident financial sector, in the form of loans or debt securities, have declined further, albeit at a gradually slower pace, which was partly offset by positive contributions of funding from other sectors (Chart 1.2.8). Special mention should be made to the positive contribution from the non-resident sector to changes in total credit to private companies (including loans obtained and securities issued by the sector held by resident and non-resident sectors). In the case of state-owned companies, total credit growth was positive and mostly due to the resident financial sector.

A breakdown of total credit (excluding trade credits) by corporate size shows that lending to large enterprises and holding companies[17] has maintained positive rates (Chart 1.2.9). In the case of companies in other size categories, the rate of change in credit continued to be negative. Developments in credit by corporate size are strongly associated with the weight of the different sectors of activity in the size categories under review. "Construction", "real estate activities" and "wholesale and retail trade" have a much higher weight in lending to smaller enterprises than in lending to large enterprises. The decline in total credit to small and medium-sized enterprises (including micro enterprises) is, therefore, associated with developments in credit to these sectors of activity. Furthermore, increased risk aversion by banks may result in greater preference for loans to large enterprises, which tend to be less risky.

Developments in credit by sector of activity are highly heterogeneous. Total lending (excluding trade credits) to construction, real estate activities and trade declined substantially. In turn, "manufacturing, mining and quarrying", "information and communication" and "transportation and storage"

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[15] For more details, see Santos, C., "Bank interest rates on new loans to non-financial corporations – one first look at a new set of micro data", Banco de Portugal, *Financial Stability Report - May 2013*.

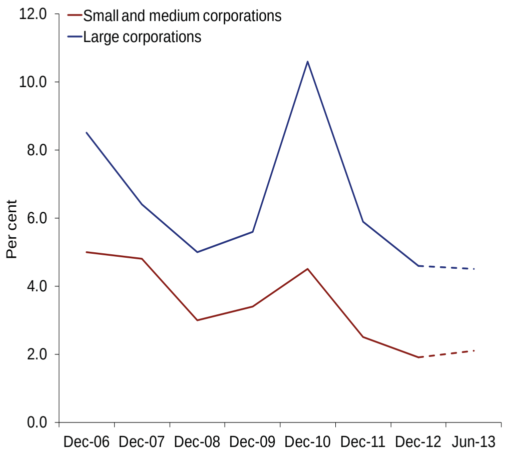
[16] Defined as the number of times non-financial corporations could make interest payments on their debt with their EBITDA.

[17] However, these holding companies borrow funds to redistribute them by other smaller enterprises within their economic groups.

Chart 1.2.7

COVERAGE RATIO AND PROFITABILITY

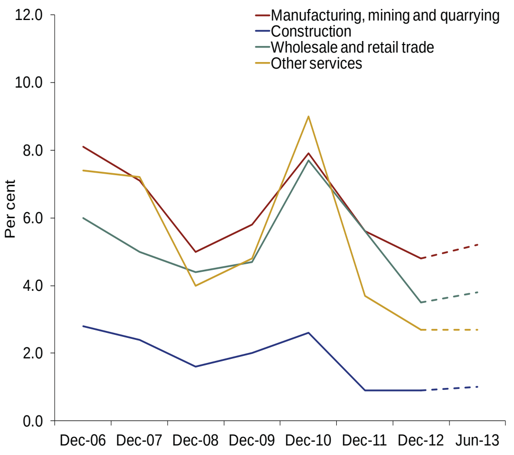
Coverage ratio | Corporation size



Source: Banco de Portugal.

Notes: Coverage ratio = EBITDA/ Interest expenses (# of times) Extrapolated values. Excludes section A of NACE-rev.2: agriculture, forestry and fishing.

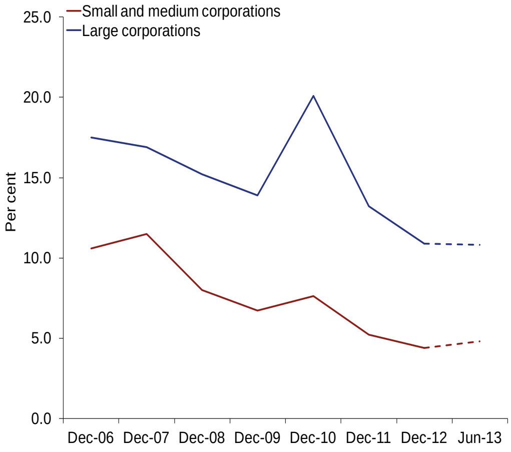
Coverage ratio | Economic activity



Source: Banco de Portugal.

Notes: Coverage ratio = EBITDA/ interest expenses (# of times). Extrapolated values. Other services includes information and communication activities and excludes agriculture, forestry, fishing, electricity, gas and water, transportation and storage and holdings.

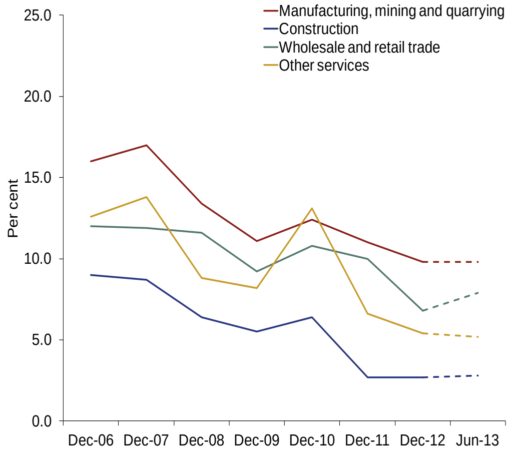
Profitability ratio | Corporation size



Source: Banco de Portugal.

Notes: Profitability ratio = EBITDA/ (equity + obtained funding). Extrapolated values. Excludes section A of NACE-rev.2: agriculture, forestry and fishing.

Profitability ratio | Economic activity



Source: Banco de Portugal.

Notes: Coverage ratio = EBITDA/ interest expenses (# of times). Extrapolated values. Other services includes information and communication activities and excludes agriculture, forestry, fishing, electricity, gas and water, transportation and storage and holdings.

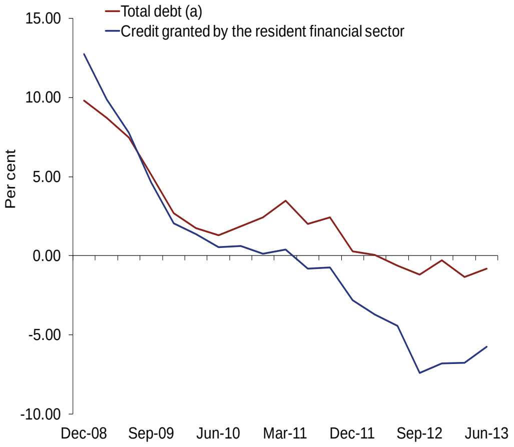
posted positive rates of change (Chart 1.2.10). These divergent developments among sectors suggest that changes in credit portfolios may be in line with the necessary reallocation of resources across the economy.

The default ratio of non-financial corporations widened in the first half of the year, reaching a peak since the launch of the euro area

The non-performing loans ratio continued to follow an upward path, reaching peaks since the launch of the euro area. At the end of the first half of 2013, around 30 per cent of financially indebted

Chart 1.2.8

CREDIT GRANTED TO NON-FINANCIAL CORPORATIONS | ANNUAL RATE OF CHANGE

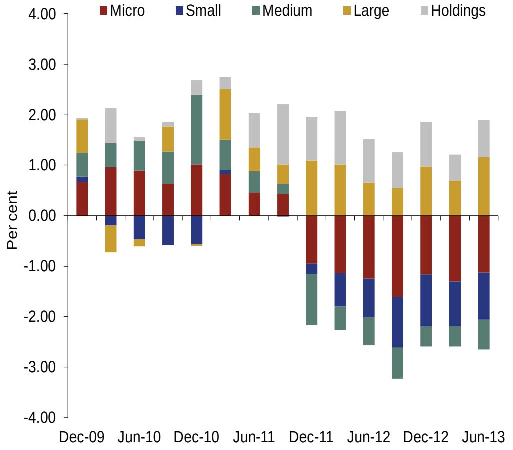


Source: Banco de Portugal.

Note: (a) Does not include trade credits.

Chart 1.2.9

CREDIT GRANTED TO NON-FINANCIAL CORPORATIONS | CONTRIBUTIONS TO TOTAL CHANGE, BY CORPORATION SIZE



Source: Banco de Portugal.

Notes: It considers the complete set of credits granted to the non-financial sector by the resident and non-resident financial sector. The sum of the individual contributions may differ from the total credit's granted annual rate of change due to the non-allocation of some credits.

companies had defaulted. This ratio has deteriorated significantly since the onset of the financial crisis, when it stood at around 15 per cent. In terms of credit amount, in July 2013 it accounted for approximately 12 per cent of total loans granted by the resident financial sector to non-financial corporations. The deteriorating default ratio of non-financial corporations is in line with developments in GDP, a variable which, inter alia, limits the probability of non-financial corporate default. In turn, the annual flow of new non-performing loans has followed a downward path since the end of 2012 (Chart 1.2.11).

The non-performing loans ratio increased across most sectors of activity (Chart 1.2.12). However, construction, real estate activities and trade made the greatest contributions to the increase in total non-performing loans to non-financial corporations. Construction was particularly noteworthy, with the highest indebtedness level, typically higher financing costs and lower-than-average profitability rate and, consequently, increased financial vulnerabilities.

The number of dissolved companies in the first half of 2013 decreased by around 14 per cent from the same period in the previous year. Over the same period, the number of companies incorporated rose by 20 per cent.[18] In both cases, companies are mostly part of the services sector.

In the first half of 2013 general government net borrowing declined compared with the same period one year ago

General government net borrowing amounted to 7.1 per cent of GDP in the first half of 2013, stan-

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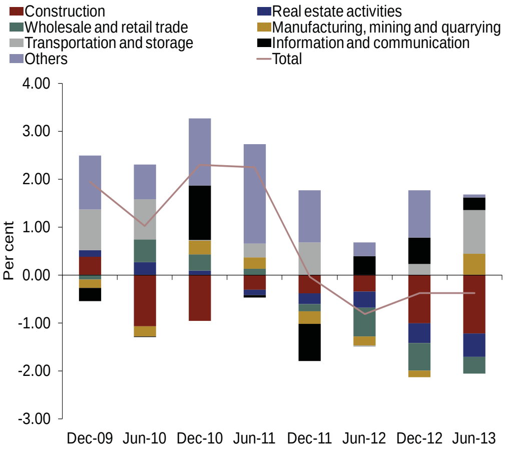
[18] According to data released in the Statistics Portugal's Monthly Statistical Bulletin. The number of dissolved companies in the first half of 2013 was 8,149, with a EUR 1,394 million capital share. The number of companies incorporated during the same period amounted to 19,211, with a EUR 511 million capital share.

Chart 1.2.10

CREDIT GRANTED TO NON-FINANCIAL CORPORATIONS | CONTRIBUTIONS TO CREDIT'S GRANTED ANNUAL RATE OF CHANGE, BY ECONOMIC ACTIVITY

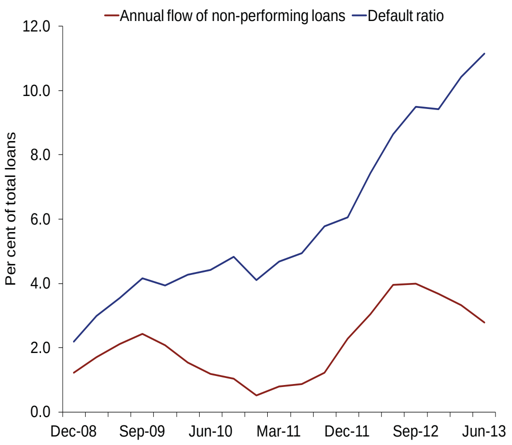


Source: Banco de Portugal.

Notes: It considers the credit granted to the non-financial sector by the resident and non-resident financial sector. The sum of the individual contributions may differ from the total credit's granted annual rate of change due to the non-allocation of some credits.

Chart 1.2.11

NON-PERFORMING LOANS OF NON-FINANCIAL CORPORATIONS

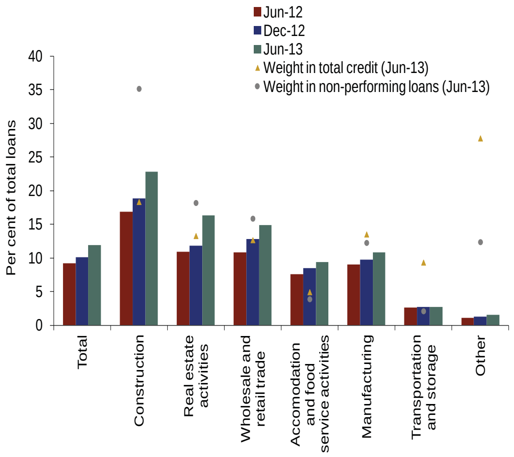


Source: Banco de Portugal.

ding at 6.2 per cent of GDP excluding the effect of BANIF's recapitalisation.[19] This improvement from the same period in 2012 (7.8 per cent of GDP) chiefly resulted from an increase in revenue due to direct taxes, which more than offset a decline in indirect taxation revenue. Other current revenue, related to dividends, interest and European Social Fund transfers, also made positive contributions. In total, revenue grew by 3.1 per cent. Primary expenditure increased 1.0 per cent, while interest expenditure remained virtually unchanged. For the year as a whole, the adjustment pattern should remain unchanged from the first half of the year, *i.e.* by focusing solely on developments in revenue, given that structural primary expenditure is expected to increase.[20]

Chart 1.2.12

NON-PERFORMING LOANS OF NON-FINANCIAL CORPORATIONS | ECONOMIC ACTIVITY



Source: Banco de Portugal.

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[19] The negative impact of this operation on the general government balance was EUR 700 million.

[20] For more details, see Banco de Portugal, *Economic Bulletin Autumn 2013*.

The Report on the State Budget for 2014, sent to Parliament on 15 October, has confirmed the target for general government deficit of 4.0 per cent of GDP in 2014, on a national account basis, and revised upwards the estimate for 2013, to 5.9 per cent of GDP. The main fiscal consolidation measures included in the State Budget for 2014 are related to the public expenditure reduction programme, which mainly affects staff costs, retirement costs, social benefits in kind and expenditure on intermediate consumption. On the revenue side, measures will likely have a less significant impact on the deficit. As such, in 2014 the primary structural balance is expected to improve further, which would lead the fiscal consolidation efforts accumulated in the 2011-2014 period, as measured by this indicator, to approximately 9 percentage points of GDP.

In the first half of 2013, general government net borrowing was fulfilled with recourse to both increased loans in the scope of the Economic and Financial Assistance Programme and the issuance of medium-term debt, chiefly acquired by the resident financial sector and non-residents.

The government debt ratio is expected to increase further in 2013, but this trend should reverse next year

General government debt under the Maastricht treaty[21] amounted to 131.4 per cent of GDP at the end of the first half of the year, standing at 118.4 per cent of GDP excluding central government deposits (Chart 1.2.13). Public debt is estimated to reach 127.8 per cent of GDP at the end of 2013, compared with 124.1 per cent of GDP at the end of 2012. According to the State Budget for 2014, the government debt ratio is expected to narrow in 2014, standing at 126.7 per cent at the end of the year.

Over the past few years, the increase in public debt has been largely accommodated by the resident financial sector, whose exposure to sovereign debt is high. The non-resident sector also continues to be a major holder of general government debt, although since 2011 the weight of funds received in the scope of the Economic and Financial Assistance Programme has accounted for an increasing share of this debt. By June 2013 it had already reached 31 per cent of consolidated debt stock.[22]

Over the past few years, public debt levels have reflected a number of factors: first, the dynamics of debt associated with primary deficits, on a national account basis;[23] second, the differential between the nominal implicit interest rate on government debt and the nominal growth rate of GDP which is positive; third, the factors associated with the deficit-debt adjustment, which combines the deficit value with changes in debt and includes, inter alia, financial asset transactions, which affect debt but do not influence the deficit;[24] fourth, the reclassification of state-owned enterprises with the Portuguese National Accounts' benchmark year update to 2006.[25] Several public enterprises were then reclassified within general government, while other entities have been reassessed with a view to their reclassification. The debt of companies included in general government accounted for 15 per cent of GDP at the end of 2012.

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[21] The concept of Maastricht debt is defined in Council Regulation (EC) No 479/2009 of 25 May 2009 on the application of the Protocol on the excessive deficit procedure annexed to the Treaty establishing the European Community. According to it, Maastricht debt includes the nominal value of consolidated gross liabilities. This concept differs from that of debt on a national account basis given that, on the one hand, it does not include financial derivatives, trade credits and other accounts payable and receivable and, on the other hand, it uses different criteria for the valuation of liabilities (nominal value instead of market value). Total gross public debt, on a national account basis, increased to 136.4 per cent of GDP in June 2013 (128.6 per cent at the end of 2012).

[22] For more details, see Box 6.1 "Evolution of residents' Portuguese public debt portfolios", Banco de Portugal, *Financial Stability Report May 2013*.

[23] According to the accrual-based accounting principle, differing from cash-based debt.

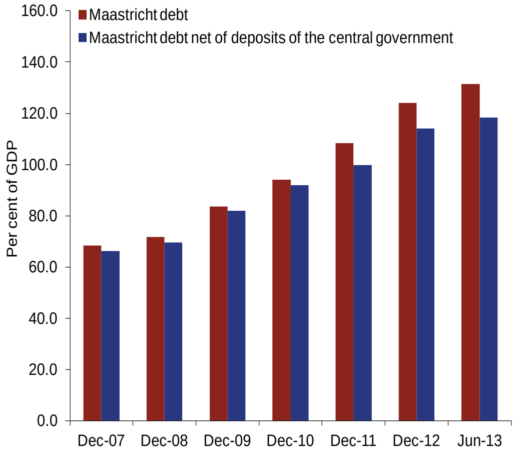
[24] In contrast, transactions in a number of liabilities, such as financial derivatives and other accounts receivable, are not included under debt. The debt value is also affected by exchange rate fluctuations and other effects of changes in volume.

[25] For more details, see the Public Finance Council Opinion No 1/2013.

Finally, over the next few years a substantial share of medium and long-term sovereign debt will need to be refinanced and, as such, access to international financial markets is particularly imperative (Chart 1.2.14). The materialisation of this goal will make it possible to reallocate the banking system's asset portfolios, releasing funds for lending to the private sector, favouring investment and, ultimately, activity growth.

Chart 1.2.13

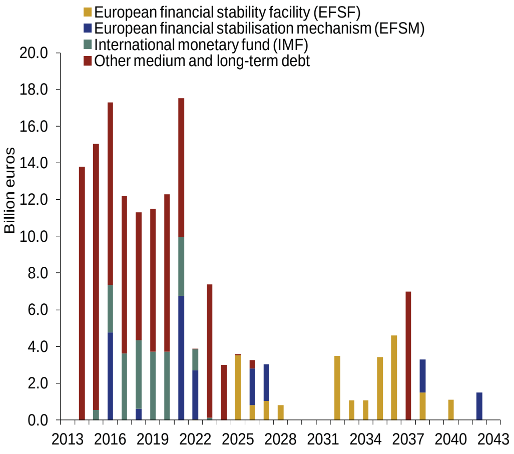
GENERAL GOVERNMENT DEBT



Source: Banco de Portugal.

Chart 1.2.14

ANNUAL REDEMPTION CALENDAR OF MEDIUM AND LONG TERM DEBT



Source: *Instituto de Gestão do Crédito Público*.

Notes: On 21 June 2013, ECOFIN has decided to extend the average maturity of EFSM loans by 7 years. Individual loans approaching maturity might be rolled over more than once. It is therefore not expected that Portugal will have to refinance any of its EFSM loans before 2026.

BOX 1.2.1 | DECOMPOSING CREDIT GROWTH ON THE BASIS OF THE BANK LENDING SURVEY

Weak credit developments are among the factors pointed out as causes for the weak economic growth that continues to characterise many advanced countries in the wake of the 2008 financial crisis. However, identifying the causes underlying these developments is particularly difficult.

The purpose of this box is to decompose credit growth in terms of the contribution of credit supply and demand, *i.e.*, trying to understand whether weak credit growth is due to banks' decisions to tighten loans or to a retraction by households and firms. The methodology follows closely the one presented in the second chapter of the latest IMF's Global Financial Stability Report (GFSR). The time horizon of the analysis spans from the first quarter of 2003 to the first quarter of 2013.

Data are taken from Bank Lending Surveys (BLS) of eight euro area countries.[1] These quarterly surveys to major banks in each country contain questions that try to capture bank officials' opinions on developments in the credit market in the previous quarter. In their responses to the survey, banks must inform whether their credit standards have tightened or loosened in the previous quarter, as well as on their perception regarding developments in demand for credit over the same period. Although responses are qualitative, it is possible to assign them numeric values in order to create a quantitative index. These indices, one for supply and one for demand, may subsequently be used as explanatory variables of credit behaviour.

However, many of the factors that may tighten credit standards do not depend directly on banks' financial condition, but rather on exogenous factors, such as rising uncertainty or a deterioration of the country's economic growth prospects. This is why the supply index should be first "cleansed" of this type of noise, so that an adjusted supply index may be obtained. For this purpose, it is possible to use another series of questions included in the BLS aimed at assessing the contribution of a set of factors to changes in credit standards. These factors may be classified as relating to the bank's position (capital position, liquidity and access to market financing), competition (from banks, markets and other) or the economic environment (growth prospects, uncertainty and collateral risk). Based on these data, it is possible to estimate what the change in credit standards would have been if subject only to changes in the first type of factors.[2] This adjusted supply index, combined with the demand index obtained directly from the survey, is used in this box to explain credit growth.[3]

After obtaining the estimates for the impact of both indices on credit growth, it is possible to obtain a decomposition of contributions from supply and demand, by resorting to a methodology similar to the one used to adjust the supply index for demand effects.[4] In this case, the purpose is to estimate credit growth if it were conditional on changes on one side of the market alone. For this effect, a forecast is made, based on the estimated model, where it is exogenously established that regressors associated with the market side that is not intended to be studied are equal to zero.

The results obtained are similar to those presented in the recent IMF's GFSR, using similar methodology and data (Table 1, full panel). For Portugal, in particular, the results show a strong contribution of supply factors to the decline in credit growth, chiefly as of the start of the Financial Assistance Programme.

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[1] Austria, France, Germany, Italy, Luxembourg, Netherlands, Portugal and Spain.

[2] This calculation was based on the estimation of a fixed-effects regression with robust standard deviations.

[3] It would be preferable to also "cleanse" the demand index of exogenous effects such as, for instance, the reluctance of households and firms to apply for loans, because of the anticipation of rejection. The surveys, however, do not include questions that allow this analysis.

[4] This time using an Arellano-Bond regression with robust pattern deviations and a credit-growth variable lagging by one quarter.

Table 1

DETERMINANTS OF CREDIT GROWTH, EURO AREA, CORPORATE LOANS

	Full Panel	Countries under stress Panel	High rated countries Panel
Credit Growth (t-1)	0.535***	0.771***	0.390***
	(0.128)	(0.084)	(0.139)
Σ Demand Index (t-i)	0.029***	0.030***	0.030***
	(0.007)	(0.004)	(0.009)
Σ Supply Index (t-i)	-0.036***	-0.010	-0.041
	(0.007)	(0.009)	(0.028)
Number of Observations	288	108	180

Source: Banco de Portugal calculations.

Notes: The regressions include a lag of the dependent variable and four lags of the Supply and Demand indexes. Arellano and Bond regressions with robust standard errors in parenthesis. The estimation covers the period from 2003Q1 until 2013Q1 and includes Austria, France, Germany, Italy, Luxembourg, Netherlands, Portugal and Spain. ** and *** represent significance at the 5% and 1% levels, respectively.

Around mid-2012, there was a rebound of the supply component, but which has stagnated in the meantime. Demand also saw a sharp decline in 2011, followed by a recovery. However, contrary to the supply component, this recovery persisted until the end of the sample. These results could be interpreted as an indication that credit-stimulating policies in Portugal would be more effective if they were concentrated on the supply side.

Nonetheless, the current market fragmentation within the euro area advises a more in-depth analysis of the results. For this reason, the final model was estimated with a split of the initial sample into countries with high credit rating and countries under stress.[5] The estimates of the different models are shown in table 1.

The results of these new models show some notable differences. For instance, for the panel of countries under stress, the supply index coefficient, albeit still negative, loses significance. The values of the demand indices, in turn, are virtually identical.

Chart 1 shows the decomposition of supply and demand for Portugal and Germany, based on both models. These enable only the evaluation of the relative evolution of each component. For the German case, the new decomposition provides an interpretation that is rather similar to that of the initial model, as regards the relative developments of both components over time. In the Portuguese case, this second decomposition differs substantially from the first. In fact, the contributions from supply and demand are now similar up to the beginning of the Financial Adjustment Programme. From then onwards, it is the demand component, instead of supply, that seems to be chiefly responsible for the decline in credit. It is also important to note the incipient recovery of demand, beginning at the end of 2012.

It is worth noting that the division of the initial panel into two groups of countries reduces significantly the observations for each group, which does not allow to draw such robust conclusions. Nevertheless, the results of this second model point to some heterogeneity within the euro area as regards the relation between demand and supply, on one hand, and credit growth, on the other. This suggests that any potential conclusions on credit market functioning should always consider the fragmentation currently prevailing in the euro area.

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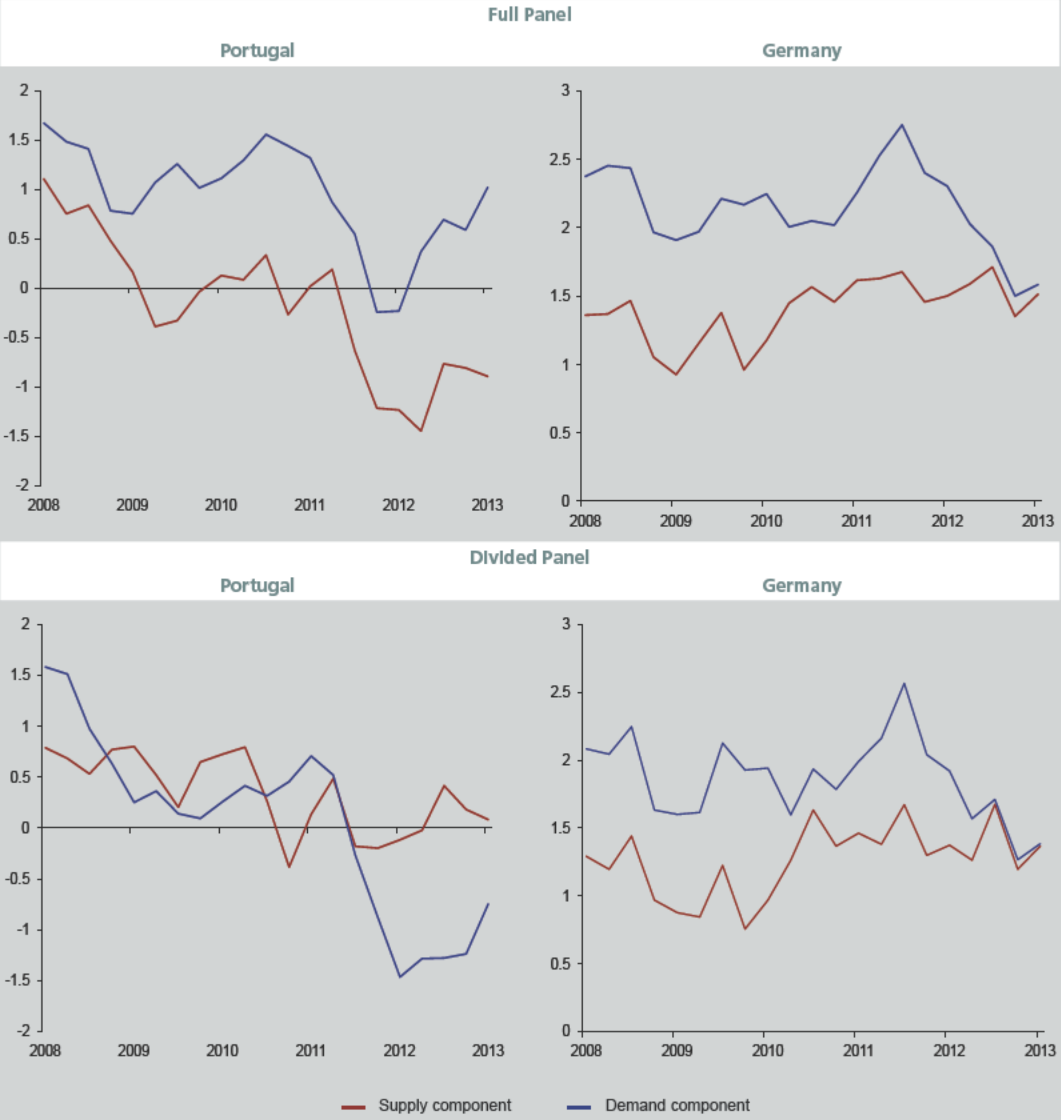
[5] The group of countries under stress includes Portugal, Italy, and Spain.

Chart 1

CREDIT GROWTH DECOMPOSITION – FULL PANEL VS. DIVIDED PANEL



Sources: ECB (Bank Lending Surveys) and Banco de Portugal calculations.

BOX 1.2.2 | INTEREST RATE DISPERSION IN THE CORPORATE LENDING MARKET

Interest rates on bank loans are widely dispersed. At any given moment, this dispersion is chiefly related to both the credit policy followed by each bank and risks underlying operations, particularly credit risk. Santos (2013)[1] identifies a number of firm characteristics that are likely to induce discrimination in interest rate setting, controlling for the loan characteristics. In particular, this article shows that, *ceteris paribus*, larger enterprises and exporting companies obtain loans at significantly lower rates. However, the wide interest rate dispersion on loans to large enterprises or exporting companies suggests that banks' lending policy is very heterogeneous (Chart 1).

This box provides an in-depth analysis of factors explaining interest rate dispersion of new loans to non--financial corporations with a view to isolating the effect of heterogeneity in banks' practices. Results are based on a regression analysis in which the dependent variable is the interest rate, including as explanatory variables several blocks of variables. All models include a dummy variable taking value one for bank i and zero for the remaining banks. The estimated coefficient associated with this variable, which is the focus of the analysis in this box, is the average difference between interest rate applied by bank i and those applied by the remaining banks, controlling for loan and corporate characteristics. More specifically, the analysis is based on the results of the following four models: model (1) that includes only the dummy variable for the bank; model (2) that also includes the loan characteristics (amount, maturity and an indicator of existence (or absence) of collateral, in line with Santos (2013)); model (3) that includes observable characteristics of companies, which are related to their ability to meet their debt commitments in the future (profitability, growth, self-financing capacity, export propensity, size, age and sector of activity) as well as characteristics related to the nature of their credit relationships with the banking system (number of credit relationships, duration of the relationship with the bank and default); finally, model (4) that was estimated with fixed effects at corporate level, which means that non-observable, firm-specific and time-invariant characteristics are also controlled *(e.g.* quality management).

Data used in this study are based on information compiled in the scope of monetary and financial statistics regarding interest rates on new loans to non-financial-corporations between June 2012 and June 2013 (which corresponds to over 500 000 observations).[2] In the regression analysis, only data on loans to resident private companies are taken into account.

Models (1) to (4) were repeatedly estimated, varying only the dummy related to the bank. Therefore, a series with the coefficients associated with that dummy variable was obtained for each model, *i.e.* a series for interest rate differentials of each bank *vis-à-vis* the average. The empirical distribution of the series obtained with each model is shown in Chart 2. The distribution of differentials obtained with model (1) shows the marked dispersion of interest rates applied by banks to loans to non-financial corporations in the period under review. Results presented also show that dispersion is successively reduced when loan (model (2)) and corporate (models (3) and (4)) characteristics are controlled. The more substantial change in distribution is in model (4), where the effect of corporate non-observable characteristics is controlled (fixed effects model).

The marked dispersion in the distribution of banks' interest rate differentials, even when loan and corporate characteristics are controlled, may be partly due to the fact that banks, from the onset, select customers with different risk profiles. With a view to controlling this selection effect on banks' interest

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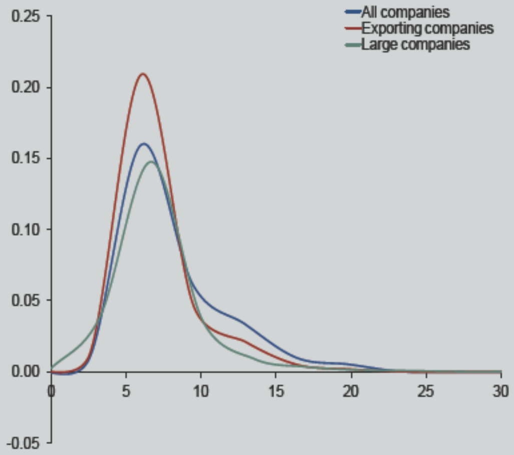
[1] See Santos, C. (2013), "Bank interest rates on new loans to non-financial corporations – one first look at a new set of micro data", Banco de Portugal, *Financial Stability Report - May 2013*.

[2] This includes loans granted by banks that, on a monthly basis, have granted new loans to the amount of at least EUR 50 million. The concept of new credit operation excludes operations associated with loan restructuring and debt consolidation when there is a default.

Chart 1

DISTRIBUTION OF INTEREST RATES ON NEW LOANS TO NON-FINANCIAL CORPORATIONS | SPREADS *VIS-À-VIS* 3 MONTH EURIBOR



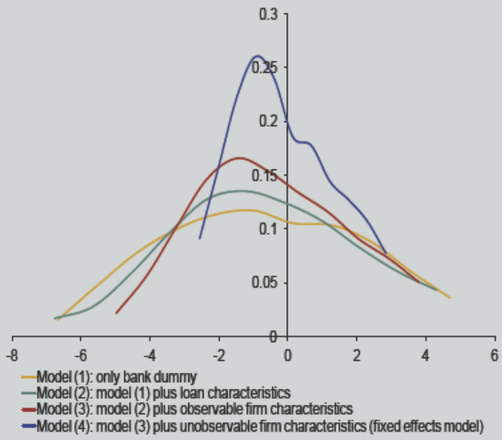
Source: Banco de Portugal.

rate differentials, models (1) to (4) were also estimated by limiting the sample to loans granted to firms that, in the period under review, borrowed simultaneously from bank *i* and any other bank. The empirical distribution of the series for estimated interest rate differentials obtained in this case is shown in Chart 3. As expected, the dispersion of differentials is lower from the outset, which indicates that there is, in fact, a selection effect. Furthermore, in this case, the contribution of observable corporate characteristics to a reduction in the dispersion of banks' interest rate differentials is more marked than in the case where loans to all firms were included, where the contribution of non-observable characteristics was less significant.

Summing up, data on new corporate loans between June 2012 and June 2013 show a high dispersion between interest rates applied by different banks. The analysis of contributions of the various types of factors to this dispersion indicates that there is a selection effect, *i.e.*, the distribution of the corporate risk profile varies across banks, with some banks focusing more on "higher quality" companies in terms of the

Chart 2

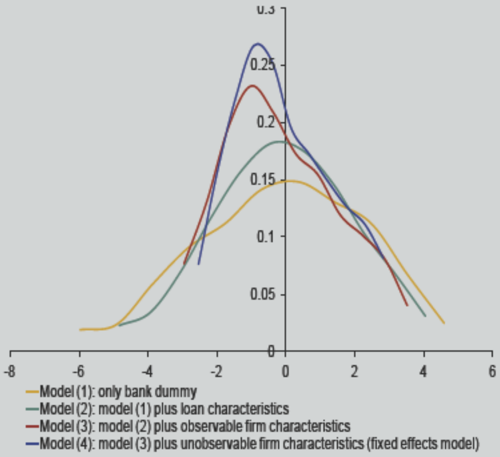
DISTRIBUTION OF BANKS' INTEREST RATE DIFFERENTIALS | LOANS GRANTED TO ALL FIRMS



Source: Banco de Portugal.

Chart 3

DISTRIBUTION OF BANKS' INTEREST RATE DIFFERENTIALS | LOANS GRANTED TO FIRMS THAT BORROWED FROM BANK *i* AND ANY OTHER BANK



Source: Banco de Portugal.

observable and non-observable characteristics, which determine credit risk. By controlling this selection effect, interest rate dispersion declines when the effect of loan and (mainly) corporate characteristics is controlled. However, even if these factors are controlled, interest rates applied by the various banks continue to be significantly dispersed, which, in part, may be due to the fact that variables associated with debtor risk explicitly included in the models are not enough to control risk in prospective terms as perceived by banks. Furthermore, this dispersion should be related to the fact that banks obtain their funding at different costs, which is shown, for instance, by their different return on deposits. Finally, it should be noted that these results seem to be in line with literature that states the importance of effects related to the existence of information costs, which explains the persistence of price differentials, even in the case of homogeneous products and in competitive markets.[3]

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[3] See, for instance, Martín, Saurina and Salas (2005), "Interest rate dispersion in deposit and loan markets", Banco de España, *Working Paper No 0506*.

1.3 Financial sector assets, liabilities and prudential situation

1.3.1 Banking sector[26]

In the context of banks' balance sheets deleveraging, the quality of credit portfolio continues to deteriorate

In the first half of 2013 the banking system's activity continued to be quite restrained by the external macroeconomic and financial environment as well as by the Portuguese economy's structural adjustment process, which implies broadly based cross-cutting deleveraging, affecting all agents and activity sectors. Hence, the contraction of banking business in comparison with the pre-crisis period is understandable (Chart 1.3.1.1).

In the half-year under review, the maintenance of the downward trend of the Loan-to deposits ratio[27] was associated with a decline in credit and with a positive albeit moderate development in domestic customer resources.

The decline in bank assets in the first half of 2013 was essentially explained by a 4.6 per cent contraction in (net) credit to customers, this item accounting for around 59 per cent of assets at the end of the period. This trend in credit is a consequence from redemptions of the loan portfolio and from the end of operations in Greece by one of the major Portuguese banking groups.

The decline in credit granted to resident customers was broadly based across non-financial corporations and households, and especially marked for loans to households for consumption and other purposes (Chart 1.3.1.2). It should be noted, however, that credit granted to non-financial corporations accelerated somewhat in the first half of the year.

Credit quality continued to deteriorate, as measured by a rise in the credit at risk ratio, which stood at aggregate values close to 11 per cent of credit granted.[28] The change in this ratio in the half-year under analysis was simultaneously due to a rise in the volume of credit at risk (3.5 per cent) and the above-mentioned decline in credit granted. The rise in the credit at risk ratio was associated with activities with residents, and although it was broadly based across the different segments, it was particularly significant in credit to non-financial corporations. With regard to activities with non-residents, the ratio decline was associated with the already mentioned end of operations in Greece.

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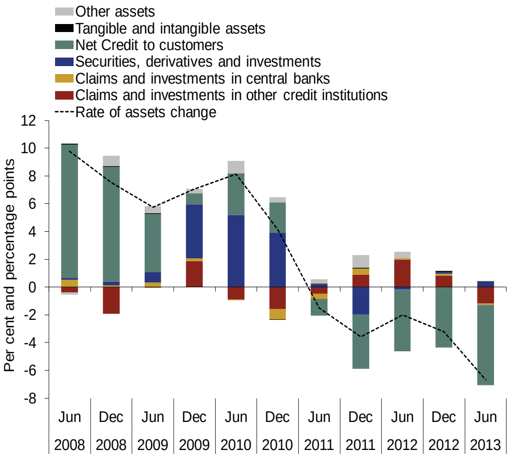
[26] The concept of banking sector, as well as of the remaining financial sectors considered in this section, is defined in "Box 1.3.1 *Portuguese financial system: from the statistical classification to the prudential approach*", in this Report.

[27] The loan-to-deposits ratio corresponds to the ratio of the credit value net of provisions/impairment on credit (including securitised and non-derecognised credit) to the value of customer resources and other loans, referring to the same period.

[28] The concept of credit at risk was initially defined by Banco de Portugal in Instruction No 22/2011, and was amended on a later date by Instruction No 24/2012, with a view to incorporating data on restructured credit by segment. Credit at risk correspond to the following elements as a whole: (a) Total amount of outstanding loans with principal installments or interest overdue for a period of 90 days and over. Non-contracted current account claims should be considered as credit at risk 90 days after an overdraft is recorded; (b) Total amount of outstanding restructured loans not covered by the preceding sub-paragraph, whose installment or interest payments, overdue for a period of 90 days and over, have been capitalised, refinanced or their payment date delayed, without an adequate reinforcement of collateral (this should be sufficient to cover the total amount of outstanding principal and interest) or the interest and other overdue expenses that have been fully paid by the debtor; (c) Total amount of credit with principal installments or interest overdue for at least 90 days, but on which there is evidence to warrant classification as credit at risk, notably a debtor's bankruptcy or winding-up. In case of debtor's insolvency, recoverable balances may cease to be considered as non-performing following approval by a court of the respective agreement under the Insolvency and Corporate Recovery Code, should there be no persisting doubts as to whether the outstanding amounts can be effectively collected. Finally, in this new credit at risk ratio no deduction is performed stemming from the existence of collateral. Hence, the ratio is among the most conservative at European level.

Chart 1.3.1.1

CONTRIBUTIONS TO ANNUAL CHANGE OF ASSETS | ON A CONSOLIDATED BASIS

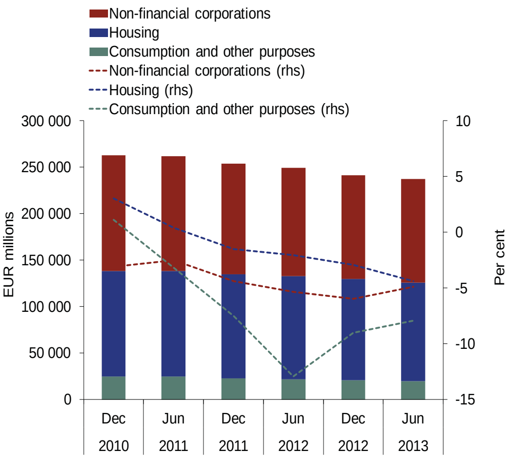


Source: Banco de Portugal.

Note: Securities, derivatives and investments include financial assets at fair value through profit or loss, available for sale financial assets, investmentes held to maturity, investments in subsidiaries and hedge derivatives.

Chart 1.3.1.2

CREDIT EVOLUTION – NON FINANCIAL PRIVATE SECTOR



Source: Banco de Portugal.

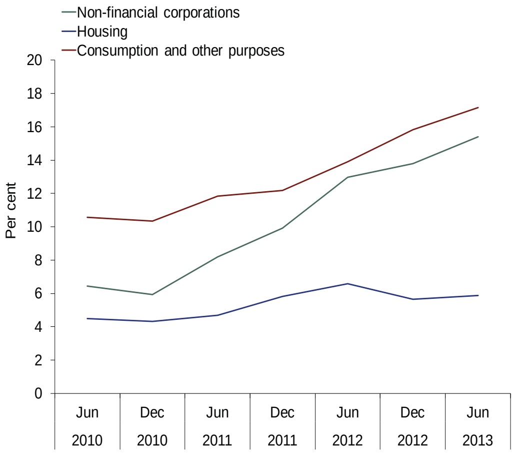
Note: According to Instruction nº22/2011.

By credit segment in domestic activity, loans to non-financial corporations and to households for consumption and other purposes continued to record the highest risk levels, reaching credit at risk ratios of 15 per cent and 17 per cent respectively (Chart 1.3.1.3). By contrast, the credit at risk ratio in the segment of loans to households for housing remained at contained and stable levels, at around 6 per cent.

Despite a rise in the credit at risk ratio, the corresponding coverage ratios[29] per segment remained relatively stable (Chart 1.3.1.4), reflecting an effort to maintain provisioning levels. In aggregate terms, the credit at risk coverage ratio stood at 54 per cent at the end of the half-year (a level similar to that observed in December 2012).

Chart 1.3.1.3

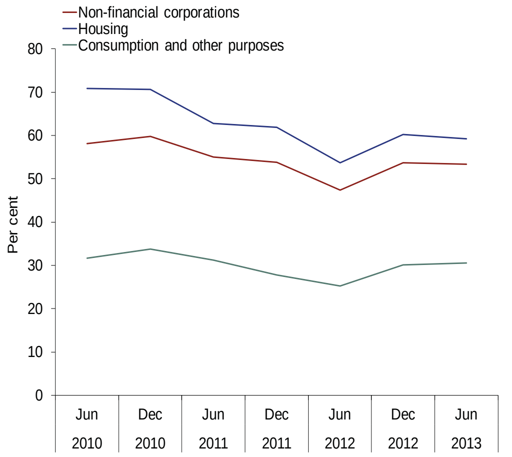
CREDIT AT RISK RATIO BY SEGMENT



Source: Banco de Portugal.
Note: According to Instruction nº22/2011.

Chart 1.3.1.4

CREDIT AT RISK COVERAGE RATIO BY SEGMENT



Source: Banco de Portugal.
Note: According to Instruction nº22/2011.

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[29] The coverage ratio corresponds to the ratio of the value of accumulated provisions/impairment on credit to the value of non-performing loans (gross), referring to the same period, according to data reported within the scope of Instruction of Banco de Portugal No 22/2011.

In June 2013 the system's securities portfolio increased by 3.1 per cent year on year, which was largely accounted for by developments in debt instruments (Chart 1.3.1.5). More specifically, the Portuguese public debt portfolio increased, in line with the most recent years. In the half-year under review this trend seems to have also benefited from a further reduction of the Portuguese public debt yields, accompanied by a rise in the average maturity of such debt.

In June 2013 the Portuguese public debt securities portfolio accounted for around 37 per cent of the securities portfolio. The equity capital component remained relatively stable compared with preceding periods (accounting for 6 per cent of securities in portfolio).

Overall, securitised and non-securitised exposure to Portuguese general government accounted for around 8 per cent of the system's total assets.[30] Exposure to this sector increased by 7 per cent in the half-year under review, and the rise in Portuguese public debt securities surpassed the decline in credit granted to the public sector. This behaviour was broadly based across the major Portuguese banking groups, with securitised debt accounting for around 80 per cent of total exposure to Portuguese general government.

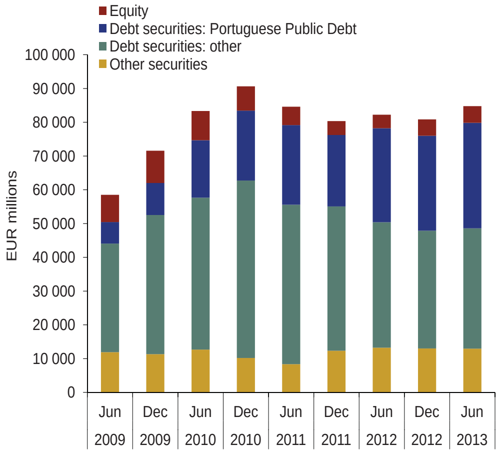
Reinforcement of deposits in the banks' funding structure and positive developments in liquidity gaps

The banking system's funding sources continued to be adjusted, aiming at a funding structure that is more sustainable and less sensitive to changes in international investors' risk perception. Deposits' growth has been playing a key role in this adjustment process, reflecting banking customers' confidence in the robustness of Portuguese banks (Chart 1.3.1.6). The contraction in the Portuguese banking system's assets was accompanied by a reduction of the importance of resources obtained through debt issuance, reflecting also difficulties in obtaining funding in international financial markets.

At the end of the first half of 2013 deposits reached 52 per cent of total banking funding sources (48 per cent in June 2012), although there was a persisting slowdown in this item. The overall change in deposits in the half-year under review was penalised by a decline in non-domestic activity. This event constituted a one-off effect related with the already mentioned end of an operation abroad. Once controlling for this effect, international activity continued to make a positive contribution to the increase in customer resources.

Chart 1.3.1.5

SECURITIES PORTFOLIO



Source: Banco de Portugal.

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[30] For analysis purposes total credit to general government was considered as reported under Instruction of Banco de Portugal No 22/2011 and Portuguese public debt securities in portfolio.

The rise in deposits collected in Portugal in the first half of 2013 was due to an increase in household deposits.[31] However, this aggregate's evolution may have been affected in the half-year under analysis by the change in the payment dates of holiday and Christmas bonuses by the State (Chart 1.3.1.7).

The banking system's loan-to-deposits ratio stood at 123 per cent in June 2013, accounting for a 5 p.p. decline from December 2012, continuing the downward trend started in June 2010 (when the ratio reached its peak, *i.e.*, 167 per cent). Its evolution had a contribution of -17 p.p. from deposit growth and -27 p.p. from a decline in credit (Chart 1.3.1.8).

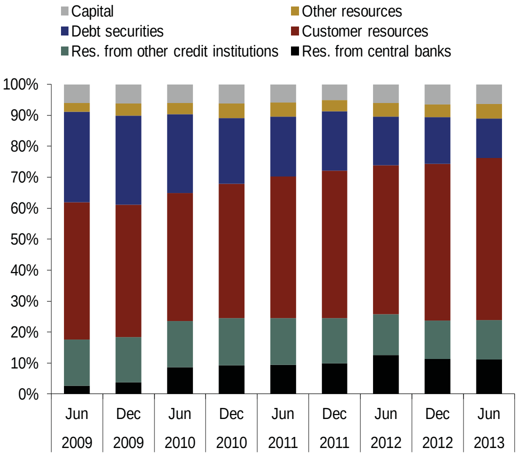
The level of funding obtained by resident counterparties from the Eurosystem expressed in terms of the Portuguese banking system's assets remained relatively stable (at around 9 per cent), similarly to the past few quarters but quite above the Eurosystem's average (around 3 per cent). In fact, throughout 2013 the amount of funding from the Eurosystem remained at close to EUR 50 billion, with longer-term refinancing operations (chiefly with a maturity of 3 years) corresponding to approximately 90 per cent of total funding from the Eurosystem.

The Portuguese banking system's funding structure continues to be quite limited by the segmentation of financial markets and of the interbank market, which restrains diversification of funding sources, notably access to market sources. In the medium term, once the constraints that hamper smooth market functioning are overcome, recourse to funding from the Eurosystem is expected to decline considerably.

In this context, the liquidity position of Portuguese banks (and more generally of euro area banks) has benefited from the ECB's actions, at the level of conventional and non-conventional monetary policy measures. As regards conventional measures, it is worth mentioning the reduction of key interest rates, with the narrowing of the corridor of standing facility interest rates contributing to a decline in money market interest rate volatility. With regard to non-conventional measures, reference should be made to the fixed-rate regime and the complete satisfaction of demand adopted for Eurosystem funding operations, to the conduct of long-term refinancing operations (especially two with a maturity of three years) as well as to measures with an impact on collateral eligibility rules, allowing for an increase in available collateral.[32] Portuguese banks could thus significantly raise their collateral pools with the Eurosystem,

Chart 1.3.1.6

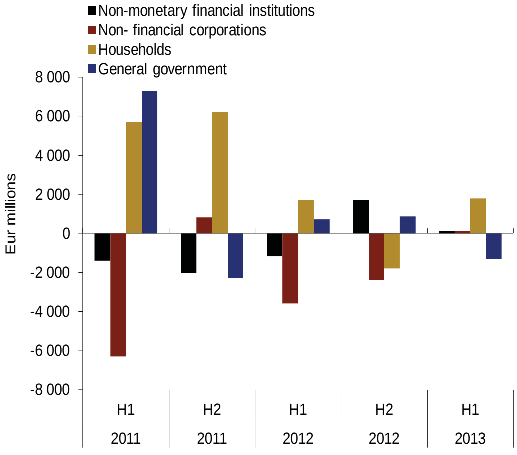
BANKING FUNDING STRUCTURE



Source: Banco de Portugal.

Chart 1.3.1.7

CUSTOMER RESOURCES TAKEN IN PORTUGAL – SIX MONTH VARIATION



Source: Banco de Portugal.

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[31] Based on monetary and financial statistics data (non-consolidated data on deposits collected in Portugal, including off-shore activity).

[32] For further details on these measures see "Chapter 5 *Liquidity Risk*", Banco de Portugal, *Financial Stability Report – May 2013*.

i.e., the group of assets eligible as collateral for Eurosystem lending operations. Hence, it was possible to raise the degree of overcollateralisation of refinancing operations, which endowed institutions with an increased capacity to accommodate adverse shocks to their liquidity needs in the short term.

In parallel, Banco de Portugal has sought to promote the smooth functioning of the domestic interbank money market, and thus contribute to an efficient monetary policy transmission by making available a platform for the recording and processing of transactions in the unsecured and the secured interbank money market (in September 2012 and as of May 2013, respectively).

Given this context, in general and when assessed by liquidity gaps, the Portuguese banks' liquidity situation remained relatively comfortable during the first half of 2013 (Chart 1.3.1.9).[33]

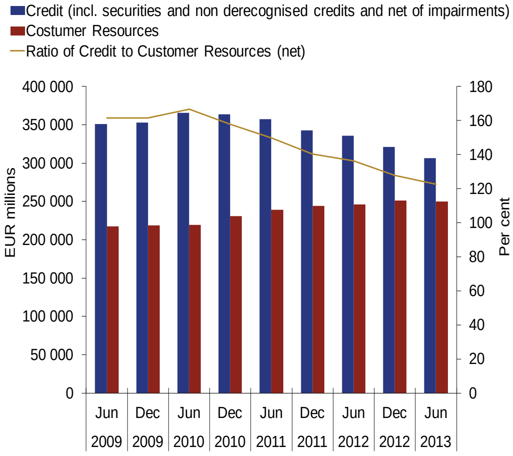
Banking sector's profitability remains subdued by economic developments and banks' funding conditions

Profitability remained overall negative in the course of the first half of 2013, especially due to a narrowing of net interest income and impairment developments (Chart 1.3.1.10). In this context, the ability to generate internal funds remains as one of banking business main challenges, since the adjustment of business models is slowly reflected into banking income.

In the first half of the year, the sector's net interest income remained under pressure (Chart 1.3.1.11), due to the contraction and deterioration of credit quality and to the persistence of reference interest rates at historical lows, affecting a significant share of credit portfolio granted with long maturities, index-linked interest rates and low and fixed spreads (notably loans to households for house purchase). The above factors contributed to a fall in interest received, while deposit remuneration rates showed greater rigidity in the period under review, as a consequence of borrowing policies based on higher interest rates for longer-term deposits, which continued to influence banking income, partly explaining the narrowing of the credit-deposit rate differential seen up to the end of 2012 (Table 1.3.1.1). To these net interest income penalising factors is also added the cost of interest of hybrid instruments issued by banks involved in recapitalisation operations, with recourse to public capital during the Financial Assistance Programme. By contrast, the recourse to funding from the Eurosystem in stable and low cost

Chart 1.3.1.8

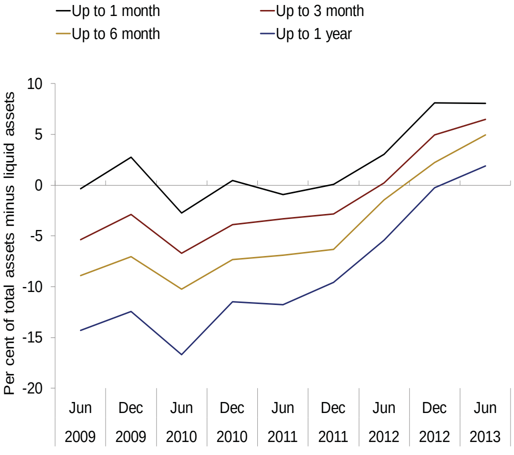
LOAN-TO-DEPOSITS RATIO



Source: Banco de Portugal.

Chart 1.3.1.9

LIQUIDITY GAPS



Source: Banco de Portugal.

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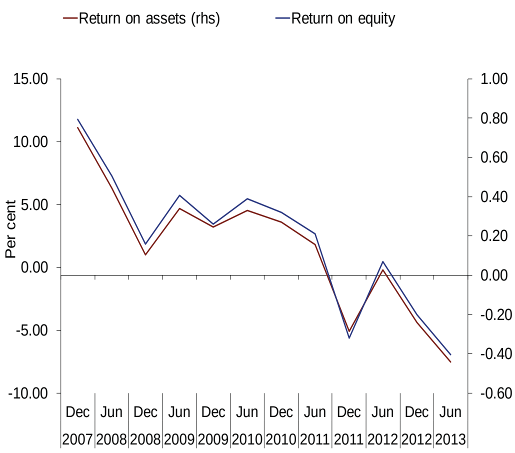
[33] Liquidity gaps are defined according to the ratio (net assets – volatile liabilities)/(assets – net assets)*100, for every cumulative scale of residual maturity.

Chart 1.3.1.10

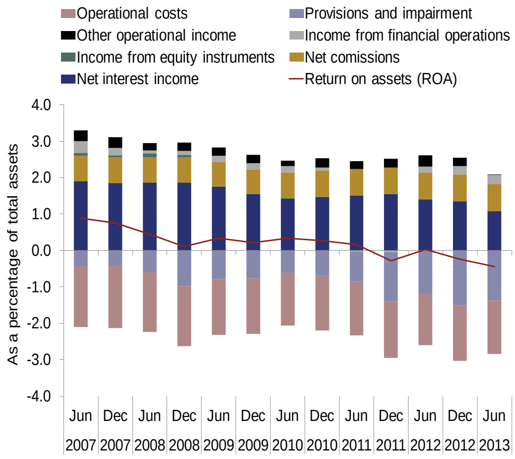
RETURNS ON ASSETS AND ON EQUITY



Source: Banco de Portugal.

Chart 1.3.1.11

RETURNS – BREAKDOWN OF COMPONENTS



Source: Banco de Portugal.

Table 1.3.1.1

IMPLICIT AVERAGE INTEREST RATES OF THE MAIN BALANCE SHEET ITEMS[(a)] | PER CENT

	2008		2009		2010		2011		2012		2013
	H1	H2	H1	H2	H1	H2	H1	H2	H1	H2	H1
Interest-bearing assets	**5.83**	**6.04**	**4.41**	**3.13**	**3.05**	**3.26**	**3.64**	**4.19**	**3.98**	**3.50**	**3.20**
of which:											
Interbanks assets	4.45	4.22	2.27	1.28	1.30	1.66	2.00	2.25	1.82	1.55	1.46
Non-interbanks assets											
Credits	6.17	6.49	4.83	3.49	3.33	3.56	4.03	4.68	4.52	3.88	3.69
Securities	6.12	6.63	5.51	4.19	4.19	4.12	4.48	5.14	5.07	4.86	3.93
Interest-bearing liabilities	**3.82**	**4.02**	**2.67**	**1.86**	**1.71**	**1.84**	**2.25**	**2.70**	**2.66**	**2.46**	**2.24**
of which:											
Interbanks assets	4.65	4.64	2.44	1.56	1.25	1.28	1.80	2.24	1.83	1.59	1.35
Non-interbanks assets											
Deposits	2.90	3.17	2.39	1.61	1.38	1.60	2.06	2.67	2.76	2.51	2.15
Debt securities (other then subordinated liabilities)	4.63	4.99	3.16	2.38	2.52	2.96	3.19	3.55	3.84	3.94	4.06
Subordinated liabilities	5.56	5.50	4.51	3.50	3.34	3.15	3.41	3.91	3.84	6.45	6.33
Spreads (in percentage points):											
Interest bearing assets - Interest bearing liabilities	2.01	2.01	1.75	1.28	1.34	1.42	1.39	1.49	1.32	1.04	0.96
Credit - Deposits	3.27	3.32	2.44	1.87	1.95	1.96	1.97	2.01	1.76	1.37	1.54

Source: Banco de Portugal.
Note: (a) Implicit average interest rates are calculated as the ratio between interest flows in the period under consideration and the average stock of the corresponding balance sheet item.

conditions has minimised such impacts, although, as mentioned, this funding source remained relatively stable in the course of 2013.

Additionally, as regards the evolution in banking revenues, net commissions declined somewhat in the period, chiefly due to a decline in commissions received for services provided, consistently with deleveraging in the sector. Notwithstanding, this component made a relatively stable contribution to the Portuguese banking system's profitability. In a context of decline in activity (both as regards the credit portfolio and total assets), that induced negative volume effects on some commission components, there is evidence that the price policy adjustment has contributed to limit the decline in commissions.

Income from financial operations declined compared with the same period a year earlier, particularly in the second quarter of 2013, with the end of extraordinary financial income associated with the marked decline in yields on Portuguese public debt securities in 2012. Future developments in this revenue component are subject to a high degree of uncertainty and rather dependent on the behaviour of spreads on Portuguese public debt in the market, given the current weight of these assets in the banks' portfolio and the already mentioned increase in debt maturity.

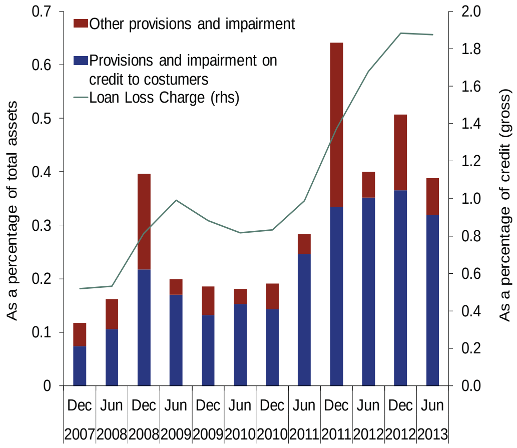
Impairment costs remained at high levels, accounting for 47 per cent of activity costs at the end of the first half of the year. The slight contraction in this item (-2.2 per cent *vis-à-vis* the same period a year earlier) largely reflected an extraordinary reduction of credit impairments, following the end of a banking group's operations abroad (Chart 1.3.1.12). Nevertheless, the difference between net interest income and impairments resumed negative values in the second quarter of 2013.

The worsening of credit risk has implied an increase in recognised impairments. Banco de Portugal regularly conducted special inspections to the credit portfolios of the eight major Portuguese banking groups with the purpose of guaranteeing that impairments were aligned with the quality of assets in portfolio (during the first half of 2013 there was another cross-cutting exercise[34] to review credit portfolio impairments with reference to 30 April 2013).

In the first half of 2013 operational costs followed a downward trend, declining by 4 per cent from the same period a year earlier. This trend is anchored to a contraction in depreciation and in general and administrative costs, by 11 and 7 per cent respectively. In turn, staff costs declined by 1 per cent year on year. The decline in operational costs should be interpreted while taking into account the restructuring processes that major domestic banking groups are undergoing. These encompass a considerable reduction of the number of branches and consequently of the number of employees, due to both retirement and rescission of employment contracts, promoting the needed adjustment between expenditure and revenue expected for banking business in the medium term. In any case, given the short-term rigidity in the adjustment of some of these costs' components, the cost-to-income ratios (that present an inverse relationship with operational efficiency) remained at high levels, due to a sharp drop in banking output, and particularly in net interest income.

Chart 1.3.1.12

TOTAL IMPAIRMENTS AND LOAN LOSS CHARGE



Source: Banco de Portugal.

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34 See Banco de Portugal's press release of 2 August 2013 (http://www.bportugal.pt/en-US/OBancoeoEurosistema/ComunicadoseNotasdeInformacao/Paginas/combp20130802.aspx)

As already mentioned, the end of a Portuguese banking group's activities in Greece had repercussions on the sector's international activity indicators (Table 1.3.1.2). Excluding this effect, international activity continued to make a positive contribution to income in this sector, although at a more moderate pace, quite restrained by the recognition of impairments associated with other assets in the balance sheet (in particular impairments to cover the risk within the scope of the already mentioned end of activities in Greece).

Solvency remained on an upward trend, complying with minimum regulatory requirements

Banking system's solvency ratios remained on an upward trend (Chart 1.3.1.13), complying with the objectives set out in the Financial Assistance Programme – the banking system's Core Tier 1 ratio[35] reached 11.9 per cent in June 2013, compared with a minimum regulatory requirement of 10 per cent.

In the course of the first quarter of 2013 a new recapitalisation operation took place with recourse to public funds. It should be recalled that recapitalisation operations in 2012 played an important role and resulted in a remarkable increase in original own funds of the major Portuguese banking groups and hence in enhancement of solvency ratios in the sector. These operations made decisive contributions to reinforcing the solvency of the major Portuguese banking groups, in a context characterised in aggregate terms by negative net income.

In the first half of 2013 the positive trend of solvency ratios was also associated with a decline in risk-weighted assets, although at a slower pace than in previous periods. The reduction observed reflected a fall in assets, improved and more stable calculation models, the holding of assets with lower regulatory capital requirements and recourse to risk mitigating measures by some banking groups (for example, the conduct of a synthetic securitisation operation to cover credit risk).

The improvement in the Core Tier 1 solvency ratio was broadly based across most banking institutions analysed (Chart 1.3.1.14), and the degree of heterogeneity observed among institutions remained relatively stable compared with the end of 2012.

The accounting capital to assets ratio stood at 6.3 per cent at the end of June 2013, similarly to the end of 2012, and compared with 5.9 per cent in the same month in 2012. The stability in the half-year under review reflects a further joint reduction in assets and capital, in a context of maintenance of negative net income for the year.

Table 1.3.1.2

RELEVANCE OF INTERNATIONAL ACTIVITY FOR THE INCOME OF THE EIGHT MAJOR RESIDENT BANKING GROUPS | PER CENT

	Relative weight of foreign subsidiaries		International activity y.o.y rate of change		Domestic activity y.o.y rate of change	
	Jun 2012	Jun 2013	Jun 2012	Jun 2013	Jun 2012	Jun 2013
Net interest income	28.6	40.6	-11.2	-3.1	-11.3	-43.4
Commissions	25.9	21.5	23.8	-17.1	-5.2	5.7
Gross Income	24.8	31.0	0.4	-13.5	5.9	-36.6
Operational Costs	27.8	26.8	5.8	-6.2	-9.5	-1.5
of which: staff costs	26.8	25.1	5.5	-5.7	-14.8	2.9
Impairment	11.2	14.2	86.6	19.7	53.2	-8.9

Source: Banco de Portugal.

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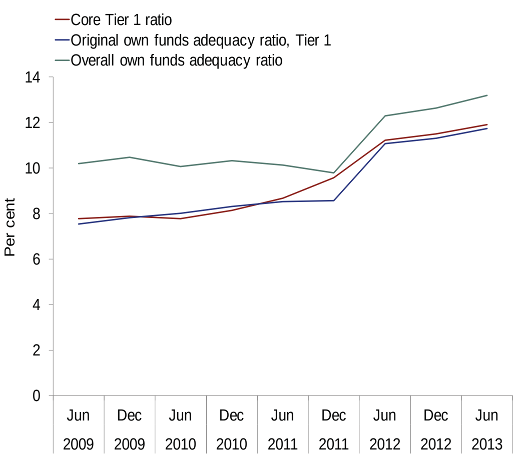
[35] The Core Tier 1 ratio corresponds to the ratio of original own funds net of non-core elements to risk-weighted assets.

Chart 1.3.1.13

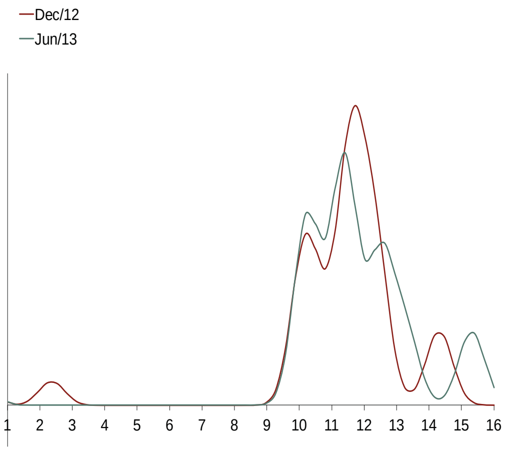
CAPITAL RATIOS



Source: Banco de Portugal.

Chart 1.3.1.14

CORE TIER 1 RATIO | EMPIRICAL DISTRIBUTION



Source: Banco de Portugal.
Note: Empirical distribution using a gaussian kernel in which institutions are weighted by total assets.

1.3.2 Insurance sector[36]

Growth of insurance production supported by the behaviour of life business and savings products

In the first half of 2013, insurance production, measured by gross written premiums (direct business) and contributions to products considered for accounting purposes as investment contracts, increased significantly in year-on-year terms. This is explained by the behaviour of the life business, whose production rose by around 49 per cent (Chart 1.3.2.1), whereas non-life business declined by approximately 5 per cent (Chart 1.3.2.2).

Developments in the life business are chiefly justified by investment contracts, since growth in insurance contracts was short of 8 per cent. It should be noted that this followed a period of sharp declines in production levels, which was influenced by the banking sector's funding needs and was more evident on insurance corporations with bancassurance distribution channels.

Non-life developments conditional on the macroeconomic situation and on the decline in average insurance rates

Reflecting, at least partly, the mandatory nature of some segments, non-life business has remained more stable, although also denoting the unfavourable macroeconomic context. In effect, production declined by around 5 per cent in the first six months of 2013 (after a drop of almost 4 per cent in the same period of the previous year). This behaviour was similar across main aggregates in this segment, except health insurance, which had an increase in activity. Against this background, it is important to mention in particular the more significant declines in the workers compensation and motor segments, whose developments cannot be dissociated from the deterioration of macroeconomic conditions, although there has also been a decline in average rates in the recent past.

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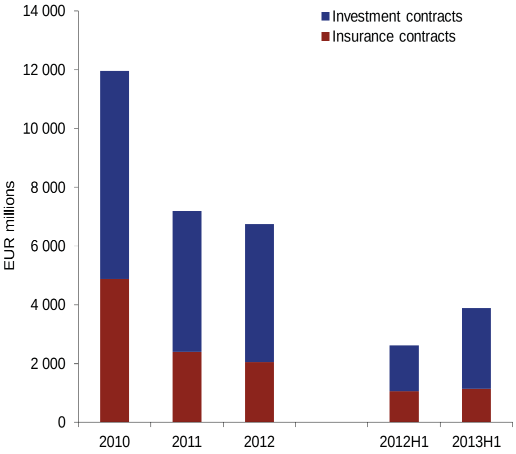
[36] The insurance sector concept considered in this section is defined in "Box 1.3.1 *Portuguese financial system: from statistical classification to prudential approach*", in this Report.

Chart 1.3.2.1

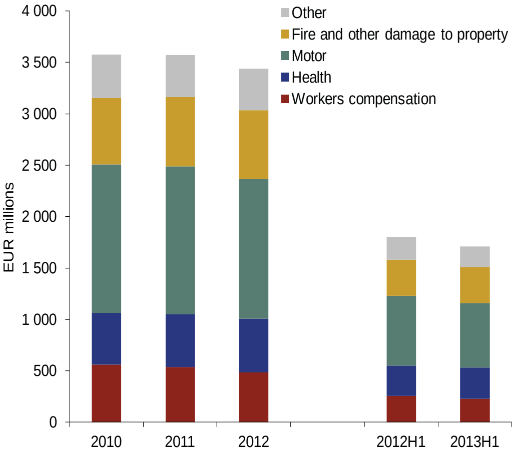
GROSS WRITTEN PREMIUMS – DIRECT LIFE BUSINESS



Source: *ISP*.

Chart 1.3.2.2

GROSS WRITTEN PREMIUMS – DIRECT NON-LIFE BUSINESS



Source: *ISP*.

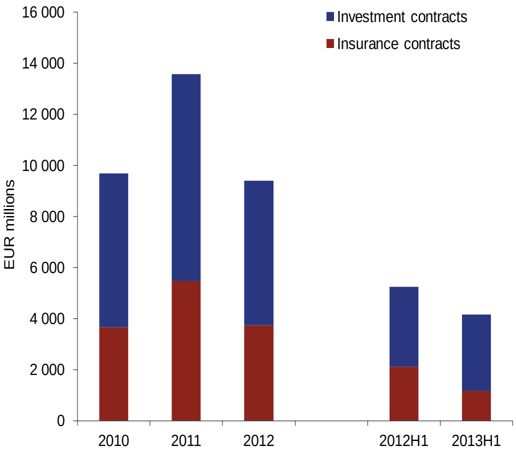
Decline in cost of claims due to the behaviour of life business

Cost of claims in the life business maintained the downward trend observed since the first half of the previous year (Chart 1.3.2.3). This is chiefly explained by the significant decline in surrenders, which contributed to bring the value of cost of claims closer to that of insurance premiums, even though the latter continued to stand at lower values than the former. Without prejudice to the significant rise in life business production, particularly in financial products, the increase in households' savings did not translate into a net rise in the resources delivered to the insurance sector, negatively affecting the liquidity and profitability of life insurance corporations.

As a result of the storms early in the year, and chiefly influenced by the almost 62 per cent growth of cost of claims in the fire and other damage to property segment, aggregate cost of claims in non-life insurance increased by around 2 per cent in the period under review (Chart 1.3.2.4).

Chart 1.3.2.3

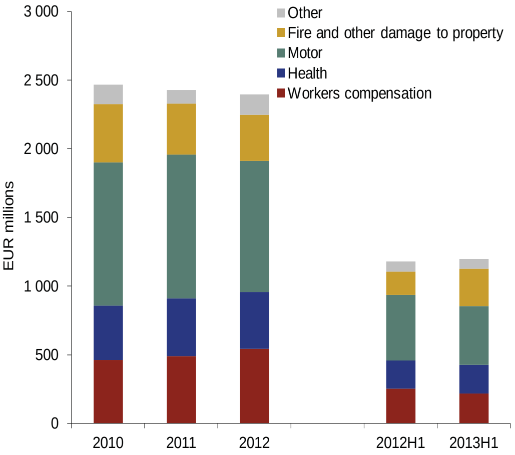
CLAIMS – DIRECT LIFE BUSINESS



Source: *ISP*.

Chart 1.3.2.4

CLAIMS – DIRECT NON-LIFE BUSINESS



Source: *ISP*.

Decrease of domestic bond yields has a positive effect on the value of investment portfolios

The value of assets held to cover technical provisions exceeded €47 billion in June 2013, €41 billion of which were allocated to life insurance and €6 billion to non-life insurance (Chart 1.3.2.5). Compared with June 2012, the overall amount of these assets grew by approximately 4 per cent, which may have been influenced by the fall in yields of debt securities issued by domestic entities.[37] Positively influenced by the behaviour of investment portfolios, the cover ratios of technical provisions improved in both business segments (Chart 1.3.2.6).

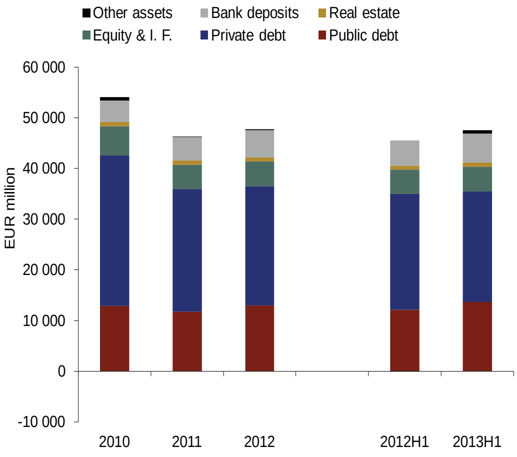
The composition of investment portfolios remained relatively stable. Reference should be made, however, to the continued upward trend of the amounts invested in deposits and government debt securities, in detriment of corporate bonds. Within this scope, and in a context of continued financial market segmentation in the euro area, it is also relevant to mention the increasing concentration in domestic sovereign debt.

Aggregate net income has increased significantly, but is influenced by non-recurrent factors

Net income of the aggregate insurance industry attained approximately €440 million in the first half of 2013, showing a significant improvement from the €159 million registered in the same period of the previous year. This result brings the annualised return on asset ratio[38] in the first half of 2013 to values close to 2 per cent, compared with a figure below 1 per cent in the year-on-year period. It should be stressed, however, that, according to information published by the Instituto de Seguros de Portugal – ISP (Portuguese Insurance and Pension Funds Supervisory Authority), in addition to favourable developments in financial income, this change was very much due to a reinsurance operation carried out by a life insurance operator in June 2013. This reinsurance operation made it possible to bring forward the financial flows that would be received during the life-time of the reinsurance contracts. Mention should also be made to a similar operation that occurred in July 2012, carried out by an insurance corporation that is part of a major financial group operating in Portugal.

Chart 1.3.2.5

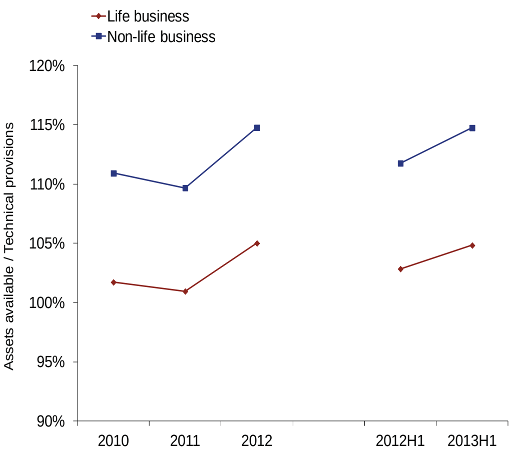
ASSET ALLOCATION



Source: *ISP*.

Chart 1.3.2.6

COVER RATIO



Source: *ISP*.

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[37] A considerable share of financial investments is evaluated at market prices in the insurance corporations' balance sheets.

[38] The ratios are obtained from annualised six-month net returns, *pro rata* to total assets at the end of the previous year.

Solvency ratio remains at comfortable levels

The solvency ratio[39] stood at approximately 242 per cent, remaining at relatively high levels and showing an improvement from the same period of 2012. Also in this context, according to data made available by the ISP, the evaluation of total assets at market value would lead to an increase greater than 10 p.p. in the solvency ratio in June 2013.

An analysis by branch of activity shows that this ratio stood at around 242 per cent in life insurance operators, 254 per cent in non-life insurance, and 238 per cent in corporations that manage both businesses.

1.3.3 Pension funds

Decreasing risk premiums in domestic securities contributes to the rising value of investment portfolios

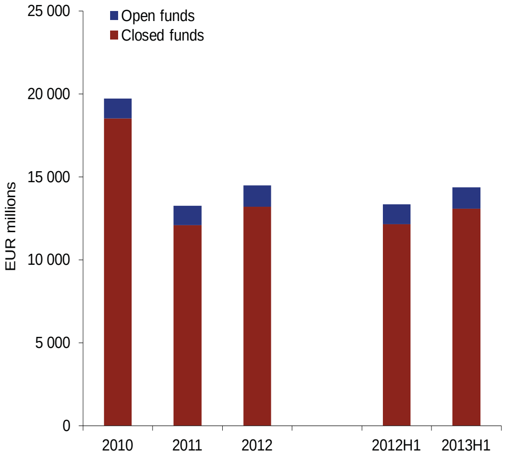
At the end of June 2013 total assets under management attained more than 14 billion euro, substantiating an increase of almost 8 per cent from June 2012 (Chart 1.3.3.1). As in the case of insurance corporations, the decline in yields of debt securities issued by domestic entities contributed to this effect, via portfolio valuation.

From the total number of pension funds in place in June 2013, 68 per cent correspond to closed pension funds that manage 91 per cent of the assets in the sector. In addition, 78 per cent of the assets under management (as of December 2012) are allocated to closed pension funds held by financial institutions and mostly ensure the coverage of defined benefit pension plans.

Recent developments in this sector are therefore rather conditional on changes in banking sector pension plans, following the tripartite agreements on banking sector social security, which establish the gradual integration of employees into the social security scheme and the transfer of past service liabilities and corresponding financial assets to social security, with effect since 1/1/2011[40] and 31/12/2011[41] respectively.

Chart 1.3.3.1

ASSETS UNDER MANAGEMENT



Source: *ISP.*

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[39] The required solvency capital is a minimum requirement intended to ensure the risks covered by insurance corporations. The solvency ratio corresponds to the ratio of available solvency capital to required solvency capital, and shall be greater than 100 per cent.

[40] Decree-Law No 1-A/2011 of 3 January.

[41] Decree-Law No 127/2011 of 31 December.

Moreover, following the implementation of social security's 1st Tripartite Agreement which determines that new bank employees shall be covered by the general social security scheme, these pension schemes do not receive new employees since 3 March 2009.[42] Such changes account for the decline in assets under management from 2010 to 2011, as well as the recent change in benefits and contributions of those funds.

In turn, contributions to pension funds declined markedly in the first half of 2013, compared with the same period of 2012 (Charts 1.3.3.2 and 1.3.3.3). According to *ISP*'s information, this change is justified by closed funds and is conditional on the effect of an extraordinary contribution made in the first half of 2012, without which this decline in contributions would be significantly lower. Contributions to open funds have increased slightly.

Benefits paid remained relatively constant over the first half of 2013. However, while closed funds increased, open funds declined, more significantly in the case of pension savings schemes, due to the decline in surrenders.

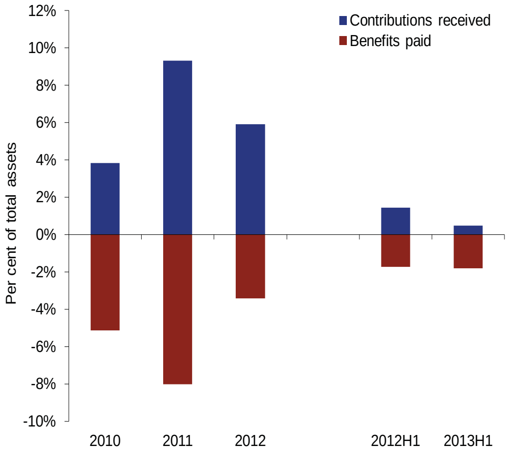
The fragile macroeconomic context affecting the associates' capacity to make contributions may add further to an increase in the number of defined contribution pension plans, where the investment risk is transferred to the fund's beneficiaries.

Composition of the asset portfolio remains relatively stable

The composition of investment portfolios by type of financial instrument remained relatively stable, but an upward trend of the exposure to government debt securities is noticeable, in detriment of corporate bond investments (Chart 1.3.3.4). In addition, and similarly to developments in asset portfolios of insurance corporations, an increase may also be observed in the concentration of domestic government debt, albeit to a smaller extent than in the insurance sector.

Chart 1.3.3.2

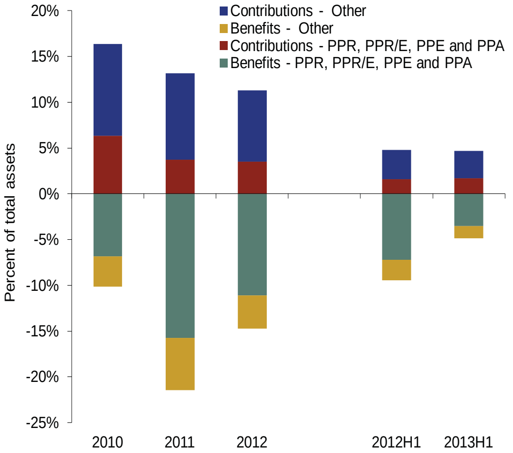
CLOSED FUNDS



Source: *ISP*.

Chart 1.3.3.3

OPEN FUNDS



Source: *ISP*.

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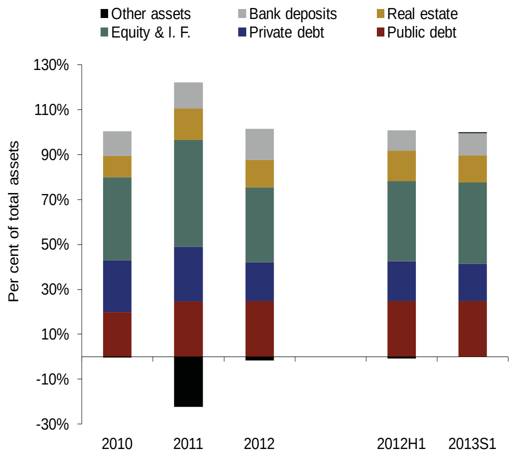
[42] Decree-Law No 54/2009 of 2 March.

Chart 1.3.3.4

ASSET ALLOCATION



Source: *ISP*.

Note: The category Other assets reflected, in December 2011, the remaining amount of assets to be transferred to Social Security during the first semester of 2012 (due to the transfer of responsibilities from banking sector pension funds).

1.3.4 Investment funds

Growth of assets under management

The investment funds sector, year-on-year, registered a 14% rise in total assets under management in June 2013, standing at €12 billion in that month. This development is largely explained by special investment funds,[43] classified as bond funds, pursuant to ECB guidelines (Investment Funds Manual). In turn, assets managed by real-estate investment funds continue to show some stability in the semester, with the values under management amounting to €16 billion in June 2013.

In terms of composition of the investment fund portfolio it has been registered an year-on-year increase in debt securities, largely explained by the acquisition of securities issued by entities resident in Luxembourg, and by the component of deposits with the banking sector (Chart 1.3.4.1). This acquisition of securities issued by entities resident in Luxembourg reflects the exposure of a number of funds to entities within the group. Over a more recent period, however, this situation was reversed, as a result of the approval of a new legal framework imposing ceilings on exposure per entity.[44]

Therefore, as regards the exposure of investment funds to the different institutional sectors, exposure to the government sector and to the non-resident sector has increased, particularly in what regards European Union countries, via the acquisition of debt securities. Moreover, investments in debt securities issued by the non-resident sector continue to play a dominant role, with focus on securities issued by entities residing in Luxembourg, as mentioned above.

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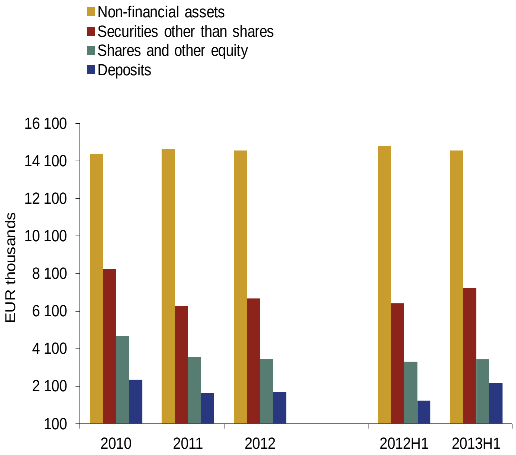
[43] Classification in accordance with national legislation followed by the *Comissão do Mercado de Valores Mobiliários – CMVM* (Portuguese Securities Market Commission). Pursuant to ECB guidelines (Investment Funds Manual), these funds are classified as bond funds if they invest mostly in bonds or bond funds.

[44] Legal Framework of Undertakings for Collective Investment, set out in Decree-Law No 63-A/2013, according to which: "an Undertaking for Collective Investment in Transferable Securities cannot invest more than: a) 10 per cent of its overall net worth in transferable securities and money market instruments issued by the same entity, without prejudice to the provisions of paragraph 3; b) 20 per cent of its overall net worth in deposits opened with the same entity".

Chart 1.3.4.1

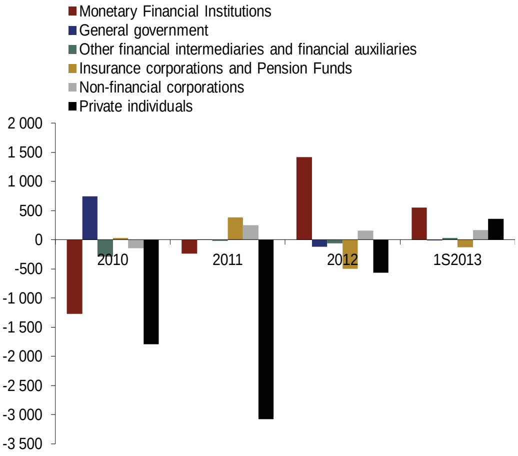
ASSETS OF INVESTMENT FUNDS BY INSTRUMENT



Sources: *Comissão do Mercado de Valores Mobiliários* and Banco de Portugal.

Chart 1.3.4.2

NET ACQUISITION OF INVESTMENT FUNDS SHARES BY THE RESIDENT SECTOR



Sources: *Comissão do Mercado de Valores Mobiliários* and Banco de Portugal.

In what respects the holders of resident investment funds, during this half-year, units have been redeemed by insurance corporations and pension funds, while households have replaced their units in real estate funds for units in other mutual funds. This change in behaviour by households may be due to the increase in market indices and, in parallel, to a more aggressive strategy adopted by banks when selling this type of instrument. Monetary Financial Institutions have acquired units in real estate funds (Chart 1.3.4.2), partly to accommodate redemptions of this type of funds by households. These developments contribute to the increase of banking system's exposures to the real-estate sector, which has been monitored by Banco de Portugal. As regards the representativeness of the different types of investment funds, reference should be made to the importance of bond funds and real-estate funds (Chart 1.3.4.3).[45]

Regarding the valuation of units, in the first half of the year, investment funds showed broad-based declines in their return[46] (Chart 1.3.4.4.). The exception being other funds where negative returns became less pronounced in the same period. Real-estate investment funds and hedge funds revealed some instability in terms of return in this half year.

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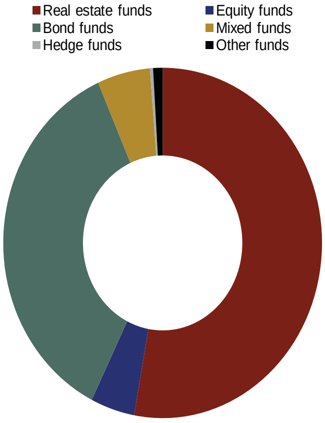
[45] This representativity is measured in terms of unit value. Equity funds: funds that primarily invest in shares and other equity or in shares/units issued by equity funds; Bond Funds: funds that primarily invest in shares/ units issued by bond funds; Mixed Funds: funds investing in both equity and bonds, without any prevalent policy for either; Real Estate Funds: funds that primarily invest in real estate or in shares/units issued by real estate funds; Hedge funds are classified in line with the statistical definition set out in guideline ECB/2007/9, and mean funds that apply relatively unconstrained investment strategies to achieve positive absolute returns; Other funds: residual category.

[46] Return is proxied by the amount of price changes as a percentage of the total amount at the end of the period.

Chart 1.3.4.3

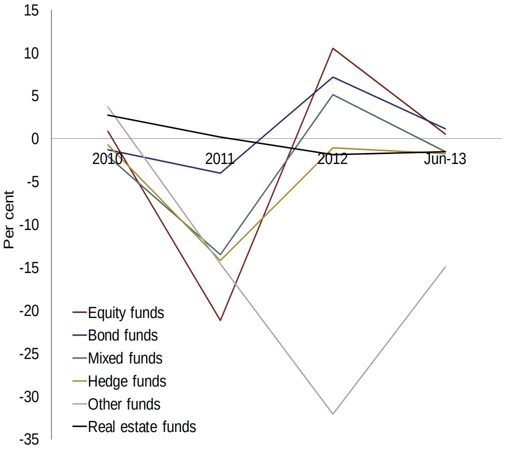
FUNDS REPRESENTATIVENESS BY INVESTMENT POLICY



Sources: *Comissão do Mercado de Valores Mobiliários* and Banco de Portugal.

Chart 1.3.4.4

YIELDS BY TYPE OF INVESTMENT FUND



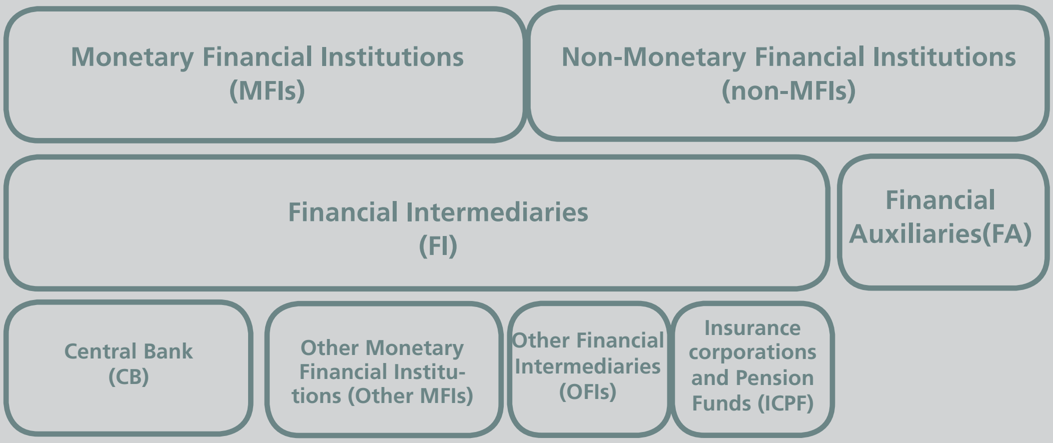
Source: Banco de Portugal.

BOX 1.3.1 | PORTUGUESE FINANCIAL SYSTEM: FROM THE STATISTICAL CLASSIFICATION TO THE PRUDENTIAL APPROACH

The financial system's development/complexity is key for the functioning of modern economies and is composed by entities with differentiated functions. This box presents a summarised description of the types of entities comprising the financial sector in Portugal, based on a statistical approach and in tandem with prudential approach.

From the statistical classification ...

According to the statistical classification, the financial system comprises: (i) entities that contribute to money creation, namely Monetary Financial Institutions (MFIs), including the Central Bank (CB) and other Monetary Financial Institutions (other MFIs); and (ii) institutions supporting financial activity but not contributing to Eurosystem's monetary aggregates, denominated non-Monetary Financial Institutions (non-MFIs). Non-MFIs include other financial intermediaries (OFIs) other than MFIs, insurance corporations and pension funds, as well as financial auxiliaries.


Monetary Financial Institutions (MFIs)
Non-Monetary Financial Institutions (non-MFIs)
Financial Intermediaries (FI)
Financial Auxiliaries(FA)
Central Bank (CB)
Other Monetary Financial Institu-tions (Other MFIs)
Other Financial Intermediaries (OFIs)
Insurance corporations and Pension Funds (ICPF)

In the case of financial intermediaries, either monetary or non-monetary institutions, the financial intermediary function is reflected on their balance sheet via the accounting of financial assets and liabilities on which they act, placing them exposed to the inherent risks. The main difference between financial intermediaries and auxiliaries is that financial auxiliaries are not exposed to risk when they assume assets and liabilities as they only support the financial intermediation activity. This means that they do not register the financial assets and liabilities that are the object of their action in their balance sheets.

Using total assets to gauge the relative importance of each subsector, it is possible to conclude that other MFIs have a dominant weight (Table 1), which is higher if we also consider the interlinks between other MFIs and other financial institutions operating in Portugal (see Box '*Interconnectness within the resident financial system*').

Banco de Portugal plays a key role as a supervisor of credit institutions, and as monetary authority while a member of the Eurosystem and of the European System of Central Banks. Central bank's total assets expressed in terms of the whole Portuguese financial system reflect the increase in monetary operations that result from the tensions in the euro area financial markets.

Other MFIs include banks; savings banks; mutual agricultural credit banks; and money market funds (MMFs). Except for MMFs, the other entities are also classified as credit institutions, pursuant to the Legal Framework of Credit Institutions and Financial Companies (Legal Framework) and are included in the banking system's regular analysis. MMFs are investment funds that, due to their characteristics, receive

Table 1

PORTUGUESE FINANCIAL SYSTEM - STATISTICAL APPROACH (DOMESTIC ACTIVITY)

December 2012	Assets (10^6 €)	Total	%GDP	Nº Entities	Quote (5 largest)
Central bank	93 579	11%	57%	1	-
Other MFIs	541 518	66%	328%	165	73%
Insurance corporations	58 601	7%	35%	80	71%
Pension funds	14 471	2%	9%	227	79%
Securitisation funds and companies	43 584	5%	26%	39	75%
Mutual funds, except MMF	27 692	3%	17%	524	84%
Other financial intermediaries and FA	49 585	6%	30%	201	-
Financial setor - Total	829 030	100%	502%	1237	-

Fontes: *Instituto de Seguros de Portugal* and Banco de Portugal (non-consolidated figures).

Nota: Total assets correspond to financial assets, with the exception of investment funds that reflect total assets. Investment funds excludes MMF and Venture capital funds. OFI and FA only includes supervised entities. FMM exclude investment funds and venture capital. The OFI only include supervised entities.

deposit-like resources and therefore should be part of the monetary sector.[1] The main function of other MFIs is to capture deposits and to channel resources to the non-financial sector. In that context, and within its relationship with the central bank, these institutions play an important role in the operation of the monetary policy transmission mechanism; in addition, they also carry out other relevant functions, among which payment system operations.

OFIs include a very diverse set of entities. In particular, they include entities that may grant loans directly to the non-financial sector, and that are classified as credit institutions, pursuant to the Legal Framework (*e.g.* credit financial institutions; financial leasing companies; and factoring companies). Moreover, OFIs include other entities that are not classified as credit institutions, such as investment funds and securitisation funds/companies.

Investment funds' principal function is to invest the funds raised from savers, as units, in the financial market (investment funds excluding real-estate funds) or in the real-estate market (real-estate funds). In Portugal, units' valuation reflects the valuation of assets held in portfolio, as there are no constant net asset value investment funds. Considering the investment policy of investment funds operating in Portugal, it may be concluded that bond funds and real-estate funds are the most representative. It should be added that Special Investment Funds, which are classified in the other types of funds according to their investment policy, have gained relevance. Special investment funds, compared with other investment funds, face fewer restrictions in their investment policy.

Securitisation funds/companies are the only financial vehicles authorised to carry out securitisation operations in Portugal. These entities are significantly exposed to the banking sector, given that around 80 per cent of securitisations operations are not derecognised from banks' balance sheets. Therefore, although the original debtor corresponds mainly to households, the effective debtor is the bank, which in turn also holds a relevant share of the securities/units issued by these entities.

The main function of insurance corporations is to provide financial intermediation services that are the result of the aggregate management of diversifiable risks, chiefly as direct insurance or reinsurance. Insurance may cover risks regarding goods and property rights or risks relating to life, health and physical integrity.

The main function of Pension Funds is to provide financial intermediation services that are the result of the allocation of social risks and the requirements of insured people (social insurance), via the setting up of autonomous property, which is exclusively intended to finance such liabilities . Pension funds, in their quality as social insurance scheme, guarantee retirement income and very often death and disability benefits.

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[1] Resources invested in these funds are not covered by the Deposit Guarantee Fund.

Even though insurance and pension fund activities represent a considerably lower weight on GDP when compared with the banking sector, they assume a range of specificities in the management of their activity which should be highlighted, in particular: (i) the fact that activity is related to an inverted production cycle, where the duration of assets tends to be shorter than liabilities duration; (ii) their weight as long-term institutional investors in the public and private sectors; and (iii) the relevance of exploring non-traditional business areas in the stricter sense, which cover other risks, such as the financial products in life insurance, or non-life credit insurance.

... to the prudential approach

The banking sector's prudential approach differs from that used in statistical analysis because it aims at having an integrated evaluation of the risks that may constrain the performance and position of banking institutions, within the ceilings established in the law as regards the delimitation of supervision by the three supervisory authorities of the financial sector (Banco de Portugal, *ISP* and *CMVM*). In this context, based on the statistical delimitation, the main differences to the scope are both the different coverage of institutions to be considered and data consolidation.

The reference population for the banking supervisor comprises: (i) banking groups, on a consolidated basis, in those cases where they include at least one credit institution or one investment company in the consolidation perimeter,[2] and (ii) credit institutions and investment companies, on an individual basis, when they are not the object of consolidation in Portugal. Actually, the population covered for supervisory purposes is based on the credit institution concept, which includes, in addition to other MFIs (excluding MMFs) other entities classified as non-MFIs for statistical purposes. In effect, non-MFIs may be considered in the supervisory perimeter if they are classified as credit institutions or investment corporations, if they correspond to the parent company of a financial group (for instance holding companies) or if they correspond to a subsidiary of a banking group (when consolidated in the parent company).

In addition, the regular analysis of the banking system considers consolidated data of the banking group, instead of information on an individual basis. Therefore, accounting information reflects the activity of the subsidiaries (domestic and non-domestic) that belong to a banking group, while for statistical purposes account is only taken of the activity carried on (at the domestic or international level) by the bank that residin Portugal. It should be added that the banking system is of overriding importance within the Portuguese financial system (Table 2).

As regards the insurance sector, the *ISP*, as competent authority for the supervision of these entities, considers insurance and reinsurance corporations having their head office in Portugal, including the

Table 2

FINANCIAL SYSTEM - PRUDENTIAL APPROACH

December 2012	Assets (10^6 €)	% GDP
Banking system	496.082	300%
Insurance corporations	52.485	32%
Pension funds	14.471	9%
Mutual Funds, except MMF	27.692	17%

Sources: *Instituto de Seguros Portugal* and Banco de Portugal.

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[2] The following shall be considered investment companies: dealers, brokers, foreign-exchange or money-market mediating companies, investment fund management companies and wealth management companies.

activities carried on in the territory of other Member States by their branches or undertaken under the freedom to provide services, and also branches of insurance or reinsurance corporations having their head office outside the European Union operating in Portugal. Against this background, the difference between the statistical approach and the prudential approach is that branches of foreign corporations having their head office in the EU are only considered for statistical purposes. In addition, statistical information only takes into account domestic activity, *i.e.*, it does not consider activity carried on in the territory of other Member States by the respective branches or under the freedom to provide services.

Adding to the analysis of the banking system, the insurance sector and pension funds, the financial stability report will also include a section on the investment funds sector, because it is deemed to be somewhat relevant in the Portuguese financial sector.

RISKS TO FINANCIAL STABILITY

II

2. RISKS TO FINANCIAL STABILITY

Financial stability consists of a smooth functioning of the financial system, without any frictions to hamper its role of efficient financial intermediation in the economy. It is therefore important to identify the risks to this smooth functioning in order to mitigate them by using instruments that are considered more effective in avoiding or dampening their effects. Among these are risks related to macroeconomic developments, asset price developments, the interconnection between resident financial sectors and risks specific to each subsector.

Uncertainty about domestic macroeconomic developments is the main risk to financial stability

Full implementation of the Economic and Financial Assistance Programme (EFAP) and a return to international financing markets are important challenges for the Portuguese economy. Relevant steps have already been taken to correct structural imbalances in the Portuguese economy in the past few years. However, significant vulnerabilities remain that need to be corrected in order to ensure the financial sustainability of resident institutional sectors, thus contributing to boost the competitiveness of the Portuguese economy and ensure financial stability. In the current environment, fiscal consolidation is particularly important as an instrument conducive to sound and sustainable public finances. This is a key objective considering the impact of public sector externalities on the financial stability of the remaining resident sectors through various channels. On the one hand, sound and sustainable public finances are crucial to the confidence of domestic economic agents, promoting efficient decision-making that favours an adequate resource allocation to the characteristics of the Portuguese economy. On the other, they are the basis for international investor confidence – which is needed to ensure sustainable financing of the economy over the medium to long term and, at the same time, weaken the link between sovereign risk and business risks (both for financial and non-financial corporations).

Against this background, some uncertainty remains regarding the specific fiscal measures and the fiscal strategy that will be adopted over the medium term to achieve full consolidation of public finances, which is key to ensure financial stability. At the same time, uncertainty remains about the pace of implementation of structural reforms needed to balance the fiscal consolidation path with high and sustained economic growth.

A scenario of decreased economic activity would imply less income being generated by economic agents as a whole. Consequently, demand for financial services should also be affected, which, in the presence of rigidity factors in the cost structure of financial corporations, would have a negative impact on the profitability of banks, insurance corporations and other financial institutions. In addition, a scenario of decreased economic activity would contribute to raise default, impacting, in particular, on the profitability and quality of banking system assets. This scenario would also tend to worsen risk perception of credit institutions and have a negative effect on credit supply and the financing of the economy, making it more difficult for economic activity to recover.

The contraction in domestic demand has played a key role in private sector deleveraging, which is crucial to the adjustment of the Portuguese economy. However, this process may jeopardise economic growth in the future if it induces a continued decline in corporate investment. The renewal of the corporate capital stock plays a crucial role in incorporating more advanced technologies (which are essential to improve both the quality of goods and services produced and production efficiency). These factors are fundamental to ensure that the Portuguese economy remains competitive and to correct macroeconomic imbalances. Corporate investment is also important to absorb higher-skilled workers, and thus boost economic growth. It is therefore essential to ensure that financing conditions are in place to facilitate valuable investment projects. In this respect, it is crucial to establish a new financial development institution, in cooperation with specialised international institutions and the domestic financial system, aimed at financing investment and strengthening the corporate financial structure.

Against this background, the labour market also plays a key role in the efficient allocation of human capital. Consequently, a smooth-functioning and flexible labour market is a necessary condition for a faster reorganisation of the productive sector and a sustained decline in unemployment. A marked deterioration in labour market conditions, specifically persistently high unemployment (in spite of a drop seen in the past quarters) and steadily increasing unemployment duration, pose risks to a sustained recovery of economic growth. At the same time, these factors prevent an adequate level of social welfare from being attained, posing additional risks to households being able to fully meet their credit obligations, and may therefore have a negative effect on financial stability. The pursuit of structural reforms in the labour market (that improve labour reallocation and thus create conditions to absorb labour) will reduce unemployment in a sustained manner, which is an important step for financial stability. The processes of reorganising and restructuring companies need to be faster and more transparent in order to maintain and create employment and reallocate resources, even if there are short-term costs.

External macroeconomic developments also condition the implementation of domestic adjustment objectives

The implementation of the EFAP has led to growth in domestic saving and has implied a considerable correction in the current and capital account imbalance, against a background of significant contraction in both the economy and employment. Despite buoyant exports in the recent period, deteriorating macroeconomic prospects for the countries that are the main destination markets for Portuguese exports pose risks to the adjustment objectives.

In the euro area, projections point to subdued growth in 2014, against a background of high heterogeneity among Member-States. Several factors contribute to this situation in addition to country-specific characteristics. In particular, despite recent signs of improvement, financial market fragmentation remains, with high risk premia in stressed economies and uncertainty regarding the implementation of mechanisms that allow greater financial, economic and fiscal integration. Deepening the European Union and, in particular, establishing a complete Banking Union – including not only the Single Supervisory Mechanism, but also resolution and deposit guarantee schemes for all banks – are essential to overcome this fragmentation. Obstacles to this process would increase risks, particularly for stressed economies, hindering access to external financing and a return to significant economic growth.

In addition, the outlook for inflation remains at levels that are clearly below the medium-term objective established by the ECB, which is a challenge for the conduct of euro area monetary policy.

The United States are expected to continue to experience growth rates above those of most advanced economies, although the establishment of medium-term fiscal consolidation plans is key to avoid uncertainty regarding the sustainability of public finances in the United States. With regard to emerging market and developing economies, projections point to robust growth, albeit below previous forecasts. There is evidence that companies have been increasing their leverage in some of these economies, in part with recourse to foreign currency-denominated debt, which constitutes a vulnerability in the event of adjustments in capital flows.

Developments in household disposable income pose risks to default levels

The decrease in household disposable income observed since 2011 is hindering effective compliance with the commitments made by Portuguese economic agents. In the private sector, this has resulted in decreased expenditure and increased default ratios and, in the public sector, additional adjustment measures need to be adopted in order to fully implement the fiscal adjustment process.

High household indebtedness remains a risk factor for financial stability, despite the adjustment that has already taken place, which resulted in significant net debt repayment. Credit risk has mostly materialised in bank loans for consumer credit and other lending, remaining more moderate in loans for house purchase. In spite of a recovery in economic activity throughout 2013, uncertainty still remains high regarding future economic and unemployment developments. In parallel, fiscal consolidation measures established in the State Budget for 2014 (which tend to decrease the income of civil servants and retired civil servants, after a significant tax increase) are expected to impact on household disposable income, affecting their consumption and saving decisions. These developments may have a negative effect on domestic demand and consequently jeopardise a recovery in employment, possibly impacting on the number of households that may not be able to meet their credit obligations.

The degree of monetary policy accommodation is relevant from this perspective, as it has an effect on household disposable income (in particular highly indebted households) and affects default levels. It is also important to continue to reallocate resources to the tradable goods sector, in order to offset the effects of weak domestic demand. In turn, the extension of the current regime on prevention and settlement of arrears on credit agreements with household customers (Pre-Arrears Action Plan – PRAP and Out-of-court Arrears Settlement Procedure– OASP) may help prevent these situations from continuing or worsening.

The high leverage of non-financial corporations is an important risk to the financial system

The leverage of Portuguese non-financial corporations remains very high, in a context where profitability has decreased to low or even negative levels. Although there are important differences among business sectors, construction has the highest leverage in the economy, with the banking sector particularly exposed to it.

The Portuguese economic adjustment has had a considerable impact on construction, given this sector's imbalance in the pre-crisis period, with a negative effect on both its profitability and its ability to meet credit obligations. In fact, construction is particularly sensitive to the domestic adjustment process. On the one hand, household deleveraging and a reduction in household income affect their demand for real estate assets. On the other, a drop in public investment (specifically public works) also limits demand for construction. Cash flow decreases reduce the ability of construction companies to meet their credit obligations.

Resident and non-resident financial sectors have reduced their exposure to the construction sector after incorporating these factors into their risk assessment. As a consequence, this segment saw the highest decrease in debt in absolute terms over the period 2009-2012, recording persistently negative annual rates of change. Nonetheless, resident financial institutions remain highly exposed to the construction sector, with two distinct dimensions in terms of risk: sustained and increased default and the inability of companies to obtain funding for projects, even with an acceptable return, owing to their high leverage. Construction companies have identified and are aware of both these dimensions, pointing to deteriorating sales prospects as the main factor limiting their activity, followed by the ability to obtain bank funding.

A recovery in construction companies and, in part, employment (particularly for higher-skilled workers) will likely be dependent on access to alternative markets and their ability to go international, which may, at the same time, ease pressure on the sector to obtain funding. Although creating some vulnerability to jurisdiction-specific shocks, this sector's internationalisation will result in geographical diversification of assets, a higher return and access to macroeconomic contexts that are not dependent on developments in the Portuguese economy. These developments are expected to have a positive impact on the resident financial sector, strengthening the quality of its claims on the construction sector.

The risk associated with the exposure of the financial system to non-financial corporations is not limited to the construction sector. As companies in other sectors are also highly indebted and display a gradual adjustment, deteriorating domestic economic activity may worsen their financial positions, and thereby significantly increase the already high number of companies in default. From this perspective, it is increasingly important that non-financial corporations diversify their financing sources and, in particular, increase own funds. The resulting strengthening of the capital structure of Portuguese companies (to which the new financial development institution may give an important contribution) is expected to decrease their risk and give them access to better funding conditions.

Incentive schemes should also be promoted, taking the form, for example, of prudential, judicial or tax mechanisms aimed at both early assessment and timely resolution of companies' financial imbalances. This would improve resource reallocation and therefore minimise losses of human and physical capital. In addition, instruments such as SIREVE and PER – which establish out-of-court negotiation procedures to recover companies that, although economically viable, are in a difficult situation or imminent insolvency – may help achieve the same objectives.[1]

There are risks associated with the current level of interest rates

Keeping interest rates at low levels affects banks' profitability as it puts pressure on their interest rate margins. In Portugal, this is particularly relevant in the current situation, where a significant share of banks' assets (specifically in loans for house purchase) is remunerated at variable rates with small spreads that are fixed for long maturities. In addition, the cost of banks' funding has largely decoupled from these variable rates, as it worsened significantly after the start of the financial crisis. However, a low return on these assets is important to contain default, with a positive effect on bank profitability as it limits credit impairments.

Overall, low interest rate environments may favour search for yield, *i.e.* a greater preference for assets with longer maturities and/or higher risk, which raises concerns among EU national supervisory authorities. Against this background, these authorities have worked together to develop methodologies that identify and measure risks associated with the current environment.

In a context of euro area financial fragmentation, risks associated with low interest rates will tend to mainly affect entities in northern and central Europe (specifically insurance companies), as these have long-term commitments with guaranteed return on investment in their products. In turn, in southern Europe, fixed income securities continue, in general, to offer higher rates of return, supporting a guaranteed return on investment. In Portugal, a significant part of the portfolios of financial institutions is made up of Portuguese assets (specifically sovereign debt) which continue to have relatively high returns.

A premature or unanticipated phasing-out of monetary policy measures (standard and non-standard), adopted following the current financial crisis, may cause additional difficulties to banking systems, and is not limited to stressed jurisdictions. In turn, this situation may also have considerable consequences in terms of asset valuation (specifically for debt securities).[2] However, the fact that main central banks have signalled the key elements of their forward guidance to the market (with the Federal Reserve in particular ensuring that the policy change will be phased and supported by indicators signalling economic recovery) reduces the probability of sharp movements.

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[1] SIREVE (*Sistema de Recuperação de Empresas por Via Extrajudicial* - out-of-court corporate recovery system) and PER (*Processo Especial de Revitalização* - special revitalisation process) are part of *Programa Revitalizar* (Revitalise Programme) and are managed by IAPMEI (Institute for support to small and medium-sized enterprises and innovation).

[2] A low interest rate environment implies an increase in the value of assets, as their cash flows are discounted at a lower rate. This situation has an impact on the valuation of assets at market prices.

Other factors beyond the control of monetary policy-makers may influence interest rate developments

To the extent that interest rates incorporate risk premia, they are also affected by shifts in perceived sovereign risk and expectations for capital movements at international level. As regards shifts in perceived sovereign risk, special mention should be made to risks associated with political and social difficulties in moving forward with structural adjustment processes in economies with large macroeconomic imbalances, namely as regards the public sector. In the case of Portugal, such market perception changes were particularly noticeable over the summer, namely due to institutional tensions. Meeting the State Budget targets for 2014 is, in this context, crucial to ensure an improvement in perceived risk on the Portuguese Republic, with an impact on the corresponding risk premia.

Furthermore, if the euro area sovereign debt crisis worsens, leading to rating downgrades to below investment grade in a number of countries, institutional investors whose investment mandate only allows them to hold investment grade bonds would have to liquidate positions in those assets, thus putting pressure on their prices, with a potential contagion effect on sovereign debt of other countries with poorer creditworthiness.

With regard to capital movements at international level, any decrease in saving rates, namely in emerging economies for which economic growth expectations have been revised downwards, may have an impact on demand for safer assets and on their yields, thereby also giving rise to market instability.

Exposure to sovereign risk warrants a prudent management approach by the financial sector

In the first half of 2013, the Portuguese financial system increased its exposure to Portuguese sovereign risk, chiefly due to the purchase of Portuguese government debt by the banking system and insurance companies. As at June 2013 such securities accounted respectively for 7 per cent and 19 per cent of these sectors' assets. Such levels, which have helped increase institutions' profitability, bear some risks. On the one hand, there is a significant exposure to the risk of an increase in interest rates applicable to medium and long maturities. On the other hand, and particularly in the case of the banking sector, some uncertainty surrounds the prudential treatment to be applied to sovereign risk exposures, which may lead to a risk weighting of these assets and the setting of limits to geographical concentration. In both cases, this could impact on the regulatory capital. This change may imply a reduction or diversification of exposures, which would affect institutions' profitability.

Despite a real estate market adjustment, risks of a further decline in housing prices cannot be excluded

Although evidence indicates that there is no real estate price 'bubble' in Portugal and that housing prices have already dropped by approximately 10 per cent since the beginning of the Economic and Financial Assistance Programme, the risk of additional price corrections cannot be excluded. Price dynamics in the real estate market should chiefly hinge on three factors: the stock available for sale (still influenced by the significant rise in supply in the past), the liquidity and solvency of holders of real estate assets (conditioned by developments in the domestic economic situation and the need to reduce household indebtedness), and a possible rental market buoyancy.

Taking into account the weight of real estate assets held direct or indirectly (namely in the form of mutual fund units involving real estate risk) in banking system portfolios, this movement could have negative effects on banks' profitability and solvency. However, price correction could be cushioned or countered by a 'search for yield' among investors, including non-residents, which see housing investment (namely for rental purposes) as an alternative to low returns on other investments.

With the aim of preventing any effects on the financial sector, the National Council of Financial Supervisors has recently outlined a number of principles for a prudent assessment of real estate assets. Furthermore, over the past few years Banco de Portugal has conducted several inspections of specific asset classes particularly exposed to macroeconomic or market developments, which include real estate assets. These inspections have contributed to mitigating the risk of overvaluing these assets in the portfolio of institutions under review.

During periods of greater uncertainty, the risk of a deterioration in confidence in the financial system increases

Reputational risk is associated with the confidence of economic agents in a given institution. As such, confidence is a crucial intangible asset of the financial system. A deterioration in confidence placed by the public in financial institutions may result in a lack of interest for products issued, thus hampering their future business or, even, giving rise to a massive and disorderly withdrawal of resources entrusted to those institutions, thereby compromising their continuity. Also, any problem arising in a given financial activity sector may quickly affect other segments within the same industry, due to sector-wide interlinks, the highly centralised distribution in the retail banking network and cross-selling practices.

In a fragile macroeconomic context, characterised by heightened financial market volatility and uncertainty, reputational risk tends to play a more substantial role, to the extent that returns on products placed by each institution tend to be more unpredictable, particularly in those cases where there are no capital or minimum return guarantees. This may result in greater losses than expected in households' financial investments, thereby hampering credibility and confidence placed in financial institutions. As such, even to the detriment of short-term profits, it is imperative to match the type of financial product with each investor's profile, as well as foster households' awareness, by ensuring that all risks taken are duly understood and analysed within their economic environment. It is crucial that consumers choose their financial products in an informed, educated and responsible manner, thereby safeguarding confidence in the system.

Financial sector supervisors have closely monitored reputational risk, by maintaining an extensive intervention approach to this issue. This includes the adoption of legislation that increases consumer protection, most notably reporting requirements. Special mention should also be made to financial literacy initiatives, namely under the aegis of the National Council of Financial Supervisors, with a view to fostering population awareness, thus helping them make informed decisions in all aspects of their financial choices.

Increased competition and a depressed macroeconomic environment have contributed to lower profits in the insurance sector

Developments in the economic environment have a direct impact on insurance output. This is reflected, for instance, in the current high volatility of output indicators and life insurance costs or the contraction in insurable business within non-life insurance. As regards the latter, the fall in output is significant in some of the main classes, even in those cases where insurance is mandatory, such as car insurance and insurance against accidents at work. This may be mainly explained by two overlapping factors:

- The emergence of operators with lighter and more flexible cost structures, which use alternative distribution channels (Internet and telephone), resulting in increased competition in the sector and putting pressure on fees;
- The fragile macroeconomic environment that has affected income, consumption and employment levels, thereby reducing insurable business.

In fact, there was a reduction in the average fee charged (price effect), as well as a decline in the total number of policies (volume effect) in the above-mentioned classes, which resulted in the lowering of risk premia and a decrease in turnover. This tends to negatively constrain the operational results of insurance companies, making their profitability more dependent on the financial component of the technical account and asset management, which is more significant during periods of heightened financial market volatility and uncertainty, as is currently the case. All these risks have already been identified and are being monitored by this sector's competent supervisory authority (Insurance and Pension Funds Supervisory Authority). They are also reflected in the report on Risk Analysis on the Insurance and Pension Funds Sector.

Despite their substantial medium and long-term benefits, regulatory and institutional changes in the near future may involve implementation risks and costs in the near term

In the recent past, international regulatory requirements governing the financial sector have become more stringent. These changes are seen across the financial sector and may lead to the need of balance sheet adjustments , given that substantial changes will be introduced in liquidity, capital and asset/liability assessment requirements, inter alia. In this context, regulatory arbitrage opportunities may emerge, namely as regards attempts to optimise results, capital, financing or liquidity, against a background of strong connections between the various financial sectors. It should also be noted that the high volume of new regulations impacts on the activity of institutions and may negatively affect entities with lower resources.

With regard to the banking sector, special mention should be made to regulatory changes under CRD IV/CRR (Capital Requirements Directive IV/Capital Requirements Regulation),[3] which will imply an adjustment by Portuguese banks, due to the more stringent capital requirements and the fact that a wider set of risks will be covered by the new international financial regulatory framework. These changes, which will enter into force on 1 January 2014, are aimed at increasing the quality of banks' own funds, introducing changes as regards the definition and requirements of own funds and, also, a series of macroprudential instruments to mitigate systemic risk. They include countercyclical capital buffers, a buffer rate for systemically important financial institutions and a systemic risk buffer. Furthermore, the recent Recommendation of the European Banking Authority assumes a capital preservation scenario according to which institutions must, as a rule, maintain their capital accumulated by 30 June 2012. In this context, the Portuguese banking system's own funds were substantially reinforced, in the wake of Banco de Portugal decisions, which prepared the ground for compliance with CRD IV/CRR requirements, despite the challenges that will arise from the implementation of transitional provisions. Furthermore, Banco de Portugal has been analysing system-wide capital preservation mechanisms.

The implementation of the Single Supervisory Mechanism with a view to achieving Banking Union, which aims at strengthening investors' confidence in the euro area and mitigating the effects of the interaction between sovereign risk and the banking system, poses additional major challenges.[4] Indeed, the Council Regulation conferring specific tasks on the European Central Bank (ECB) concerning policies relating to the prudential supervision of credit institutions was published on 15 October 2013. Pursuant to the Regulation, the ECB will carry out a comprehensive assessment of major banks, covering approximately 85 per cent of the euro area banking system, with a view to increasing confidence in the soundness and quality of euro area banks' balance sheets. This exercise includes three complementary pillars: a supervisory risk assessment, an asset quality review (to foster transparency as regards banks' exposure), and a stress test to gauge the ability of banks' balance sheets to withstand adverse scenarios. This exercise should be concluded before the ECB assumes its new supervisory tasks in November 2014. Following the exercise, the ECB will provide a single comprehensive disclosure of the results and any recommendations for supervisory measures to be undertaken.

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[3] Regarding the Capital Requirements Directive (2013/36/EU) and the Regulation on prudential requirements No 575/2013.

[4] For more details, see "Box 2.1 *Banking Union: the establishing of the Single Supervisory Mechanism and the role of the ECB*", Banco de Portugal, *Financial Stability Report - May 2013*.

As regards the insurance sector, the Solvency II regime will be applicable in the near future, with the aim of enhancing the protection of policyholders through a more robust, risk-sensitive system, in a more harmonised regulatory environment for all insurance companies operating in the European Union, which will introduce significant, wide-encompassing changes to the regulatory framework in force. In this context, structural changes are expected in terms of calculation of capital requirements, the valuation of assets and liabilities, the governance and reporting systems, whose effects have yet to be clearly determined, given that the final provisions on issues as relevant as quantitative requirements are still under development. Therefore, given that it is impossible in practice to fully implement the new regime in the short run, it will likely be postponed to 2016.

However, in response to the successive delays in the implementation of this regime, the European Insurance and Occupation Pensions Authority (EIOPA) plans to expedite the partial implementation, as of 1 January 2014, of the Solvency II regime requirements, whose degree of development has stabilised somewhat. These requirements should include Pillar II (qualitative requirements) and Pillar III (reporting and disclosure requirements) and will be substantiated in the form of guidelines addressed to national supervisory authorities. Bearing that in mind, the current regime (Solvency I) still applies, without prejudice to the guidelines established by EIOPA and their implementation under the regulatory framework of each country by national supervisory authorities.

Growing monitoring of pledged assets should lead to a decrease in uncertainty about bail-in and resolution regimes, but could hamper bank financing

Since the onset of the financial crisis, a number of entities at international level (including the European Commission) have aimed at promoting financial system stability by reforming financial services. In particular, the goal is to cover financial risks in general, thus preventing regulatory arbitrage.

In this context, a number of initiatives have been developed towards the monitoring of risks associated with financial intermediation involving entities and activities outside the regulated banking system (shadow banking). This includes activities involving the raising of funds through deposit-like instruments, the transformation of maturity and liquidity, the transfer of credit risk and high leveraging.

In terms of financial markets, the goals are increased transparency and a reduction on the counterparty risk through regulatory changes stemming from the implementation of the European Market Infrastructure Regulation (EMIR), namely as regards regulations on central counterparties and risk mitigation for OTC derivative contracts. This may have a substantial impact, namely in terms of collateral demand.

Demand for collateral has increased, due to not only bank financing but also the reinforcement of margining requirements for derivative contracts. Furthermore, perceived risk and recent legislation changes (CRDIV/CRR and Resolution Directive) have also resulted in greater demand for liabilities guaranteed by own funds. Against this background, given the prevailing uncertainty about the bail-in and resolution regimes, namely as regards issues related to the liabilities covered and their hierarchy, as well as the date and entry into force of these regimes, the high levels of asset subordination and uncertainty about its quantification could harm confidence in the banking system. The importance of such disruptions varies depending on the countries (and banks) and could constrain the relative costs of banks' financing instruments. In fact, these disruptions can impact on uncollateralised debt, deposit guarantee systems, the efficiency of bail-in policies and, ultimately, the way how markets associate this measure with a reduction in State guarantees provided to banks. Given that associated risks do not seem to be reflected in the price of uncollateralised debt and that assets available for uncollateralised debt issuance may become scarce, difficulties in raising funds pose a substantial risk.

In this context, by establishing that institutions shall disclose information on the assets pledged to own funding, the European Systemic Risk Board recommendations on pledged assets (asset encumbrance) should foster increased transparency, thereby contributing to a reduction in uncertainty about this issue (although tending to make funding more expensive for institutions with greater levels of asset subordination). The clarification on the bail-in and resolution regimes at European level is also crucial.

Sectoral interlinks warrant constant monitoring so as to mitigate possible risks of contagion and regulatory arbitrage

Interdependence relationships within the financial system and the way in which they are formed are crucial for financing system stability. In general, these interlinks stem from management strategies followed by major Portuguese financial groups. This is particularly relevant as regards capital management, intra-group liquidity and the raising/distribution of resources from saver sectors. These links pose challenges to financial sector supervision, given that prudential supervision of each sector may not be sufficient to ensure the stability of the financial sector as a whole. There is a risk that sectoral regulatory measures may result in a transfer of risks among sectors, which would compromise the initial goal of mitigating identified risks (see "Box 2.1 *Interconnectedness within the resident financial system*", in this Report).

BOX 2.1 | INTERCONNECTEDNESS WITHIN THE RESIDENT FINANCIAL SYSTEM

The recent financial crisis has highlighted the interdependencies within the financial sector, as well as their importance for the system's stability. Although links within the financial sector are an important element, as they give some flexibility to the definition of the business model, they require constant monitoring in order to mitigate possible contagion and regulatory arbitrage risks.

This interconnectedness may have two types of effects. If on the one hand it can be a contagion mechanism, on the other hand, it may also be useful to absorb shocks, which has been proven by the fall in external demand for domestic securities, that lead to an increase in investment in those securities by the resident financial sector. In effect, considering that a significant group of relevant countries for the Portuguese economy are also conditional on structural adjustment processes at the economic and financial level, and against the background of a decline in external financing to the Portuguese economy, resident agents have also reduced their investments abroad. Therefore, similarly to developments at the international level, the financial sector has adopted a more domestic perspective, enabling resident banking groups to adjust within their own economic group.

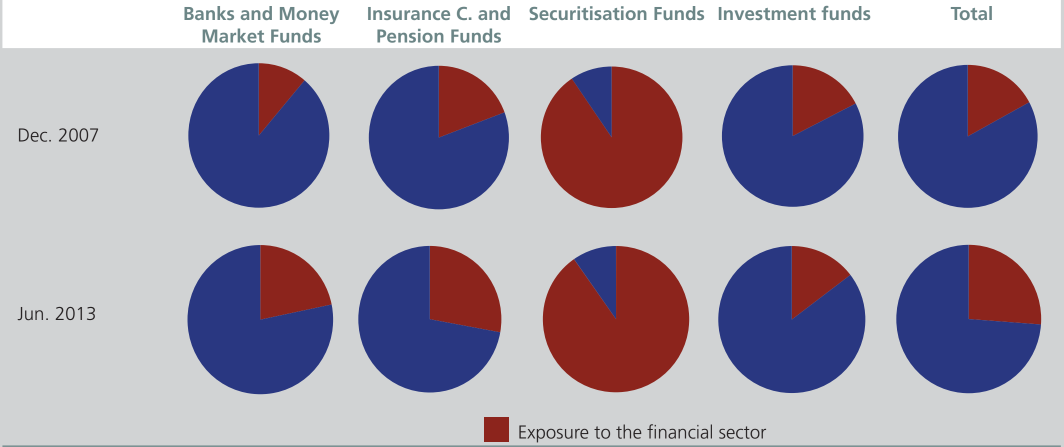
Interconnectedness within the financial system may be due to: (i) bilateral exposures, *i.e.* the most direct contagion channel; (ii) exposure to common risks; (iii) reputational risks. In addition, it is important to mention existing indirect exposures, in particular stakeholder relationships broadly based across the financial industry. In effect, in many cases, main national banks control major insurance corporations and pension fund management companies, as well as investment fund management companies operating in the national financial system, significantly influencing the business models defined by those entities.

In the recent past, exposures among national financial entities have increased considerably. In fact, exposure to the resident financial sector (measured as a percentage of total assets) grew from 17 per cent[1] at the end of 2007 to 26 per cent in June 2013, which corresponds to an important share of total assets and illustrates the relevance of existing links, as well as their recent developments.

As expected, due to its weight in the domestic economy, the banking sector concentrates the largest share of assets on national financial entities. Exposure to this sector rose from around €49 billion in December 2007 to approximately €117 billion in June 2013, mainly explained by an increase in inter-

Table 1

EXPOSURE TO THE FINANCIAL SECTOR | % OF TOTAL ASSETS



Source: Banco de Portugal.

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[1] For the purpose of this analysis, it has been purged of the effect of claims on the central bank.

-bank exposures. As a percentage of total assets, there was an increase of 11 percentage points (from 11 per cent to 22 per cent). Moreover, in June 2013, around 62 per cent of debt securities issued by banks were held in the portfolio of the resident financial sector, compared with 23 per cent in December 2007.

In addition, considering that, after the financial crisis, the interbank market and in particular non-collateralised financing ceased to be an alternative for bank funding, the physical assets held by the sector could be expected to increase. In recent years, the amount of loans granted by banks to the financial sector has declined while funding in the form of securities has increased substantially, which was related to the purchase of securities held by financial vehicle corporations and the purchase of banks' securities. This behaviour is partly explained by the need to obtain collateral for ECB funding. In this respect, repo and reverse repo operations, intended to obtain collateral for Eurosystem monetary policy operations within the scope of some financial groups should also be mentioned.

The absolute value of the banking sector claims on OFIs (other than insurance corporations and pension funds) increased by 81 per cent since late 2007, which was exclusively due to the 237 per cent rise in securitised assets. Even though the concentration of securitisation corporations and funds' claims on the national financial system has remained virtually unchanged, there is a sizeable increase in the absolute value of these investments (22 per cent), which was due to growth of credit securitisation activity during this period and also to the fact that these operations cannot be derecognised from the balance sheet.

Although the overall value of the assets held by the insurance and pension funds sector represents a rather lower amount than in other segments of the financial industry, it is important to highlight the predominance of the remaining national financial sector in the investment portfolio of these players. In fact, those investments represented 28 per cent of the total assets of the sector at the end of the first half of 2013, corresponding to a 9 percentage point increase since December 2007.

The behaviour of investment funds (excluding money market or securitisation funds) has been contrary to that observed in the other activity segments, as a result of their decreasing exposure to other entities in the national financial sector, which may be explained by changes in the investment policy of certain funds.

In spite of the risks to the financial system that may emerge from these links, reference should be made to the recent adoption of a set of measures intended to mitigate any potential systemic risks. For instance, new regulatory instruments have been introduced which consider, in a more explicit and integrated manner, the systemic risk resulting from interlinks within the financial system. These instruments shall materialise in the definition of ceilings to intra-financial sector funding (including banks, credit institutions, investment corporations, insurance corporations, funds, unregulated financial entities) which will make it possible to mitigate the concentration and liquidity risk, *inter alia*. Reference should also be made to the existence of concentration limits in investment portfolios, or provisions that desincentivate excessive concentration, which aim at promoting risk diversification.

In short, an increase in the interconnectedness of the national financial system has been apparent in the recent past. Although this has been more evident at the balance sheet level, it is interesting to stress the existence of other sources of possible contagion, such as reputational risk or the exposure to common risk factors. Also in this respect, reference should be made to exposures to other sectors and, in particular, to sovereign risk, which has shown considerable correlation with securities issued by the financial sector.

Without prejudice to the above, against the background of a sharp reduction in external financing sources available to national entities, it is interesting to also emphasise the positive role played by these mechanisms, facilitating the adjustment process of the national economy.

ARTICLES

III

A MACRO-PRUDENTIAL POLICY FOR FINANCIAL STABILITY

THE IMPLEMENTATION OF THE COUNTERCYCLICAL CAPITAL BUFFER: RULES VERSUS DISCRETION

OPTION TRADE VOLUME AND VOLATILITY OF BANKS’ STOCK RETURNS

A MACRO-PRUDENTIAL POLICY FOR FINANCIAL STABILITY*

*Rita Bessone Basto***

ABSTRACT

The recent financial crisis and its impact on the global economy led the analysis and policies conducted so far for financial stability to be questioned. In this context, there is a general agreement that risks related to excessive financial leverage and to signs of speculative bubbles were largely neglected in the period prior to the crisis. This fact has motivated a profound reform in financial regulation and supervision at the international level, aimed at promoting a more efficient identification and prevention of risks and of the various channels that facilitate their propagation. Macro-prudential policy, aimed at preventing and mitigating systemic risk, has a prominent role in these reforms. In this context, several countries have been developing methodologies and an institutional framework appropriate to the implementation of macro-prudential policy. In several countries, including Portugal, this function has been attributed to the central bank. This article analyses the role of macro-prudential policy in the new policy framework for financial stability and the challenges related to its implementation.

1. Policy framework

Since the eruption of the international financial crisis the question of financial stability has been at the heart of policy discussions in the international agenda. The years that preceded the crisis have shown that significant imbalances and vulnerabilities can be accumulated during periods of relative macroeconomic stability. In fact, a period characterised by reduced inflation and output stability, at least among advanced economies, can coexist with an excessive expansion of a particular sector, giving rise to an inefficient composition of output. The form by which this activity is financed can be the source of serious financial risks: overindebted agents and highly leveraged financial institutions with significant maturity mismatches in the structure of their balance sheets. Financial innovation and an insufficient regulation, by allowing the transfer of riskier activities out of banks' balance sheet and of their regulatory and supervisory perimeter, and their propagation throughout the financial system, have contributed to the greater leverage and to a difficult apprehension of existent risks.

The fact that these vulnerabilities have been transmitted globally, giving rise to a crisis of significant proportions, placed greater emphasis on the concept of financial stability. Therefore, it became the focus of attention of policymakers and analysts of monetary issues, in addition to the traditionally important concept of price stability. Central to this question is the need to develop a policy and institutional framework able to prevent and mitigate financial crises with the nature of that recently witnessed. Its answer demands not only an analysis of the factors that led to the accumulation of existent vulnerabilities, but also of those that led policy-makers and analysts to neglect its impact.

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* This article has benefited from comments from Francisco Augusto, Dina Batista, Diana Bonfim, Miguel Boucinha, Adelaide Cavaleiro, Graça Damião, Juliana Lascasas, Manuela Raminhos, Ana Margarida Ramos, Carlos Santos, Fátima Silva and Clara Soares. The opinions expressed are those of the author and not necessarily those of Banco de Portugal or the Eurosystem. Any errors and omissions are the sole responsibility of the author.

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Macroeconomic stability policies prior to the crisis

According to Blanchard *et al.* (2010 and 2013), the lack of a timely identification of existent risks resulted from the prevailing paradigm for macroeconomic stability, which relied essentially on monetary policy to guarantee price stability and on micro-prudential policy to ensure the solvency of the financial system, which proved to be insufficient to avoid serious systemic risks that undermined financial stability.

Monetary policy in the majority of advanced countries has essentially one goal, price stability, and one instrument, the central bank's reference interest rate. The credibility of the central bank, needed to anchor inflationary expectations, implied the avoidance of discretionary policies and the focus on the inflation rate as the main policy objective. Inflation, measured by the consumer price index, does not take into account the evolution of prices in financial and real estate markets. The numerous inflation-targeting, or very similar regimes, and the importance attributed to the independence of the central bank, as an instrument to provide credibility to monetary policy, are evidence of this policy orientation.

Implicit in this model were the assumptions that price stability was sufficient to guarantee output stability and that interest rates and asset prices were correlated through arbitrage mechanisms. As such, as long as the central bank could maintain inflation low, macroeconomic stability would be achieved. Since inflation could be controlled by the reference rate, the monitoring of other monetary aggregates or asset prices, namely credit growth, was seen as secondary. Given the assumption of arbitrage[1], and the control of current and future short-term interest rates, all other interest rates and asset prices would be determined accordingly. A sufficiently credible and predictable monetary policy, in order to anchor inflationary expectations, would ensure that control.

Even though many central banks did not follow this model strictly and considered other objectives besides inflation, these were attributed a secondary role.[2] There were also exceptions concerning the instruments used: namely, some emerging market economies introduced restrictions on credit growth and on foreign currency exposures, aimed at containing risks related to capital flows; and in Spain dynamic provisioning was introduced as a function of credit growth.

It is worth mentioning that there is a large debate on the interaction of monetary policy and financial stability[3], namely concerning whether monetary policy should react to the evolution of financial asset prices. Even though there are no definitive conclusions on this matter, Bernanke and Gertler (2011), for example, argue that financial instability is better prevented by a monetary policy targeting a low and stable inflation and that, in this context, the central bank should not react to asset prices, unless they affect inflation forecasts. As such, the insufficiency of the policy framework in the period prior to the crisis is not necessarily attributed to limitations related to the implementation of monetary policy, but to the lack of other policies aimed at preventing the accumulation of financial imbalances.

The function of financial regulation and supervision was limited at ensuring the solvency of institutions, with the purpose of avoiding disruptions caused by possible bank runs. The role of the central bank as lender of last resort and that of deposit guarantee funds contributed to this aim. Financial supervision, focused on the robustness of the individual institution, was justified through the correction of market failures arising from asymmetric information and other distortions. Its systemic and macroeconomic implications were not properly assessed. In addition, most of the regulatory requirements were directed almost exclusively at banks, on the assumption that financial markets could be disciplined through auto-regulation.

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[1] According to which long-term interest rates correspond to future short-term rates, adjusted by risk, and asset prices depend upon fundamentals (discounted and risk adjusted future payments on the asset).

[2] The ECB, for example, considers price stability as the main objective of the monetary policy. However, as long as price stability is assured, monetary policy can contribute to support other economic policies of the European Union. Moreover, the ECB's two-pillar approach considers the analysis of several indicators, namely credit. By contrast, the FED defines explicitly other objectives of monetary policy.

[3] See Gameiro *et al.* (2011) for a thorough analysis of this topic.

In this context, the role of fiscal policy was to ensure the sustainability of public accounts while leaving room for the automatic stabilisers to work. Ricardian equivalence and the inflationary impact of fiscal policy limited its role in providing an expansionary stimulus. For euro area countries, the limits defined within the context of the Stability and Growth Pact imposed an additional constraint on fiscal policy. The fact that these limits were surpassed in many countries contributed to the vulnerability of fiscal accounts, and to the greater financial instability during the crisis.

Notwithstanding the limitations of this policy framework, during some decades evidence seemed to confirm its efficiency, namely concerning the achievement of considerable progress in the control of inflation and in the promotion of macroeconomic stability. This period, considered by Bernanke (2004) as one of ‘great moderation’, was characterised by a significant reduction of business cycle fluctuations and by low and stable inflation, despite the strong growth of credit and historically low interest rates.

It is possible that low inflation is explained, to some extent, by globalisation and strong economic and productivity growth in emerging markets like China and India (IMF, 2006), which allowed advanced economies to import low-cost goods (imported deflation). On the other hand, the fact that monetary expansion translated into an increase in real estate and other asset prices might have limited its impact on the price of consumer goods. However, the contained impact of the stockmarket shock in 1987, of the dot.com bubble, and of the recent increases in oil prices, compared with the disruptive effects of similar shocks in the 1970s and 1980s, seemed to confirm that the policies implemented translated into significant progress in the control of inflation and were also appropriate to deal with shocks related to financial market vulnerabilities. The many crises of the 1990s were seen as exclusive phenomena of emerging markets, where the incapacity to manage the impact of capital flows was a characteristic of less developed financial systems.

It is worth mentioning that not all risks or vulnerabilities were ignored in the period prior to the crisis. In particular, those related to the significant and persistent global imbalances, characterised by a large US current account deficit and by the corresponding surpluses and accumulation of US dollar reserves in Asian emerging markets and oil exporting countries, were subject to a great debate and attention. Many analysts attributed to these imbalances the source of a future crisis.[4] This would be triggered by the lack of appetite of international investors to continue to hold assets denominated in US dollars, which would make the financing of the US deficit more difficult[5] and force a disruptive adjustment in the consumption and investment patterns of the US, with global consequences.

Even though this was not the cause of the crisis, which was triggered by developments in the US real estate subprime market, the excessive leverage prior to the crisis was attributed by many to the excess liquidity arising from the capital inflows from emerging markets in order to finance the US deficit. The fact that gross capital flows to the US, mainly from European countries, largely exceeded the net flows arising from emerging markets, might contradict the hypothesis of such a direct relationship between the financing of the US deficit and excess savings in emerging markets[6], without, however, completely dismissing the impact that global imbalances might have had on the liquidity conditions of the US economy.

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[4] See, for example, Roubini and Setser (2005) and Obstfeld and Rogoff (2004 and 2005).

[5] This impact would materialise through an increase in long interest rates, with a destabilising impact on the global economy.

[6] See, for example, Shin (2012) and Borio and Distyatat (2011), according to which an excessive ‘credit elasticity’, arising from financial innovation and insufficient regulation, had a more important role in providing the conditions for excessive leverage.

Current policy framework

The crisis revealed the flaws in the prevailing framework of macroeconomic and financial policies by showing that price stability can coincide with a severe situation of financial instability. The prices of financial assets can significantly deviate from fundamentals due to speculation. This speculation can be financed through excessive leverage, even in periods coincident with price stability. With an excessive reliance on credit securitisation and with their dissemination throughout the financial system, risks can easily reach systemic proportions.[7] In addition, with a greater complexity and diversity of financial products, markets can become quite segmented and the behaviour or some investors, following losses or due to uncertainty, can originate abrupt changes in asset prices. In those circumstances, asset prices and short-term interest rates cease to be correlated through arbitrage mechanisms and the control of the interest rate is no longer sufficient to ensure financial stability.

The prevailing paradigm also proved to be insufficient to minimise the impact of the crisis. A regulation focused on the solvency of the individual institution can even contribute to exacerbate the effects of the crisis. Strict capital requirements and rules of asset valuation at market prices pressured some institutions to massive asset sales (*i.e.* fire sales). The existence of significant maturity mismatches in banks' balance sheets, as a consequence of the lack of liquidity regulation, contributed to the greater financing needs of institutions and to precipitate these sales. The resulting drop in asset prices had a very negative impact on the balance sheets of other institutions. The uncertainty related to institutions' risk-exposure in a complex network of financial system interconnectedness, was at the source of the serious disruptions in the function of the interbank market. On the other hand, the low interest rates resulting from the prevailing monetary policy stance created little room for this policy to provide a monetary stimulus during the crisis. It is important to refer that, despite these limitations, central banks, through the implementation of non-standard monetary policy measures in order to ease the management of liquidity, had a major role in mitigating the effects of the crisis.

The crisis also evidenced the rapid transmission between financial system vulnerabilities and the real economy. As shown by the sovereign debt crisis and by the resulting fragmentation of financial markets in the European Union, the association between sovereign and financial risk can be very narrow in countries with serious macroeconomic imbalances and occur in both directions: a fragile system can precipitate a public intervention with major costs and macroeconomic imbalances, namely concerning public finances, can contribute to increase a country's risk premium and, consequently, the financing costs of national banks. These inter-linkages contributed to propagate the impact of the crisis even to countries where the banking system was not significantly exposed to risky financial assets.

As referred to by Agur and Sharma (2013), the insufficiency of traditional policies and of micro-prudential supervision to promote financial stability can be attributed to a regulatory gap caused by market externalities giving rise to an excessive pro-cyclicality and to the fragility of the system.

The limitation of these policies does not, however, imply that the new paradigm has to be characterised by radically different policies, but only that there is a need to fill the existent gap. Macro-prudential policy, with its cyclical dimension and focus on the system's interconnectedness susceptible to originate systemic risk, can, together with other policies, contribute to fulfil this gap.

In essence, the stance followed by the main policies prior to the crisis remains valid. Monetary policy should remain focused on price stability (even though it is admissible that this concept could be more encompassing than that of the consumer price index). In fact, the credibility achieved by many central banks in controlling inflation has facilitated the introduction of several non-standard monetary policy measures, in order to stabilise market conditions during the financial crisis. Regulation ensuring the solvency of financial institutions and the provision of guarantees to depositors remains essential to the confidence in the financial system. The role of fiscal policy concerning the consolidation of public accounts is even reinforced by the current crisis. However, it has become clear that this policy framework was not sufficient to ensure financial stability and that greater importance should be given to the systemic impact of risks on the financial system.

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[7] See Rajan (2005) for an analysis of the impact of financial innovation and securitization on risks to the financial system.

2. GOAL AND SCOPE OF MACRO-PRUDENTIAL POLICY

The main objective of macro-prudential policy is to contribute to financial stability through the prevention and mitigation of systemic risk, defined normally as the risk of disturbances in financial services due to the impairment in parts or in the totality of the system, with the potential to originate serious adverse consequences to the real economy.[8] The implementation of macro-prudential policy involves an analysis enabling the timely identification of risk factors and the definition and calibration of policy instruments to mitigate those risks.

According to De Nicolo *et al.* (2012) there are three types of externalities responsible for the system's fragility: (i) interconnectedness between institutions and markets, which are responsible for propagating shocks; (ii) strategic complementarities, which materialise through common exposures and imply a high level of correlation between the risks of different institutions; and (iii) fire sales of financial assets, with the potential to cause an abrupt decline in asset prices with a negative impact on the balance sheet of other institutions. The fact that markets do not have mechanisms to internalise these sources of risk or their systemic impact provides justification to macro-prudential regulation.

In addition to the structural dimension, evidenced by these externalities, systemic risks also have a time or pro-cyclical dimension. In fact, the factors responsible for financial system vulnerabilities have a tendency to accumulate during the expansionary phase of the cycle. Lower credit risk and higher valuation of collateral assets during the expansion of the business cycle contribute to credit growth and to its securitisation and dissemination through the financial system. The higher access to financing promotes investment in financial and real estate assets, easily giving origin to the emergence of speculative bubbles. By contrast, during the downturn, the reversal of these factors and a higher risk aversion contributes to depress economic conditions.

These characteristics of systemic risks also imply a two dimensioned macro-prudential policy. A structural, transversal component, which analyses the distribution of risks and interconnectedness in the system in order to mitigate risks in a given period of time, and a cyclical component, which analyses the evolution of these risks during the expansionary phase of the cycle and intervenes with the purpose of providing the system with a greater capacity to absorb losses during the downturn.

These two components allow the distinction of two intermediate objectives normally attributed to macro-prudential policy: (i) to contribute to reinforce the resilience of the financial system and (ii) to contribute to reduce the amplitude of the financial cycle, avoiding excessive leverage during the upswing and minimising the negative impact of the downswing (*i.e.,* leaning against the financial cycle).[9] Even though these two goals are not mutually exclusive, in the sense that most instruments contribute to both, this distinction is important as it contributes to increase the awareness of macro-prudential authorities of the endogenous and pro-cyclical nature of factors which can originate systemic risks. In addition, the definition of intermediate targets confers a greater operationality and transparency to the policy.

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[8] FSB-IMF-BIS (2011) and Committee on the Global Financial System (2010 and 2012).

[9] There may be other classifications of intermediate targets. For example the ESRB (2013) defines five intermediate targets: (i) mitigate and prevent excessive credit growth and leverage; (ii) mitigate and prevent excessive maturity mismatch and market illiquidity; (iii) limit direct and indirect exposure concentration; (iv) limit the systemic impact of misaligned incentives with a view to reducing moral hazard; and (v) strengthen the resilience of financial infrastructures.
http://www.esrb.europa.eu/pub/pdf/recommendations/2013/ESRB_2013_1.en.pdf

The implementation of macro-prudential policy implies the timely identification of systemic risks and the estimation of its impact. This implies: (i) the identification of the accumulation of vulnerabilities, (ii) the identification of the level after which these vulnerabilities may trigger a crisis, and (iii) knowledge of the propagation channels of risks in the financial system and in the overall economy.

Recently, there has been a considerable volume of research on the measurement of systemic risks, namely concerning the selection of a group of indicators capable of signalling the accumulation of risk, the estimation of the probability of occurrence of a crisis, given that information, and on modelling the inter-linkages between the financial system and the real economy, with the purpose of determining the impact of a crisis and identifying institutions of greater systemic importance. A significant part of this analysis is based on existent models, now adapted to macro-prudential purposes, giving rise to a significant diversity and multiplicity of models.[10]

In spite of significant progress in this area, the measurement of systemic risk continues to present several challenges due to the uncertainty surrounding the functioning of the financial system, resulting from its complexity and limited available information. Firstly, the distinction between the accumulation of imbalances and movements caused by long-term trends or cyclical fluctuations determined by fundamentals is not straightforward. As pointed out by Dell'Ariccia *et al.* (2012) only one third of excessive credit growth events have resulted in financial crises. For the remainder of the cases, some are followed by long periods of below-trend economic growth while others contributed to financial deepening and to long-term growth.

Secondly, the fact that a crisis is a rare event implies that the information needed to determine its probability of occurrence requires long time series, not always available. Also, given the innovation and the dynamism that characterise the financial system, very long time series may not be adequate to characterise the actual inter-linkages between the financial sector and the real economy. According to Handen (2013) and Haldane (2013), the incapacity, in a context of uncertainty, to form a priori assumptions concerning the probabilistic distribution of future events, may undermine the credibility of many models.[11]

These limitations in systemic risk measurement also condition the implementation of macro-prudential policy, namely concerning the estimation of the parameters of an equation linking the activation of the instruments to a systemic risk measure (or to a threshold of a given set of relevant indicators) allowing the definition of "rules" to guide policy decisions.

Related to this issue there is a general debate on "rules" versus "discretion" in the implementation of macro-prudential policy. Given the preventive nature of macro-prudential policy, it seems natural that, while contributing to reduce the dynamism of economic activity at times when risks have not yet materialised, this policy is subject to confrontation. On the other hand, limiting the amplitude of the financial cycle during a downturn normally implies the imposition of less strict regulatory requirements at a time when risks are evident, causing a possible conflict with the immediate objectives of micro-prudential policy.[12] The definition of a rule relating the activation of the instrument to a set of indicators capable of signalling risks could confer more credibility to macro-prudential policy, making it more transparent and predictable.

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[10] See, for example, Blancher *et al.* (2013) and Bisias *et al.* (2012) for a literature review on risk measurement models and methodologies. These articles analyse 23 and 31 systemic risk models, respectively, including: Macro Stress Tests (which analise the system's resilience to shocks), Network Analysis (which analyse the system's interconnectedness in order to detect common exposures or systemically important institutions), VAR models (which capture the correlation between economic and financial variables), Early Warning Indicators (which analise the capacity of several indicators to signal a crisis) and general equilibrium models (which simulate the functioning of the financial system and its adjustment to shocks). See also Silva *et al.* (2011) and Saldias (2012) for the monotoring of systemic risk based on Debt Contingent Analysis (a methodology combining balance sheet information and market data to obtain a set of indicators of financial risk).

[11] Haldane (2011) suggests that, in the presence of uncertainty, a simple rule, based on intuition and informed judgment, performs better than a rule based on the optimisation of more complex models. The argument relies on the fact that these models are derived from a probability distribution obtained from a small sample (given the limited information, considering that a crisis is a rare event) and, therefore, not representative of the reality they intend to explain.

The difficulty in establishing a mechanical relationship between a risk measure and the activation of instruments does not, however, undermine its efficacy nor does it confer to the policy an exclusively discretionary character. It only implies that, similarly to many other decision processes, the definition of guidelines in this area requires a significant degree of judgment. In this context, there is a relative consensus on the fact that the decision-making process should be based, as much as possible, in the analysis of several available indicators and models leaving, however, room for some subjectivity and discretion. The definition of simple rules, based on an informed judgment, supported by the available analysis (but without the mechanism of a rule resulting from the optimisation of a more sophisticated but uncertain model) may constitute an adequate compromise between the two different visions. These rules will simultaneously provide credibility and transparency to macro-prudential policy, as well as more flexibility to adjust the decision-making process with respect to more experience and new information gathered. The greater discretion will also allow taking into account qualitative information, normally absent from risk measuring models. More research in this area and more experience with the usage of instruments will gradually confer more robustness to the rules.

In the meantime, the limitations concerning risk measurements can be reduced by combining information from different models or indicators. For example, slow-moving indicators, based on data from banks' balance sheets, while good to identify the accumulation of risk factors and vulnerabilities, may be less able to signal the materialisation of these risks. By contrast, the occurrence of a crisis can be better identified through high frequency indicators, such as financial market data, and the combination of information from both types of indicators can be more enlightening. The great variety of risk measures provided by various models can capture different perspectives of existent risks.

The regulation of Basel III concerning the countercyclical capital buffer[13] can be an example of a good compromise between rules and discretion. The rule defines the imposition of a capital buffer during expansionary periods, being the credit-to-GDP gap the recommended indicator to trigger the policy. However, both the calibration of the instrument and the threshold for its activation are under the discretion of macro-prudential authorities. Unless there is more empirical analysis to identify a given threshold as a robust signal of the occurrence of a crisis, it may be premature to establish a more precise rule.

3. MACRO-PRUDENTIAL POLICY INSTRUMENTS

The implementation of macro-prudential policy implies the definition of a set of instruments and application conditions which, according to its intermediary targets allow: increasing the resilience of the financial sector and reducing the fluctuations of the financial cycle. In essence, most of the instruments defined for these purposes are not different from those used by micro-prudential policy. In operational terms, the main distinction is the fact that macro-prudential instruments are activated as a function of the cycle or of systemic risks, and not due to the characteristics or risk profile of a given institution.

The choice of the instrument to activate and its calibration requires knowledge of its transmission channels in order to determine its impact. As in the case of risk analysis, the impact of the instruments is also subject to uncertainty. First, the limited experience and the fact that the activation of those instruments has normally coincided with the implementation of other policies, makes it difficult to isolate their impact. Furthermore, its efficacy can be undermined by indirect unintended effects. These can emerge from the interaction and substitutability between the regulated and non-regulated sector (*i.e.* shadow banking) and from the resulting possibility of regulatory arbitrage. For example, restrictions imposed on a given sector may provide incentives for redirecting activities to other, non-regulated sectors, given rise to the accumulation of vulnerabilities in these sectors, undermining the impact of the regulatory measure on the mitigation of systemic risks.

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[12] Even though the need to ensure the solvency of the individual institution is not questioned by macro-prudential policy, this policy may advocate less strict requirements during the downturn in order to facilitate economic recovery, under the assumption that the institutions' capacity to absorb losses is strengthened due to the higher regulatory requirements imposed during the upswing.

[13] See the Basel Committee on Banking Supervision (2010).

As such, when analysing the impact of macro-prudential instruments it is important to consider also potential unintended effects that may undermine their efficacy, as well as the fact that the transmission mechanism of these instruments may not be static, evolving with innovation and the structure of the financial system.

Even though the uncertainty with respect to the impact of the instruments can make a precise calibration more difficult, these limitations can be overcome with experience and, eventually, with some gradualism in their activation, allowing the gathering of experience with a smaller risk of error.

A number of central banks and international organisations have developed research in this area with the purpose of defining a set of instruments able to prevent and mitigate systemic risks, and its application conditions.[14] These macro-prudential toolkits define a set of indicators that may be used to trigger policy intervention and criteria for the selection of instruments. These criteria are normally defined according to their relative costs and benefits, in order to ensure the proportionality between the costs of the activation of the instruments and the benefits arising from the correction of the targeted distortions. These toolkits allow reducing the limitations of having a merely discretionary policy, namely related to the lack of transparency and credibility. In addition, by clarifying the usage of instruments for macro-prudential purposes, they allow avoiding potential conflicts with the micro-prudential authority related to the competence to activate instruments due to the similarity of instruments of the two policies.

The selection of a particular instrument depends, more immediately, on risk factor, but also on the intermediate target to achieve. When the target consists in the reduction of the cyclical component of systemic risks, the instrument should be adjusted counter-cyclically, *i.e.* activated in the expansionary phase of the cycle, when vulnerabilities are increasing, and deactivated in the downturn when there is the danger that too strict requirements may destabilise the financial conditions of the economy. Therefore, the achievement of that target requires instruments allowing a greater flexibility in their implementation. Instruments consisting in significant capital increases, given the time implicit in raising such amounts of capital, may be less adequate for this purpose than, for example, limits to financial sector exposures or marginal capital increases.

By contrast, instruments aimed at enhancing the resilience of the financial sector and at mitigating risks of a more structural nature, although normally reinforced during the upswing, do not require as frequent changes, so the flexibility of adjustment conferred by the instrument is a less relevant criterion.

Instruments can be applied to all banks in general or to specific subsets exposed to greater risks. In addition, stricter requirements may be applied to institutions of greater dimension or more interconnected in the financial system due to their systemic importance.

Generally, macro-prudential instruments can be grouped into three broad categories: (i) capital or liquidity requirements; (ii) limits to exposure concentration or to credit growth, and (iii) criteria concerning credit eligibility. The first two categories of instruments are aimed at controlling the behaviour of institutions, while the latter affects more directly the behaviour of debtors.

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[14] See for example the work undertaken by the Bank for International Settlements, the European Systemic Risk Board (with the participation of several central banks of the European Union), the Bank of England and the Bank of Sweden (Bank of England, 2011 and Berntsson e Molin, 2012).

Capital and liquidity requirements, by promoting the accumulation of a capital or liquidity buffer in order to allow a better absorption of losses by banks during a downturn, have a direct impact on the resilience of the banking sector. These instruments may also contribute to reduce the amplitude of the cycle through their impact on credit growth.

Within capital requirements, instruments may consist, for example, in a countercyclical capital buffer or a systemic risk buffer. Stricter capital ratios may be applied to total financial assets or only with respect to the exposure to a specific sector, such as the real estate, in the event that risk factors originate in that sector.

The transmission mechanism of these instruments depends, to a great extent, on banks' decisions in order to meet stricter capital requirements, *i.e.* whether higher capital ratios are met by raising capital or by reducing credit exposures. If banks choose to raise capital, the effect on credit growth occurs through the impact of banks' decisions on the cost of capital, which is transmitted to credit conditions. If banks decide to meet regulatory requirements through asset reductions, there is a direct effect on the supply of credit. In this case, the impact of capital requirements would be very similar to that of restrictions directly imposed on asset exposures or on credit growth.

Liquidity requirements affect the composition of banks' assets and liabilities. These instruments can consist of a countercyclical liquidity buffer, liquidity coverage ratio or margin and haircuts requirements. These requirements impose upon banks a reduction of their share of short-term financing and/or a reduction in the maturity of loans. The transmission mechanism occurs through the effect that these changes in the structure of banks' balance sheets have on the supply and relative costs of the various assets, in particular, credit.

With limits on the concentration of bank's exposures or on credit growth the aim is normally to reduce the accumulation of vulnerabilities associated with these exposures. Within this category, instruments may include limits to credit expansion, limits to foreign currency exposures or limits to sectoral concentration of banks' assets. These instruments affect directly the supply of credit, or of the underlying asset. By allowing a reduction of vulnerabilities in the composition of banks' portfolios, these instruments also contribute to the resilience of the financial system.

The restrictions concerning credit eligibility criteria aim at reducing credit by limiting some debtors' access to financing. The examples more commonly used of these instruments are limits on loan-to-value ratios (LTV) and on loan-to-income ratios (LTI) or debt service-to-income ratios (DSTI). By limiting the access to credit, these instruments contribute to reduce debtors' vulnerabilities – in fact, in some countries, these instruments have been used to promote financial consumer protection. By reducing the probability of credit default and of the implied losses (as imposed limits imply that losses are better covered by the value of the collateral – in the case of LTV – or by the income of the debtor – in case of LTI) the instruments also contribute to enhance the resilience of the financial sector. These instruments, in particular LTV, apply more frequently to mortgage credit.

It should be mentioned that with the definition of fixed limits for these instruments, their impact is naturally pro-cyclical, as both the collateral value and the income of the debtor are generally higher during the upswing. As such, their implementation with countercyclical purposes implies, not only adjustments with respect to the phase of the cycle, but also some attention with respect to the methodologies concerning the valuation of the denominator at the time of granting the credit. In fact, a valuation of real estate assets at market prices during the upswing may not be enough to cover future losses if default occurs at a time of significant deterioration of the collateral value. As opposed to most instruments, which apply to total assets in banks' portfolios, LTV and LTI (or DSTI) generally apply to new credits.

As already mentioned, a particularly important aspect to consider in the implementation of macro-prudential policy is the fact that this policy can promote unintended effects which undermine the efficacy of policy instruments. These effects are generally manifested through the transfer of activity from the regulated sector to other non-regulated. For example, the reduction of credit supply implicit in most of the above mentioned instruments can be replaced by the supply of credit by other institutions not subject to the regulatory requirements or by branches of foreign banks. In what concerns sectoral capital requirements, banks themselves may replace credit to the regulated sector with credit to other sectors. In addition, if the numerator of LTV is not carefully defined, these instruments can be circumvented by a second mortgage.[15]

Generally, the narrower the regulatory perimeter, the greater the probability of leakages. Therefore, the enlargement of this perimeter and a greater coordination of macro-prudential policies among countries can promote policy efficiency. As such, the macro-prudential policy also considers the development of instruments particularly directed at other financial intermediaries and in order to improve market structures.

The efficiency of macro-prudential policy can also be enhanced if the substitutability and complementarities between different instruments is adequately explored. The combination of several instruments, if appropriately articulated, can minimise the occurrence of unintended effects. For example, the simultaneous imposition of capital requirements and LTV allows combining the effect of the former on credit supply with the restrictions on the access to credit promoted by the latter, which can apply to total credit transactions[16], thereby leaving a smaller room for the non-regulated sector to absorb excess demand derived from the sole imposition of capital requirements.

4. INTERACTION WITH OTHER POLICIES AND GOVERNANCE

As discussed, macro-prudential policy aims at enhancing the resilience of the financial sector and reducing the amplitude of the financial cycle. However, many other policies can interfere with these goals, which raises the question of how to articulate them. Even though this interaction can give rise to conflicts of interest, in general, the complementarities and some degree of substitutability between policies can contribute to reinforce financial stability.

The liquidity conditions of an economy, and their impact on aggregate demand, essentially of the responsibility of monetary policy, are determinant to the economic cycle. Micro-prudential policy, responsible for ensuring the solvency of the individual institutions, also contributes to the resilience of the sector as a whole. Fiscal policy, in addition to its importance for financial stability, can, through taxation, affect financial transactions and the profitability of institutions. Therefore, the orientation of these policies is not irrelevant to the achievement of macro-prudential objectives.

In the same vein as an accommodative monetary policy – by contributing to the reduction of financing costs – can promote leverage and speculative bubbles, the reversal of this policy stance can be the most obvious way to contain excessive credit growth. In fact, higher interest rates due to a tighter policy can contribute to the contraction of credit demand and to a reduction of asset prices and collateral values. However, as witnessed by recent events, a credit expansion can occur in periods of macroeconomic stability. In those circumstances, the strictness of monetary policy needed to contain the expansion of credit may conflict with its main objectives. These conflicts are greater the lower the synchronization between the financial and the business cycle, which normally occurs when credit growth is concentrated on a specific sector.

Therefore, when excessive credit growth is caused by the expansion of aggregate demand and coincides with a period of economic overheating, monetary policy may be the most appropriate to promote financial stability. However, considering its wider scope, this policy is less able to deal with sectoral or more specific financial risks. For example, using monetary policy to contain an asset bubble may imply a too high interest rate in order to compensate for the returns of investing in these assets. Even admitting some impact of credit growth, such a monetary policy stance would entail significant costs in terms of economic growth and employment.

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[15] Although not an unplanned effect, LTV and LTI may be questionable in terms of equity, by affecting more directly some segments of the population (e.g. young people in search of the first home or lower income people).

[16] If LTV are imposed as a financial consumer protection measure, in the context of banking conduct supervision, their applicability is more general, including credit granted by branches of foreign banks.

In a situation of economic stability and growing financial imbalances, macro-prudential policy may be more suited to mitigate systemic risks and provide the needed adjustment in the financial sector, without unduly affecting the rest of the economy.

Micro-prudential supervision focused on the strength of the individual institution, is essential to guarantee the resilience of the system as a whole. However, it is possible that some conflicts with macro-prudential policies occur, due to the different perception of risks of both policies. In particular, micro-prudential analysis, based on balance sheets of individual institutions, does not take into account risks arising from their collective behaviour or from the interconnectedness in the system. Conflicts between both policies are more likely during the downturn, when risks materialise, as macro-prudential policy might advocate less strict regulatory requirements in order to prevent compromising the financing of the economy, while allowing an adequate absorption of losses by the financial system.

Contrasting with monetary policy, fiscal policy can have a narrower scope and be targeted towards more specific goals. For example, through taxation it is possible to reduce incentives to certain exposures or behaviour by agents. In fact, since the financial crisis, there have been proposals to consider some fiscal measures as macro-prudential instruments, such as a tax on certain activities or a countercyclical credit tax (Jeanne and Korinek, 2010). There is, however, doubts concerning the efficacy of these measures in containing in time the emergency of vulnerabilities that may trigger a crisis.

The role of fiscal policy may be particularly important in the resolution of a financial crisis, when the role of other policies is more reduced. The greater consolidation of fiscal accounts during the upswing is indispensable to create room to provide financial support to the system or an economic stimulus, in order to minimise the costs of a financial crisis.

Even though the deactivation of macro-prudential instruments during the downturn may facilitate the recovery, these instruments are not adequate to manage crisis situations, in particular, those related to the liquidation or restructuring of insolvent institutions. However, macro-prudential analysis, focused on the inter-linkages between the financial system and the real economy, by estimating the impact of the crisis and the potential systemic impact of some institutions may provide an important contribution to the management of the crisis, essential to restore normal financial market functioning conditions.

As evidenced by the recent sovereign debt crisis, fiscal imbalances can have a destabilising effect on financial markets. Even though the correction of these imbalances is not of the competence of macro--prudential policy, these vulnerabilities should be taken into account by this policy both in the analysis of risks and in the activation of the instruments (if it is considered that risks to the financial system may be mitigated through a reduction of bank's exposures to sovereign debt).

This interaction between policies in the promotion of financial stability may imply the need of some coordination and management of conflicts of interest. In this sense, the implementation of macro--prudential policy requires an institutional framework allowing efficient governance and conferring legitimacy to act in a preventive manner to contain risks and vulnerabilities which may be more directly of the competence of other policies. In addition, a good communication strategy, by conferring greater transparency and predictability to macro-prudential policy, can contribute to enhance its credibility and to a better governance.

In euro area countries the coordination between prudential policies and monetary policy at the national level is limited, given the lack of national autonomy with respect to the latter. Although these policies are not substitute, macro-prudential policy can constitute a way to affect the liquidity conditions of an economy without monetary policy autonomy. In this context, it can contribute to reduce the fragmentation of financial markets in the euro area, which undermines the transmission mechanism of monetary policy.

Taking these considerations into account, the authority to implement macro-prudential policy should be conferred upon an institution with independence and capacity to analyse systemic risks and act timely in their prevention and mitigation. Central banks are naturally the appropriate institutions to have this authority, given their competence in the analysis of macroeconomic and financial developments and their independence and experience in the implementation of monetary policy. In addition, when the central bank is also the micro-prudential authority, the competence for the use of its instruments is also useful for macro-prudential purposes. It is, nevertheless, important that at the internal level of the institution there is a separation of these functions, in order to ensure autonomy in the pursuit of different goals.

According to a European Systemic Risk Board (ESRB) recommendation[17] – the entity responsible for the coordination of macro-prudential policies in the European Union – several countries have attributed the authority of macro-prudential policy to the central bank or to a committee in which the central bank has a prominent role (for example, in the United Kingdom).

In Portugal this responsibility was conferred upon Banco de Portugal. Its experience with monetary policy and its responsibility concerning micro-prudential supervision will permit a better management of the interaction of various policies in the promotion of financial stability.

5. CONCLUSIONS

The implementation of macro-prudential policy requires the early identification of risks and their systemic impact, the definition of appropriate and correctly calibrated instruments to mitigate these risks and governance capable of taking decisions whenever necessary, independently of lack of public support or of possible conflicts with other policies.

An analysis allowing a timely identification of risks and their impact is thus a critical aspect of macro-prudential policy. The innovation and the complex network of interconnectedness in the system, despite their contribution to the efficiency of financial intermediation, can make risks more difficult to detect. For example the securitisation of credits with increasingly opaque structures, together with their dissemination through the system, makes it difficult to identify and localise risks.

Many of the channels allowing leverage and the propagation of risks occur through the non-regulated sector. These institutions, by capturing financing with very similar characteristics to those of deposits and by transforming the maturity of the assets and liabilities can behave very much like banks, being, however, outside the banks' regulatory perimeter. Besides, they contribute to reduce the efficacy of macro-prudential policy instruments, through regulatory arbitrage.

Therefore, the efficiency of macro-prudential policy is related to the reforms of the functioning rules of the non-regulated sector, namely concerning greater transparency and the limitation of the interconnectedness with the banking sector. There are currently some regulatory initiatives in this context, at the international and European Union level, which together with the more encompassing reforms aimed at establishing a greater segmentation between the regulated and the non-regulated sector[18], should deserve due attention.

In spite of the difficulty in detecting sources of risk in financial systems, their neglect prior to the crisis cannot be solely attributed to this fact, but also to the underestimation of their consequences. In fact, the high credit growth, its excessive securitisation and the macroeconomic imbalances resulting from overindebtedness were easily observable. However, their potential systemic impact was overlooked.

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[17] See http://www.esrb.europa.eu/pub/pdf/recommendations/2011/ESRB_2011_3.en.pdf

[18] See for example Liikanen report in the European Union, the Volcker rule in the USA and the Vickers rule in the UK.

There are several factors which can contribute to limiting the action of macro-prudential authorities in face of vulnerabilities in financial systems. The preventive nature of macro-prudential policy implies the activation of instruments at a stage where risks have not yet materialised, being therefore not perceptible for economic agents. The efficacy of the policy in preventing a crisis cannot be verified either, since the crisis has not occurred. In addition, although macro-prudential policy aims at reducing systemic risks, with impact on the general economy, its instruments, as opposed to those of monetary policy, can be targeted more narrowly at specific vulnerabilities or sectors. This fact may render the policy questionable in terms of equity. The wide scope of its main objective also implies that its implementation may interact with that of other policies, possibly creating some tensions.

Therefore, in addition to a governance ensuring independence and legitimacy of the macro-prudential authorities, it may be important to establish a mechanism limiting a possible negligence in the presence of future vulnerabilities. The commitment towards a rule that, even with some subjectivity and discretion, establishes a relationship between some relevant indicators and a stance by policy-makers may limit a possible future inertia.

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THE IMPLEMENTATION OF THE COUNTERCYCLICAL CAPITAL BUFFER: RULES VERSUS DISCRETION*

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ABSTRACT

One of the key lessons of the global financial crisis is that policymakers need instruments to mitigate the potential impact of a build-up of risks in the financial system. Against this background, the countercyclical capital buffer will be one of the main instruments available to macroprudential authorities. According to the Basel Committee, the calibration of this buffer will be guided by the calculation of the deviations of the credit-to-GDP ratio from its long-term trend. In this article, we perform a sensitivity analysis to the calibration of this so-called "buffer guide", showing that the results are sensitive to the methodologies used and to the assumptions made. Furthermore, we analyze several other indicators with leading and near-coincident properties, which may potentially be relevant in guiding buffer decisions. Our analysis confirms that the credit-to-GDP gap is amongst the best performing indicators in predicting banking crises, but shows that other indicators also display good signalling properties. As such, a large set of quantitative and qualitative information should be considered when setting the countercyclical buffer rate.

1. INTRODUCTION

The global financial crisis highlighted that there were some important missing elements in the international regulatory framework of the financial system. The Basel III package intends to fill some of the most relevant gaps identified in this framework, most notably by providing tools to address the risks arising from excessive leverage and maturity mismatches. While microprudential regulation and supervision will be substantially enhanced with this reform, the first steps in setting up an international framework for macroprudential regulation were also taken. The crisis made clear that even if banks are unquestionably sound when taken individually, systemic risks may still be building up. As such, traditional microprudential regulation, focused essentially on the solvency of each financial institution individually, must be complemented by macroprudential oversight. The latter should focus on collective behaviours that potentially increase the risk within the financial system, such as excessive leverage, interconnectedness, or common exposures to similar asset classes or funding sources. Even if these behaviours do not imply a significant increase in risk for each individual institution, their systemic nature may still have important impacts on the stability of the financial system and, ultimately, on long-term economic growth.

Against this background, one of the most important tools available to macroprudential authorities will be the countercyclical capital buffer (CCB). According to the Basel Committee (2010), the main objective of the CCB is to ensure that banks hold a sufficiently large buffer of capital that allows them to absorb

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unexpected losses when faced with a negative systemic shock, thereby not compromising lending to the real economy. To achieve that, banks should build up a capital buffer during periods of excessive credit growth. This build up should also allow achieving the CCB's secondary objective, which is to somehow mitigate the magnitude of these periods of exuberance in credit markets.

When policymakers consider that risks are building up, they may choose to activate the CCB (or to use other macroprudential instruments which are better suited to deal with the risks identified). This activation implies requiring banks to hold additional capital buffers, on top of other regulatory capital requirements. Decisions on the CCB should be revised quarterly, so the build up of the buffer may be gradual. Later on, the accumulated capital buffer may be released under two distinct scenarios. On the one hand, risks previously identified may dissipate gradually, thus allowing for a gradual release of the buffer. On the other hand, a crisis might occur, thus requiring the prompt release of the buffer to cover potential bank losses and maintain the flow of credit to the economy.

One of the main challenges for macroprudential authorities will be to decide when to activate the buffer, *i.e.*, when is credit growth "excessive"? As discussed by Reinhart and Rogoff (2011), it is easy to fall into a "this time is different" fallacy, believing that strong credit growth is associated with the convergence to a new equilibrium, rather than to an unsustainable increase in risk. Moreover, the decision on when to release the buffer is also not straightforward, as dealing with expectations during a period of distress may be highly challenging.

Given these limitations, it is possible to argue that the implementation of the CCB should be, at least to some extent, based on rules. This is important not only to promote the accountability of the macro-prudential authority, but also to anchor the expectations of banks and other agents and to mitigate a potential inaction bias of macroprudential authorities. Furthermore, an important dimension of this new macroprudential tool is that, for the first time, a reciprocity regime was established between different jurisdictions. For instance, if the macroprudential authority in a given country determines the activation of the buffer, all banks with exposures in that country will have to build up that buffer, regardless of their country of origin. The mandatory reciprocity between macroprudential authorities makes it desirable that there is some common quantitative understanding about how to manage the CCB.

However, the balance between rules and discretion must be carefully managed in what concerns the implementation of the CCB. Despite the advantages discussed above, a fully rules-based system would be unfeasible, given the complexity of the phenomenon in question. A wide array of indicators should thus be considered to support the decisions taken. Further, judgement is a key element in the decision process, most notably given the uncertainty on the calibration and effectiveness of this new instrument.

In this article, we provide evidence to illustrate the need to complement rules with discretion when setting buffer rates. According to the Basel Committee (2010) and Drehmann *et al.* (2010), the deviation of the ratio between credit and GDP from its long term trend is the indicator that better performs in signalling the need to build up capital before a crisis, when examining several indicators for different countries. Given this evidence, the Basel Committee (2010) proposes that buffer decisions are anchored on the magnitude of these deviations (though recognizing the need to complement the decisions with other indicators, as well as with judgement). In this article, we perform a thorough sensitivity analysis on the estimation of this credit-to-GDP gap and discuss some of the shortcomings of this methodology. Our estimations show that the results may be sensitive to the methodology and assumptions considered. In addition, we examine the predictive power of several other macroeconomic and financial indicators. Our results confirm that the credit-to-GDP gap is among the best performing indicators in predicting banking crises with some anticipation. This does not mean, however, that this indicator will perfectly signal any future banking crises. Furthermore, other indicators, such as house price indicators and credit growth, also display good signalling properties. As such, a thorough and balanced assessment of a broad set of indicators is essential in driving buffer decisions.

The article proceeds as follows. In section 2 we provide further detail on the design and implementation of this new macroprudential tool. In section 3, we assess the performance of the credit-to-GDP ratio as an indicator to signal banking crises, performing a thorough sensitivity analysis on different possible calibrations. In section 4, we evaluate the performance of a set of alternative macroeconomic and financial indicators, both for the build up and the release decisions. Finally, in section 5 we summarize our main findings.

2. THE COUNTERCYCLICAL CAPITAL BUFFER AS A KEY MACROPRUDENTIAL POLICY TOOL

2.1 Guiding principles for the operation of the countercyclical capital buffer

Most banking crises were preceded by periods of excessive credit growth (Borio and Drehmann, 2009, Moritz, and Taylor, 2012, Reinhart and Rogoff, 2011). While ex-post, with the benefit of hindsight, it is fairly easy to recognize that this growth was unsustainable, the same cannot be said when developments are still building up. While sometimes this excessive credit growth is assessed with concern by policymakers and analysts, in many other situations, developments are perceived as the convergence to a new steady state, with higher potential economic growth (Kindleberger and Aliber, 2011). Against this background, it is easy to fall into the "this time is different" fallacy (Reinhart and Rogoff, 2011) and to give in to the inaction incentives prevailing in such periods. The global financial crisis showed that this paradigm is unsustainable, and that policymakers need tools to act countercyclically. Some authors argue that monetary policy may have a role in this domain, by leaning against the wind (Agur and Demertzis, 2013, Lambertini *et al.*, 2013). However, more important than that, a consensus emerged on the need to establish a macroprudential policy framework, equipped with a toolkit to manage systemic risks in the financial system.

Against this background, the countercyclical capital buffer is a key macroprudential instrument, introduced by the Basel Committee as part of the Basel III regulatory framework. Its main objective is to ensure that banks have an adequate capital buffer to absorb losses when a systemic crisis occurs, thus mitigating the potential impact on the economy (*i.e.*, avoiding excessive restrictions on banks' ability to continue to grant credit to the economy). Furthermore, as banks will build up this buffer when credit growth is deemed excessive by authorities, the CCB will possibly also help to smooth the credit cycle.

The CCB will be implemented as an additional Core Tier 1 capital requirement, varying between 0 and 2,5 per cent of risk weighted assets.[1] When banks fail to meet the CCB capital requirements, they will not be faced with the same restrictions as when they do not meet the core capital requirements. Instead, they will face restrictions on the distributions to shareholders and employees, for instance.

The decision to activate the CCB should be guided by the deviation of the ratio between credit and GDP from its long-term trend (credit-to-GDP gap). However, given that there is not a one size fits all approach, this decision must be complemented with the analysis of many other indicators and balanced with informed judgement. For the release phase, judgement becomes even more critical. Indeed, while Drehmann *et al.* (2010) find that the credit-to-GDP gap is the best performing indicator to signal in advance the build up of systemic risks in a wide set of crises and countries, these authors are not able to find any single variable that indicates so consistently when to release the buffer. It should be noted that the buffer may be released under two very different circumstances. On the one hand, the release may be implemented when risks materialize and a systemic crisis emerges. In this case, financial market indicators and other quasi-real time indicators should be the most helpful ones in indicating when to release the buffer, though the precise identification of the timing of this decision may be challenging (releasing too early may harm market expectations, eventually leading to self-fulfilling losses, while releasing too late may hinder the loss absorbency role of the buffer). On the other hand, the risks identified may never materialize (possibly because macroprudential policy was effective in mitigating the risks), thus leading to a gradual release on the buffer.

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[1] The buffer can be set above 2,5 per cent, though this is the limit for (mandatory) international reciprocity.

It should be noted that the effective release of the buffer might be challenging in some circumstances, as discussed, for instance, by Hanson, Kashyap, and Stein (2011). On the one hand, when risks materialize, there might be potential conflicts between macro and microprudential goals. More specifically, microprudential supervisors, coupled with market participants and rating agencies, may encourage banks to build up capital to improve their resilience, thus acting procyclically. On the other hand, when risks do not materialize and dissipate only gradually, macroprudential authorities may be afraid of releasing the buffer too soon, thus postponing this decision for longer than what would be optimal from a theoretical perspective.

Given the insurmountable uncertainty that policy makers currently face regarding the effectiveness of this new macroprudential policy instrument in achieving its objectives, it is reasonable to argue against an entirely rules-based approach. Rules are essential to allow for transparency in communication, thus helping to manage the expectations of all involved stakeholders. Further, it is important to note that this is the first instrument in financial regulation where a fully-fledged reciprocity mechanism is in place. This requires that there are some common rules to facilitate communication between the authorities involved. However, the role of judgement will need to assume a critical dimension, both in the build-up and in the release phase. First, it is unfeasible to find an indicator (or set of indicators) that perfectly signals when to activate and deactivate the buffer in all countries and in all possible periods. Though the credit-to-GDP gap has proven to have good leading properties in a large number of countries (Drehmann *et al.*, 2010), it does not perform well in all crises episodes studied (nor will any other indicator). Furthermore, it has been very challenging to find indicators that accurately signal the correct moment to release the buffer. It goes without saying that the specific calibration of buffer decisions presents even more challenges.

Given these limitations, more research is needed to better guide the decisions of macroprudential authorities. With this article, we hope to contribute in at least two ways. First, we illustrate the sensitivity of the buffer calibration to different specifications of a rules-based system. Second, we analyze a broad set of indicators that may be helpful in signalling the build-up and the release of the buffer. Moreover, we also illustrate possible buffer trajectories for the Portuguese economy in the last decades.

All in all, the current state of knowledge supports a constrained discretion approach to buffer decisions and, more generally, to macroprudential regulation. A quantitative approach can only be a starting point for a more thorough analysis, where judgment plays a key role. Furthermore, it should not be forgotten that the countercyclical capital buffer is only one of the many instruments that macroprudential authorities may use. When facing systemic risks, these authorities will have to assess which of the instruments available will be better suited to mitigate those risks and to improve the resilience of the financial system and of the economy. In a broader perspective, macroprudential authorities will also have to balance their decisions with those of central banks (as there might be synergies and conflicts with monetary policy) and with microprudential regulators (as most of the instruments available to macroprudential authorities are managed by these regulators, which may have, at times, conflicting views and goals).

2.2 A brief overview of a rapidly expanding literature

The literature on the countercyclical capital buffer (and, more generally, on macroprudential policy) is fairly recent. Borio (2003) was one of the first to discuss a potential role for macroprudential policy, arguing that the regulatory and supervisory frameworks should encompass financial stability concerns. After the collapse of Lehman Brothers, a broad consensus emerged internationally on the need to endow authorities with specific tools to mitigate risks to financial stability. The countercyclical capital buffer was proposed by the Basel Committee in end-2010 against this background, thus being one of the pillars of the new macroprudential toolkit.

The Basel Committee's proposal was accompanied by an analytical document by Drehmann *et al.* (2010). These authors test several variables, including indicators of aggregate macroeconomic conditions, banking sector activity and cost of funding. These indicators are assessed using a signal extraction methodology. While for the build-up phase indicators should have strong early warning properties, in order to allow authorities to activate the buffers well in advance of the materialization of risks, for the release phase the indicators should be coincident or near-coincident with the financial cycle. The authors conclude that the credit-to-GDP gap is the best performing indicator for the build up phase, displaying the lowest noise-to-signal ratio, while still managing to predict more than 2/3 of the crises in the sample. In turn, credit spreads and loan losses seem to have some useful properties in signalling the release, even though these findings are based on very small samples. Drehmann *et al.* (2011) confirm and expand the previous results of Drehmann *et al.* (2010). For the build-up phase, the credit-to-GDP gap continues to be the best indicator, achieving the lowest noise-to-signal ratio. A group of second-best variables is composed of credit growth, the difference between credit and GDP growth, equity price growth, property prices and their gap. Market-based indicators perform poorly, displaying very high noise-to-signal ratios. For the release phase, none of the macro variables or banking indicators signals enough crises. Market-based indicators show better results for the release, but with many false signals. No single variable manages to predict enough crises and maintain an adequate precision in terms of noise-to-signal ratio at the same time, thus demonstrating the need to rely on a broad set of indicators, as well as on some guided judgement. More recently, Drehmann and Juselius (2013) find that the debt service ratio also has good signalling properties ahead of financial crises.

Alessi and Detken (2011) suggest a different approach to evaluate the performance of indicators when setting buffer rates. These authors propose a loss function for the policy-maker that combines the frequency of type I and type II errors with the policy-maker's aversion to such errors. Based on that, the authors compare the losses of using or ignoring the indicator and compute a usefulness level. While the noise-to-signal ratio is completely independent from the level of aversion to the two types of errors, the major contribution of this usefulness indicator is the consideration of the preferences of each policy-maker. With this more encompassing methodology, the authors test the best indicators for asset price booms using a quasi-real time signalling approach and the latest vintage of available data. The results show that, for the entire group of countries considered, the best indicators for predicting costly asset price booms are cumulated real consumption growth (over 6 quarters), the nominal long term interest rate gap and the real equity price gap. When considering a smaller group of countries from the euro area, the best indicators are the global private credit gap, the nominal long term interest rate gap and the M1/GDP ratio gap. For the euro area countries, financial indicators seem to outperform real variables (namely consumption and investment).

Behn *et al.* (2013) evaluate a set of domestic and global financial indicators, including banking sector variables, using data for 23 EU Member States. In a multivariate early warning model framework, they find that, in addition to the already mentioned credit variables, equity and house prices, and banking sector indicators display good forecasting properties.

Chen and Christensen (2010) stress the fact that coincident indicators will have to be used for the release of the buffer. These may include the performance of the banking sector (earnings, losses and asset quality), the cost and availability of credit (funding spreads), prices of assets (real estate and equity) as well as other measures of financial intermediation. Still, some of these indicators, when used individually, may not provide the best signals. Indeed, when combined, their predictive capabilities increase significantly, as also shown by Borio and Drehmann (2009).

In sum, the credit-to-GDP gap seems to perform well as a leading indicator of banking crises in various countries, even though many other indicators will have to be considered jointly in the analysis. However, Repullo and Saurina (2011) argue that the credit-to-GDP gap suggested by the Basel Committee may not work as intended, enhancing the pro-cyclicality that the buffer was supposed to mitigate. Their argument is based on the fact that credit usually lags the business cycle, thus taking some time for the indicator to react to a downturn. The fact that the variable is a deviation of a ratio with respect to its trend compounds the problem. These authors show that GDP growth and the credit-to-GDP gap are negatively correlated (the hypothetical buffer and GDP growth are also negatively correlated), so when economic growth is high the indicator signals a reduction of the buffer and when GDP growth is low, capital requirements increase. Repullo and Saurina (2011) provide an alternative indicator to support buffer decisions: the deviations of credit growth with respect to its long-term average. They conclude that credit growth appears to be a good indicator for the build-up phase, while not promoting the pro-cyclicality of the minimum capital requirements. In turn, Edge and Meisenzahl (2011) discuss the potential costs of linking the implementation of the buffer to the credit-to-GDP gap. These authors argue that the gap is an unreliable real-time measure, mainly due to ex-post revisions and to the instability of end-of-sample trend estimates. These problems lead to many false positives, *i.e.*, the indicator estimated in real time signals several periods of excessive credit, which are not confirmed *ex-post*, with longer time series. This might generate unnecessary constraints on bank lending.

Countercyclical macroprudential instruments are a relatively new concept. As such, there is virtually no empirical evidence that allows assessing its effectiveness. One of the few exceptions is the dynamic provisioning system implemented in Spain in the late 1990s. The main idea was to require banks to build up a buffer of own funds using retained profits in good times, which can be used in bad times to cover the realized losses. Jiménez *et al.* (2012) analyze three policy experiments in Spain (2000, 2005 and 2008), one of which implemented during "bad times". The main result is that countercyclical bank capital buffers produce positive effects both on firm-level and aggregate credit through the smoothening of credit cycles. The results show that bank pro-cyclicality can be mitigated with these buffers due to the lower accumulation of risks in good times and the support of bank lending during bad times. In turn, Drehmann and Gambacorta (2012) simulate the policy implementation for the Spanish economy. They show that the effects on bank lending are material, indicating that the countercyclical capital buffer scheme may reduce credit growth during the build up phase and attenuate credit contraction with its release. Exploring variations in bank-specific capital requirements imposed by UK regulators, Francis and Osborne (2012) find that countercyclical capital requirements may not effectively limit credit growth if banks are able to fulfil stricter requirements with lower quality and less expensive capital (as opposed to high quality common equity).

Horváth and Wagner (2013) show that countercyclical capital instruments reduce the impact of shocks on the economy. However, they may also increase systemic risk, by providing the incentives for banks to become more correlated. As such, there might be important interactions between countercyclical tools and those addressed to mitigate systemic risk.

3. THE PERFORMANCE OF THE CREDIT-TO-GDP RATIO AS AN INDICATOR TO SIGNAL THE NEED TO BUILD-UP THE BUFFER

In this section, we focus our analysis on the credit-to-GDP gap, given its prominent role in the implementation of the countercyclical capital buffer. We begin by describing the methodology proposed by the Basel Committee to compute this indicator. We also describe the data used in our estimations. We present the baseline estimation of the buffer guide and then we perform an extensive sensitivity analysis on several parameters underlying the computations of the buffer.

3.1 Calculating the buffer guide

The starting point for decisions regarding the implementation of the countercyclical capital buffer will be the credit-to-GDP gap, also called the "buffer guide". According to the guidelines of the Basel Committee, the gap between the ratio and its long-term trend is transformed into a buffer recommendation following three steps. First, the ratio between aggregate credit to the non-financial private sector (using the broadest credit aggregated available) and nominal GDP is computed. Second, the trend of this ratio is estimated, using a one-sided Hodrick-Prescott filter.[2] Finally, both the upper and lower boundaries for the variable are set up. The buffer size will be 0 per cent at the lower boundary and linearly increase up to 2,5 per cent as the level of the credit-to-GDP gap approaches the higher boundary:

$$\begin{cases} 0 & \text{if} \quad z_t < L \\ \dfrac{z_t - L}{H - L} 2,5 & \text{if} \quad L \le z_t \le H \\ 2,5 & \text{if} \quad H < z_t \end{cases}$$

where z_t represents the credit-to-GDP gap and L and H denote the lower and upper bounds for the gap, which correspond to the minimum and maximum values of the buffer, respectively (the Basel Committee's guide presents in its calculations L=2 and H=10).

Further remarks are warranted on the use of the Hodrick-Prestcott (HP) filter. This filter is a statistic tool that allows for the separation between the cyclical and the trend components of a time series. By using this detrending method on the credit-to-GDP, one can extract its trend and determine the gap between the observed value and the corresponding trend value for every observation. A crucial component of the HP filter is its smoothing parameter λ. This parameter changes the calculations by affecting the linearity of the trend component, *i.e.* for larger values of λ the filtering technique returns a more linear trend. The value suggested by the Basel Committee (2010) is λ=400.000. According to Ravn and Uhlig (2002), λ should be adjusted according to the frequency ratio of observations, using the rule λ=1.600(freq), where "freq" stands for the ratio of frequencies. Assuming the financial cycle to be four times longer than the business cycle, this frequency ratio is 4, which results in a smoothing parameter of approximately 400.000 (Drehmann *et al.*, 2011).

This choice of λ implies that the trend becomes more linear, changing very slowly as new data becomes available, thus making it harder to predict turning points in the cycles. This may present an important problem, given that the buffer decisions for a certain point in time may not be the most adequate if the early years of the sample are keeping the trend from adapting to recent events and/or structural shifts. A possible solution is to consider a moving sample with fixed size, ensuring that older data is removed from the window of observations and that recent data gets more weight in the determination of the trend.

To evaluate the real-time accuracy of the indicator, the gap should be calculated using only information available at the time, which means that the trend cannot be determined based on a full sample of data (*i.e.*, a one-sided filter is computed). By applying the Hodrick-Prestcott filter recursively to the data available for each point in time, one can surpass this problem and simulate the construction of a buffer as if it were in real-time. Still, the estimations for the most recent period of the sample may not be the most accurate, as discussed by Edge and Meisenzahl (2011), due to the so-called end point problem. Predicting future values of credit and GDP and incorporating them in the sample could help to overcome this, though at the cost of introducing extra uncertainty and noise (Gerdrup *et al.*, 2013, present a proposal to implement this approach).

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[2] As discussed later, using a one-sided filter implies that only the information available up to a given moment in time is used.

3.2 Data

One of the objectives of this study is to evaluate the implementation of the buffer scheme based on the credit-to-GDP gap, as well as identifying other indicators well suited to guide buffer decisions. As such, it is important that the analysis is conducted in a way that allows for a comparison between the different "test subjects" (in this case, the historical data of the various countries for which the buffer was calculated). Therefore, our priority was to gather data series for each country that would allow for adequate consistency and comparability across countries.

Quarterly credit data was collected from the "Long series on credit to private non-financial sectors" (BIS).[3] In turn, GDP data was collected from Thomson Reuters, being based on national official statistics. This ensures that all the credit-to-GDP series are identical and provide the same information for all countries considered, allowing the analysis to focus on the predicting capabilities of the indicator. For each country (Belgium, Finland, France, Germany, Ireland, Italy, Portugal, Spain and United Kingdom), all available data was considered when creating the final dataset. The countries were selected based on data availability constraints. Our objective was to have long and comparable time series for different countries.

Quarterly GDP was annualized using information from the last four quarters in order to create a yearly sum of flows. Even though the Basel Committee guidance does not state it explicitly, the example provided in the guidance document also uses this transformation for GDP data.

In order to test the usefulness of the credit-to-GDP gap and of the other indicators analysed, it is necessary to identify in which periods the buffer should have been activated (periods in which there was a generalized increase in domestic credit and/or in which several imbalances were building up in the financial system and in the economy). Against this background, we use the database compiled by the ESRB/IWG Expert Group on Guidance on Setting Countercyclical Buffer Rates. This database was based on banking crises data compiled in Babecky *et al.* (2012), based on input from the Heads of Research of the Eurosystem. The database was recently updated with contributions from the ESRB/IWG Expert Group (for further details, see ESRB, 2014). This database considers two different definitions of crises: one with actual banking crises and another which also includes episodes of heightened vulnerability which could, ex-post, have justified the implementation of macroprudential tools, even if no crisis effectively occurred.

For instance, for Portugal, it was included one additional stress episode that was not effectively a crisis, but in which sizeable vulnerabilities were building up. Indeed, in the late 1990s/early 2000s, domestic credit developments may have generated sizeable vulnerabilities in the economy, though it is hard to distinguish, even *ex-post*, to what extent these developments were reflecting the convergence to a new equilibrium, related with the introduction of the euro. In this period, there was significant credit growth and increasingly large deviations in credit to GDP. Current account imbalances widened and house price growth was significant. Though it is possible that these developments may have reflected the convergence to a new steady state, it is possible that, in some dimensions, their magnitude was somewhat excessive, leading to the creation of some structural imbalances (*e.g.*, indebtedness ratios became amongst the largest in the EU). These imbalances were not only internal, thus intensifying the vulnerabilities and limiting the ability to adjust to potential shocks. As no crisis occurred, it is difficult to precisely date this vulnerability period. Based on available evidence, the period 1999Q1 – 2000Q1 was classified as a stress event in which, with the benefit of hindsight, the occurrence of an endogenous or exogenous shock could have originated an abrupt adjustment of underlying vulnerabilities.

In our analysis, we consider the broader definition of crises, including heightened vulnerability periods, in addition to the crises actually observed. For robustness purposes, we also present some results with the stricter crises definition.

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[3] http://www.bis.org/statistics/credtopriv.htm

3.3 Buffer guide estimation

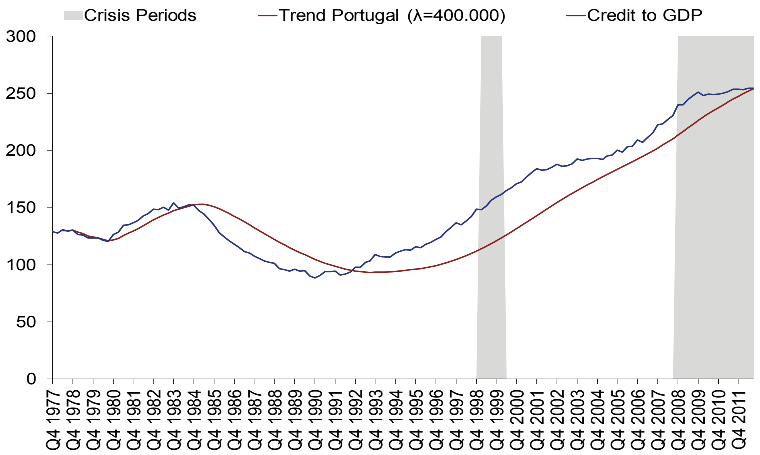
We compute the credit-to-GDP gap for a group of 9 countries (Belgium, Finland, France, Germany, Ireland, Italy, Portugal, Spain and United Kingdom), calculated recursively with all the available data and using λ=400.000, *i.e.*, according to the guidance of the Basel Committee. We test whether this gap works as a leading indicator of the financial stress periods identified in the crises database.

In chart 1, we illustrate the credit-to-GDP ratio for the Portuguese economy and its trend, using the Basel Committee's calibration. The stress or crises periods are identified in grey. Considering data since 1970, there is a long period in which the credit-to-GDP remains above the long term trend (since the early 1990s, starting in 1992Q2). This fact results in an active buffer recommendation that is kept for almost 20 years, as illustrated in chart 2. Of course, this is a static exercise. The activation of the buffer could possibly have mitigated credit growth during this long period, thereby leading to its release.

The results for Portugal suggest that the credit-to-GDP gap may lead to confusing signals when the financial system and the economy undergo structural changes. Indeed, the Portuguese financial system

Chart 1

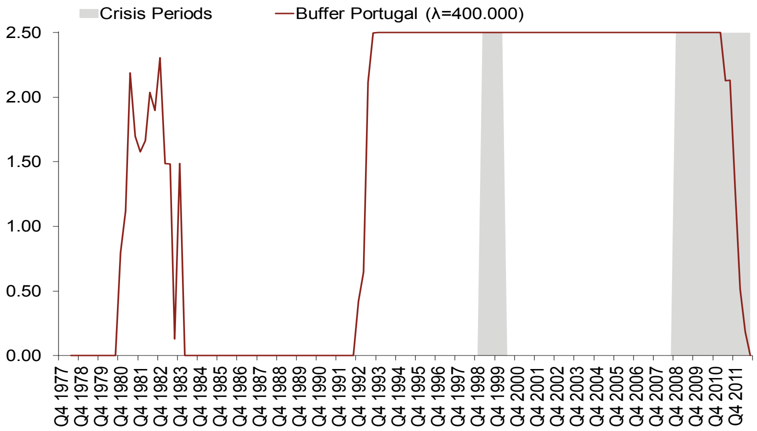
CREDIT-TO-GDP TREND – PORTUGAL | PER CENT



Sources: Thomson Reuters and authors' calculations.

Chart 2

BUFFER RATE | PER CENT



Sources: Thomson Reuters and authors' calculations.

underwent significant changes in the early 1990s as a result of a liberalization and privatization process. Most state-owned banks were privatized and interest rate and credit ceilings were gradually abandoned. Reserve requirements were also significantly lowered, though very gradually.[4] Given this, it is possible to argue that, at least to some extent, the large and persistent credit-to-GDP gap reflects a structural change in the economy. In such circumstances, it may be very hard to distinguish the building up of vulnerabilities from the convergence to a new steady state, most notably in real-time.

3.4 Evaluation methodology

Though the visual inspection of the figures above for each country could provide some insights on the ability of the credit-to-GDP gap to signal banking crises, a more structured evaluation approach may make this assessment clearer.

The first step in our evaluation approach is to determine when can a signal be considered useful. The criteria used to determine what is a "good" signal is defined as a recommendation to accumulate a buffer 4 to 12 quarters prior to the crisis starting date. The choice of the minimum time threshold is related to both the lags in data disclosure and the need to give some time to banks to adopt the regulatory recommendation to build up a buffer (the Basel Committee suggests that the recommendation to build up a buffer should allow for a one year implementation horizon, given that adjusting bank capital ratios in a shorter horizon could be unfeasible without disproportionate costs)).[5] In turn, the choice of the maximum time threshold (12 quarters) is related to an expectable loss of forecasting power when using longer horizons, increasing the uncertainty that policymakers face.

We put the indicator to the test, expecting it to provide a positive signal in all sequential quarters prior to the start of the crisis event (*i.e.*, in the 12 to 4 quarters before the start of the crisis). This ensures that weak (not persistent) signals are discarded, while imposing a stricter goal for indicator performance and keeping only strong and persistent deviations from the trend as signals. At the same time, we focus on predicting the beginning of the crisis (the first crisis quarter alone), as the macroprudential objective is to prepare for the stress period before it starts. This implies that the indicator should issue signals in the 4th, 5th ... 11th and 12th quarters prior to the crisis starting date. Additionally, we exclude from this test the 3 quarters immediately before the crisis starts (since it would be too late to activate the buffer), as well as the whole crisis period (where indicator signals would have no purpose since the crisis is already ongoing).

In order to evaluate the indicator's performance, we use the AUROC method (DeLong *et al.*, 1988). To do so, the procedure that we followed consisted on setting slightly increasingly larger thresholds for buffer activation (reference values for the indicator, which if surpassed would represent the issuance of a signal). For each threshold, we gathered the signals that the indicator would issue in the dataset. Each increase in the threshold makes the criteria for signal issuance stricter, and lowers the number of signals that the indicator issues during the sample period. This ensures that some false signals that were appearing due to the low threshold start to disappear as the threshold increases, leaving only stronger signals. Still, an excessively high threshold carries with itself a very strict rule for signalling crisis events that can delay, or even miss, the identification of a true signal.

For example, we can consider two possible thresholds for the credit-to-GDP gap: 3 p.p. and 5 p.p. When using the lower one, the indicator signals a crisis every time its value is higher than 3 p.p.. If we consider the second threshold, only in the periods in which the credit-to-GDP gap is higher than 5 p.p. the indicator issues signals. Therefore, all the observations with a credit-to-GDP gap between 3 p.p. and 5 p.p. represent signals of an incoming crisis with the calculations for the first threshold, but disappear when we consider a higher and stricter threshold. Some of these signals could be false signals (with no crisis occurring), which means that the first threshold was possibly too relaxed and allowed more false positives (type I error), but at the same time they could also be true positive signals that are discarded with the more restrictive threshold, resulting in false negatives (type II error). Given this, it is important to evaluate the indicator along a wide range of thresholds and see how it fares as a whole.

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[4] For further details, see Antão *et al*. (2009).

[5] This recommendation is consistent with that foreseen in the EU Capital Requirements Directive approved in 2013.

Starting with a very relaxed (very low) threshold, and considering increasingly more restrictive ones, we classify indicator signalling behaviour as:

- True Positive (TP): If the indicator issues a positive signal and, in fact, a crisis occurs 4 to 12 quarters afterwards.
- False Negative (FN): If the indicator does not issue a signal when it should, due to an incoming crisis.
- True Negative (TN): If no signal is issued and there is no crisis in the next 4 to 12 quarters.
- False Positive (FP): If the indicator issues a signal but there is no crisis starting in the next 4 to 12 quarters.

FOR EACH THRESHOLD, A MATRIX OF SIGNALS AND CRISES IS ESTIMATED:

		Crises Events	
		Crisis	No Crisis
Signals	Signal Issued	True Positive	False Positive
	No Signal Issued	False Negative	True Negative

When combining all the results for each threshold, one can compute "Sensitivity" and "Specificity", two measures of performance for binary classification tests. These can be related to the true positive[6] and false positive rates[7] being the true positive rate equal to Sensitivity and the false positive rate equal to (1-Specificity). These relations can be plotted, resulting in a Receiver Operating Characteristic (ROC) curve. Visually, this is a way to interpret the performance of the indicator by comparing it to the expected result of a random decision (represented by the 45° line). By randomly signalling a crisis event, one expects the true positive rate and the true negative rates to be equal (the signals should be balanced between hits and misses). Chart 3 plots the true positive and the false positive rates for each threshold. The 45° line connects the points in which the 2 rates equal each other, resulting in the visual representation of the random signal. To be useful, an indicator must manage to perform better than the 45° line result, by achieving a higher area under the curve.

By calculating the area beneath the ROC curve (AUROC), an evaluation measure can be attained. This measure will represent the quality of the indicator as a whole in predicting the stress event. It is more than a measure of a rules-based mechanism with a fixed threshold, as it gathers the information from a wide variety of thresholds and delivers an aggregate measure of its quality to predict this specific stress event. In the case of the credit-to-GDP gap (full sample calculations with a smoothing parameter λ=400.000), the ROC curve is always superior to the 45° line, which results in an AUROC of 0,7679 (Chart 3). This means that the indicator is useful in signalling the occurrence of periods of financial stress. The credit-to-GDP gap also performs well for Portuguese data, achieving an AUROC of 0,7703 for the baseline calculations (with a lead of 4 to 12 quarters) (Chart 4).

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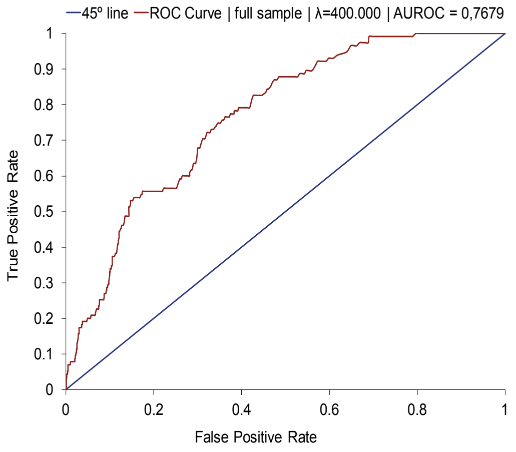
[6] True Positive Rate = TP/(TP+FN)

[7] False Positive Rate = FP/(FP+TN)

Chart 3

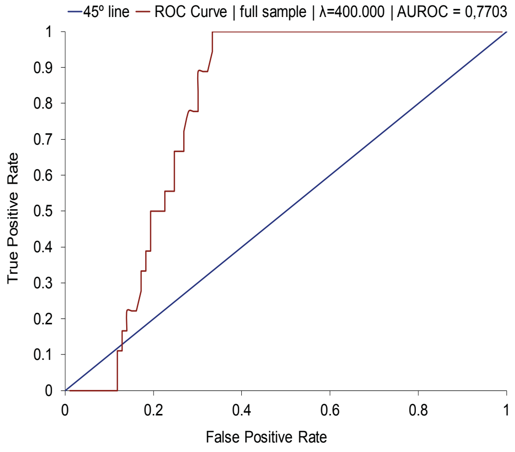
ROC CURVE – CREDIT-TO-GDP GAP



Sources: Thomson Reuters and authors' calculations.

Chart 4

ROC CURVE – CREDIT-TO-GDP GAP – PORTUGAL



Sources: Thomson Reuters and authors' calculations.

3.4 Sensitivity analysis

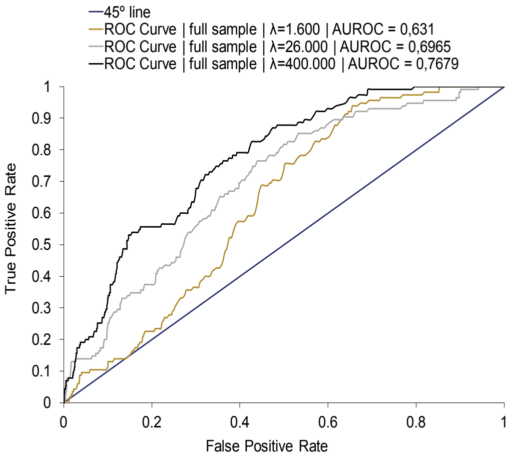
The results presented above reflect the calibration recommended by the Basel Committee. However, it is possible that the results change when different assumptions are considered. To test this, in this subsection we present the results of a sensitivity analysis performed on the choice of the smoothing parameter λ and on using moving windows of data (which entails ignoring older observations in the estimation of the most recent periods, to deal with possible structural breaks).

We consider first the process of detrending the credit-to-GDP series with a different smoothing parameter. With lower λs, the HP-filter trend becomes less linear and the gap variable changes accordingly. This procedure has significant effects in the buffer guide.

Chart 5 shows that, in the case of the credit-to-GDP, the higher smoothing parameter results in a more useful indicator (evaluated by the AUROC). Visually, one can also see that the ROC curve for λ=400.000 is almost always above the other two. Notice that each combination of false positive rate and true positive rate reflects the setting of a determined threshold, and that different thresholds result in different

Chart 5

ROC CURVE – CHANGES IN λS



Sources: Thomson Reuters and authors' calculations.

combinations of true positive and false positive rates. So, this means that for almost all considered thresholds, the indicator calculated with λ=400.000 provides a higher true positive rate (for each false positive rate) and, therefore, has a better performance.

When all the available data at each moment is considered in the estimation, the long term trend is updated every period with a new observation, allowing for a recursive calculation. This ensures that all the data available influences and contributes to the desired long term trend. However, it also implies that all the considered information is relevant, which may not be the case. Data from 40 years ago may not be comparable or relevant to today's values, so using such information may bias the trend towards an outdated reference point, most notably if there are structural breaks.

To mitigate this problem, we test the estimation based on a moving dataset that excludes older data when updating the series with new observations (maintaining a fixed size, ideally long enough to achieve the long term trend's reference capabilities). We test three different sizes for this window: 40, 60 and 80 quarters (10, 15 and 20 years of observations, respectively). As before, we analyze the performance of the credit-to-GDP gap when predicting the starting point of a crisis with a lead of 4 to 12 quarters (Table 1). It should be noted that while considering moving windows may be useful to mitigate potential problems related to structural breaks, it also implies that, in some cases, full credit cycles are not being taken into account, given that its average duration is relatively long (Drehmann *et al.*, 2011).

The results for calculations with moving windows of data result in more flexible trends, which lead to a lower range of values for the gap indicator. As seen in table 1, the moving window calculations also grant good "scores" in terms of AUROC. However, it is the full sample that manages to achieve the best results for almost all smoothing parameters (the only exception is for the sample with 80 quarters window for a smoothing parameter of 1.600). The longer period of data considered in the full sample calculations results in a better suited long-term trend and higher AUROCs. The best overall performance is achieved when combining the full sample of data with a smoothing parameter 400.000.

Chart 6 confirms that both 60 and 80 quarters windows fail to achieve better results than the full sample calculations in terms of AUROC score. It should be recalled that the ROC curve is calculated using a wide variety of thresholds. More restrictive thresholds should result in less signals (both positive and negative) and so, less true and false positive rates. This means that, from bottom to top along the y-axis, we can see the links between sensitivity and specificity for a series of thresholds (decreasingly restrictive). If we focus on the ROC curves for true positive rates (Sensitivity) higher than 0,5, we can see a significant difference in the positioning of the functions and direct our analysis to a specific group of thresholds which grant at least 0,5 true positive rate without using a loose threshold (*i.e.*, a false positive rate below 0,5). Despite being clearly visible that the full sample function is almost always above the other two, in some parts of this section the full sample's result is surpassed by the one from the 60 quarter window. When desiring a very high true positive rate (between 0,8 and 0,9), without excessive false positives (false positive rate lower than 0,5), the 60 quarter moving window sample achieves a slightly better performance.

Table 1

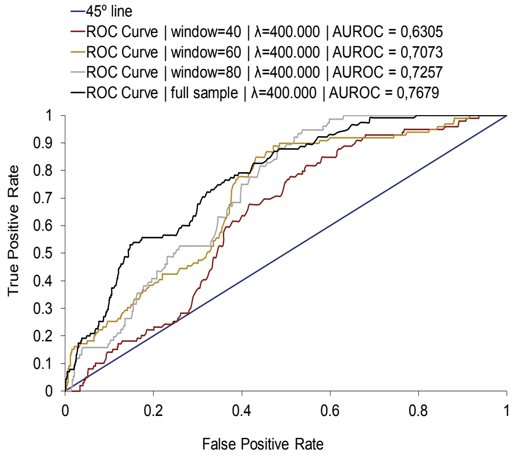
AUROC (CREDIT-TO-GDP GAP)

Window Lambda	1.600	8.000	26.000	130.000	400.000
40 Quarters	0,6274	0,6412	0,6361	0,6315	0,6305
60 Quarters	0,6207	0,6454	0,6738	0,7005	0,7073
80 Quarters	0,6470	0,6451	0,6670	0,7130	0,7257
Full Sample	0,6310	0,6649	0,6965	0,7490	0,7679

Sources: Thomson Reuters and authors' calculations.

Chart 6

ROC CURVE – MOVING WINDOWS OF DATA



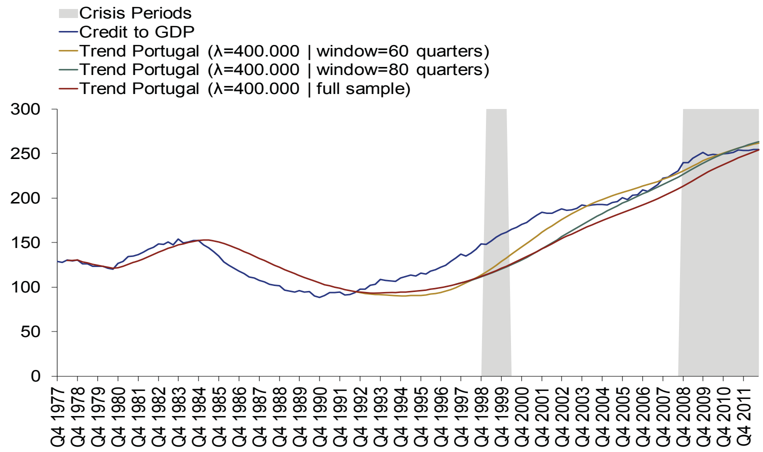
Sources: Thomson Reuters and authors' calculations.

The analysis conducted thus far focuses on the performance of the credit-to-GDP ratio for the whole sample, including 9 countries. However, it is also relevant to analyze to what extent buffer settings in Portugal could be sensitive to different calibrations.

Given the structural changes that mark part of the period under analysis, perhaps the most relevant aspect is to understand the impacts of considering a moving window of data. As illustrated in chart 7 and chart 8, the results change significantly. Since the early data is removed from the sample as time passes, the trend becomes much more flexible, resulting in a sharper rise of the trend curves calculated with moving windows of data in the 2000s. This faster convergence between the trend and the actual values results in lower credit-to-GDP gap values which, in turn, imply a small buffer recommendation prior to the crisis in 2008 for the 60 and 80 quarter window calculations (the results for the 40 quarter window calculations are almost the same as those achieved when using a window of 60 quarters; for that reason the 40 quarter results are not shown in the figures). The 1990s are still identified as a period of fast credit growth and the buffer build up recommendation is present for all the considered windows. However, for the crisis in 2008, only the full sample calculations grant a sufficient and early buffer accumulation.

Chart 7

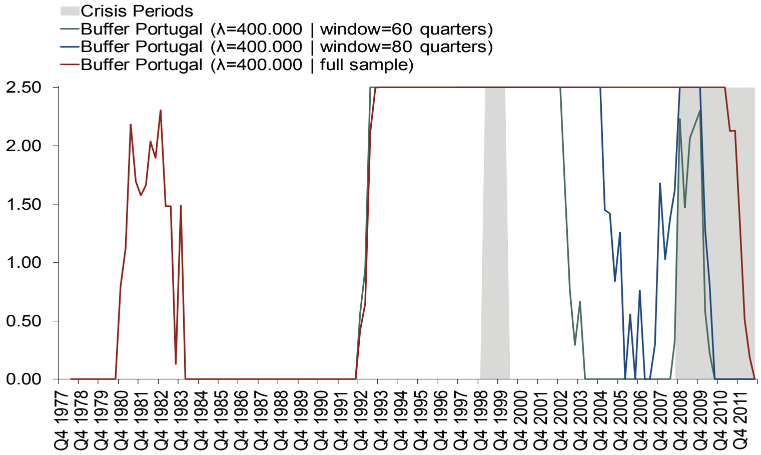
CREDIT-TO-GDP TREND – PORTUGAL – MOVING WINDOWS OF DATA | PER CENT



Sources: Thomson Reuters and authors' calculations.

Chart 8

BUFFER RATE – PORTUGAL – MOVING WINDOWS OF DATA | PER CENT



Sources: Thomson Reuters and authors' calculations.

Table 2

AUROC (CREDIT-TO-GDP GAP)

Lambda / Window	1.600	8.000	26.000	130.000	400.000
40 Quarters	0,5268	0,5347	0,5432	0,5595	0,5446
60 Quarters	0,5756	0,4660	0,5023	0,5440	0,5324
80 Quarters	0,8485	0,6326	0,4337	0,2273	0,1439
Full Sample	0,5809	0,6126	0,6311	0,6992	0,7703

Sources: Thomson Reuters and authors' calculations.

In table 2 we present AUROCs for different smoothing parameters and moving window datasets for the Portuguese economy. The results are, as expected, poorer than when all countries in the sample are included. Still, it is clear that the full sample dataset combined with the smoothing parameter 400.000 (*i.e.*, the Basel Committee baseline recommendation) achieves a good performance, with the AUROC reaching 0,7703. However, the combination of a smoothing parameter of 1.600 and a moving window of 80 quarters achieves a significantly better result (0,8485). Despite being a good signal for indicator adequacy, we must not forget that these single country results were estimated using a very small and specific dataset.

4. OTHER INDICATORS POTENTIALLY RELEVANT FOR THE IMPLEMENTATION OF THE COUNTERCYCLICAL CAPITAL BUFFER

4.1 Data

Though there is consistent evidence that the credit-to-GDP gap performs well in predicting banking crises with some anticipation, there are also many other potentially relevant indicators suggested in the literature. In this section, we test some of these indicators in our sample, assessing their relative performance using the AUROC estimation described in the previous section.

The credit-to-GDP gap combines developments in credit markets with the real economy. Its intention is to signal potential persistent mismatches between credit and economic growth, which may be unsustainable. Given the criticisms put forth by Repullo and Saurina (2011), we also look at credit and GDP growth separately, computing year-on-year growth rates.

As discussed, for instance, by Alessi and Detken (2011), asset prices booms and busts are often associated with crises episodes. To test this relationship, we consider equity prices, house prices, consumer price indexes (CPI), and long-term interest rates on government bonds. For equity and house prices, which may be expected to have good signalling properties, we also test year-on-year growth rates. Interest rates and consumer price indexes help to characterize monetary conditions in an economy. We complement this assessment by looking at M1 developments.

Finally, we test a few other macroeconomic indicators which have been pointed out in the literature as potentially relevant, such as the current account balance (as a percentage of GDP), external debt (as a percentage of GDP), gross government debt (both in levels and as a percentage of GDP), and the unemployment rate.

All time series were collected from Thomson Reuters. The original data sources are Eurostat (government debt), OECD (current account balance and unemployment rate), IMF (long-term interest rates on government bonds), and Oxford Economics (consumer price index, M1, house price index, and external debt). Equity prices are the total market index calculated by Thomson Reuters for each country. Some series are seasonally adjusted (unemployment rate, current account balance, CPI). We collected quarterly data since 1957, though there is substantial heterogeneity in data availability across countries and indicators. All variables, except those that are presented as year-on-year growth rates, are deviations from long-term trends computed using a HP filter with a smoothing parameter λ=400.000.

4.2 AUROC evaluation

4.2.1 Global assessment

All the indicators mentioned in the previous subsection may have leading and near-coincident properties in signalling banking crises. To compare their relative performance, we compute ROC curves for each indicator and the respective AUROC, as in section 3. The results are summarized in the first column of table 3 (ROC curves for each indicator are presented in the annex).

The indicator with the best signalling properties in the sample analyzed is, by far, the credit-to-GDP gap. The second best performing indicator is the house price index, followed with some distance by its year-on-year growth rate. Our results thus show that developments in real estate markets should be closely monitored by macroprudential authorities, as they display strong signalling properties. These results are consistent with evidence obtained by Behn *et al.* (2013) and Drehmann *et al.* (2011), who also find good forecasting accuracy for real estate indicators.

Credit developments also deserve careful monitoring, as suggested by most of the literature on this topic (Drehmann *et al.*, 2010, 2011, Moritz and Taylor, 2012, Reinhart and Rogoff, 2011). The year-on-year growth of credit displays good signalling accuracy, as suggested by Repullo and Saurina (2011), being the third indicator with highest AUROC (after to the credit-to-GDP ratio and the house price index).

Stock price developments also seem to be relevant, in line with the results obtained by Alessi and Detken (2011) and Drehmann *et al.* (2011).

The indicators with the weakest predictive ability are the current account, external debt and the year-on-year growth rate of GDP. In turn, government debt, M1, government bond yields, CPI and the unemployment rate are in an intermediate situation.

Table 3

EVALUATION OF INDICATORS

Indicator	AUROC	
	All episodes	Actual crises
Credit-to-GDP	0,7679	0,7423
House price index	0,6468	0,7026
Credit (% yoy)	0,5995	0,6023
Equity price index	0,5879	0,5943
House price index (% yoy)	0,5815	0,6196
Government consolidated gross debt	0,5799	0,5799
Equity price index (% yoy)	0,5677	0,5502
Gross government debt (% of GDP)	0,5669	0,5979
Money supply, M1	0,5642	0,5760
Interest rates: government securities, government bonds	0,5475	0,6018
Consumer price Index	0,5286	0,5617
Unemployment rate	0,5041	0,4771
GDP (% yoy)	0,4660	0,4620
External debt (% of GDP)	0,4591	0,4566
Current account balance (% of GDP)	0,3055	0,3316

Sources: Thomson Reuters and authors' calculations.
Note: yoy - year-on-year growth rate.

In the second column of table 3 we present, for robustness purposes, the results using only crises actually observed (as discussed before, the baseline definition includes heightened vulnerability periods that did not materialize in a crisis). The results are broadly consistent. For most indicators, the AUROC is actually higher when this tighter definition is used. In relative terms, the performance of the house price growth rate, government debt as a percentage of GDP and government bond yields is slightly better, though the main conclusions are not affected.

All in all, the credit-to-GDP ratio seems to be the indicator with better signalling properties, being closely followed by house prices, credit growth and equity prices.

4.2.2 Signalling properties through time: build-up versus release

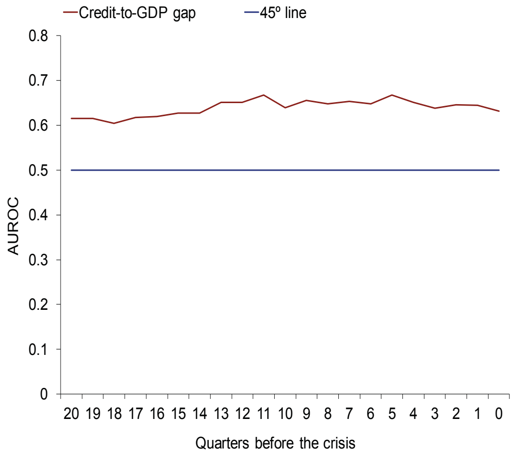
The analysis presented above allows for the comparison of the overall performance of the different indicators. It is interesting to complement this analysis with the assessment of forecasting power at different horizons. This allows to understand at which horizons does each indicator perform better, thus providing some guidance to macroprudential authorities about when should a given indicator be taken more seriously when taking decisions both about the build-up and release of the buffer. With performances for different horizons, we can see which indicators are better suited to predict a crisis event with long enough lead to activate the countercyclical capital buffer regime, and which indicators are near-coincident to the crisis, thus being more useful to signal that it is time to release the buffer previously accumulated.

Chart 9 shows the performance of the credit-to-GDP gap for several prediction horizons. The highest AUROC value is achieved for a 5 quarter lead on the crisis event, though this indicator has a very smooth behaviour in terms of predictive ability in the 5 years before the crisis.

Chart 10 presents the AUROC estimations for different horizons ahead of crises, starting 20 quarters before the beginning of each crisis. The indicators with the highest global AUROCs, which focus on real estate and credit market developments, display good signalling properties well in advance of the beginning of the crisis. The year-on-year growth rates of credit and of house prices have the highest signalling power around 3 years before the crisis starts. The house price index shows the highest AUROC nearly 2 years before the crisis hits.

Chart 9

AUROC – DIFFERENT PREDICTION HORIZONS – CREDIT-TO-GDP GAP



Sources: Thomson Reuters and authors' calculations.

The year-on-year change of stock prices displays signals very early, with the AUROC peaking around 17 quarters before the crisis begins. The stock price index peaks later (around 5 or 6 quarters ahead of the crisis, though it starts displaying useful signals at least one year before that). Yields on sovereign bonds start to display signals one and a half years before the crisis.

Besides allowing to identify how much in advance are the indicators able show strong signals, this analysis can also assess which indicators are the potentially most useful to signal the adequate time to release the buffer. It should be recalled that the release can be done in two different scenarios. On the one hand, the risks that lead to the build-up of the buffer may dissipate gradually. In this case, the indicators that have contributed to support the decision to activate the buffer may be again the most relevant to justify the gradual release of the accumulated buffer. On the other hand, the buffer can be released to allow banks to absorb losses in a stress scenario, thereby avoiding an excessive contraction of credit supply. In a crisis scenario, macroprudential authorities should be guided primarily by information available in real time, as well as by some guided judgment, given the uncertainty prevailing in such periods. Nevertheless, the analysis of the results shown in chart 10 can be a relevant input for this analysis.

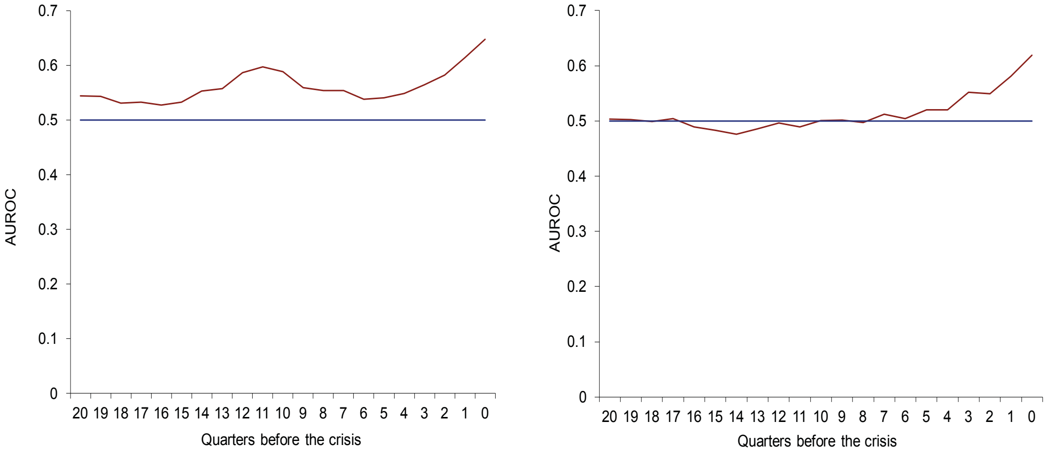
On the one hand, it is possible to assess which indicators have higher AUROCs in the quarter in which the crisis begins or in the previous quarter. Sovereign debt, the unemployment and the yield on sovereign bonds have an AUROC larger than 0,6 in at least one of these quarters. On the other hand, some of these indicators already showed significant signs in previous quarters. In this sense, it could be more useful to consider only those indicators whose signalling power became particularly strong near the outbreak of a financial crisis. According to this criterion, the most relevant indicators would be sovereign debt, the unemployment rate and, to a lesser extent, the yields of sovereign bonds, *i.e.*, the results are broadly consistent in the two approaches.

It should be noted that these results are specific to the sample and time period considered, as well as to the crises database used. Most of the crisis episodes in the sample relate to the 2008 global financial crisis, which may limit the generalization of the results. Furthermore, we only tested a limited set of indicators and many more could be tested. As such, even though we hope to provide relevant guidance for macroprudential authorities with this analysis, it should be borne in mind that the past forecasting performance of these indicators will not necessarily be replicated in the future.

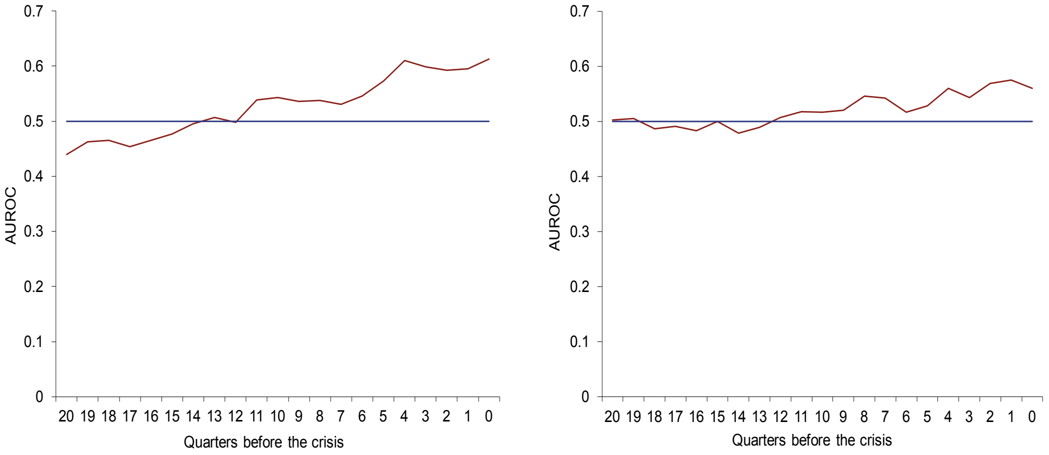
Chart 10 (to be continued)

AUROC – DIFFERENT PREDICTION HORIZONS – OTHER INDICATORS

Gross Government debt (% of GDP) **Unemployment rate**



Interest rates: Government securities, Government bonds **Consumer Price Index**



Money Supply, M1 **House Price Index**

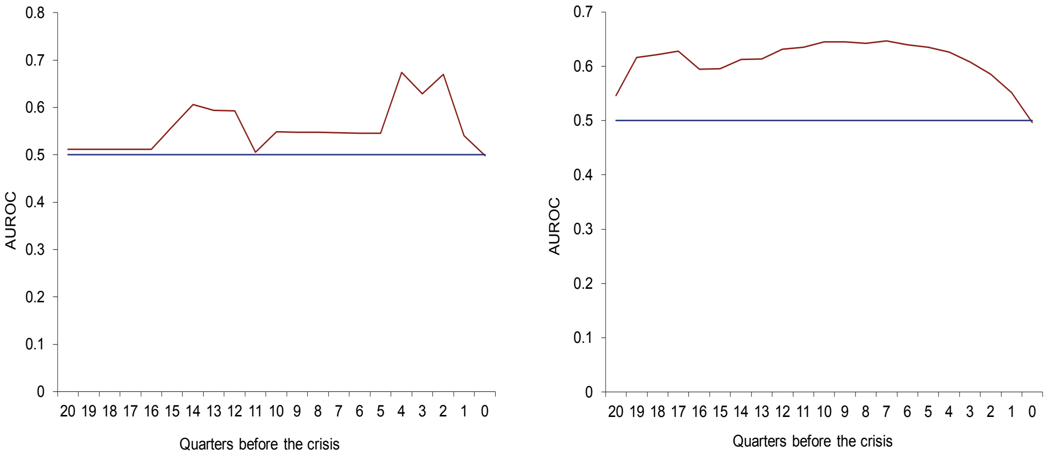
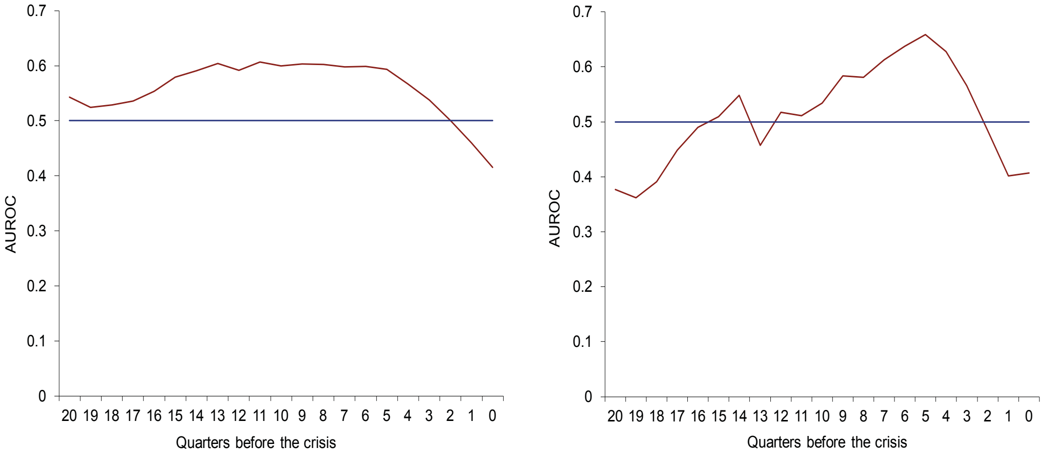


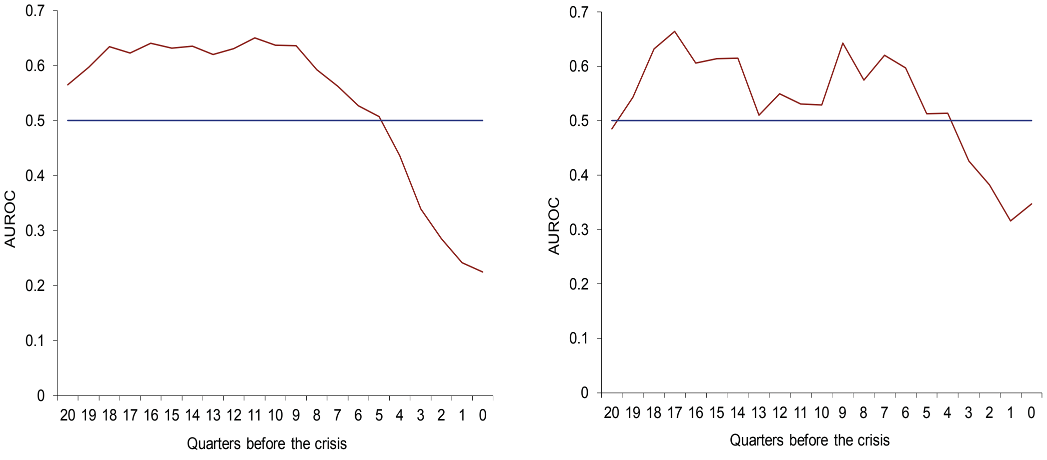
Chart 10 (continued)

AUROC – DIFFERENT PREDICTION HORIZONS – OTHER INDICATORS



Credit (%yoy)

Equity Price Index



House Price Index (% yoy)

Equity Price Index (% yoy)

Sources: Thomson Reuters and authors' calculations.
Note: yoy - year-on-year growth rate.

5. CONCLUDING REMARKS

The new countercyclical capital buffer will be one of the main instruments available to macroprudential authorities worldwide. The Basel Committee recommends that buffer decisions are, to some extent, based on the analysis of deviations of the credit-to-GDP ratio from its long-term trend, though highlighting the need to consider other indicators and to balance the available quantitative and qualitative information with guided judgement.

In this article, we assess the sensitivity of the credit-to-GDP gap to different parameters underlying its calculation. The calibration proposed by the Basel Committee delivers the best results for the set of hypothesis tested. Nevertheless, the forecasting accuracy of this indicator changes considerably depending on the assumptions used in its estimation. Since these results refer to a specific sample of countries, where most crisis events are related with the 2008 global financial crisis, it is important to note that the generalization of these results may have some limits, since all crises assume specific characteristics that may constrain the predictive ability of indicators that offered useful signals in the past. As such, the considerable risks that an approach based on rigid rules to guide decisions macroprudential may have should be underscored, reinforcing the idea that every decision must be supported by informed judgment, as well as by a wide range of indicators.

That said, we also test the forecasting performance of other macroeconomic and financial indicators, finding that even though the credit-to-GDP gap is the indicator with the best overall performance, there are other indicators that also offer useful signalling properties. Indeed, house prices, credit growth and equity prices are also useful indicators to signal crises with a significant lead. In turn, government debt, the unemployment rate, and the yield on sovereign bonds display a good near-coincident behaviour, thus providing potentially useful signals for the release phase.

All in all, our analysis shows that it is necessary to rely on a wide set of indicators and information to support the build up and release decisions concerning the countercyclical capital buffer. This information set should be complemented with guided judgement, to build a constrained discretion approach to macroprudential policy.

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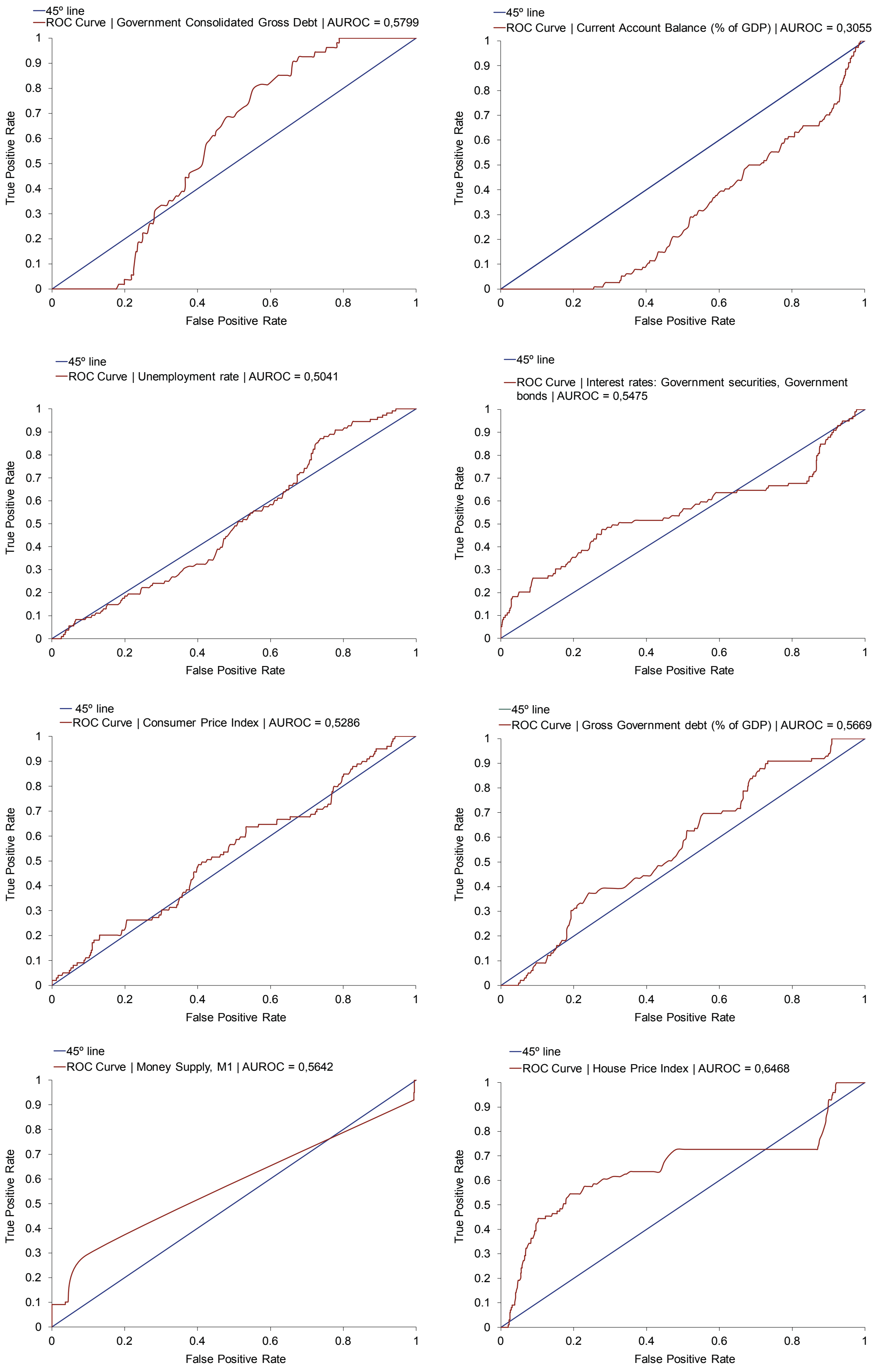
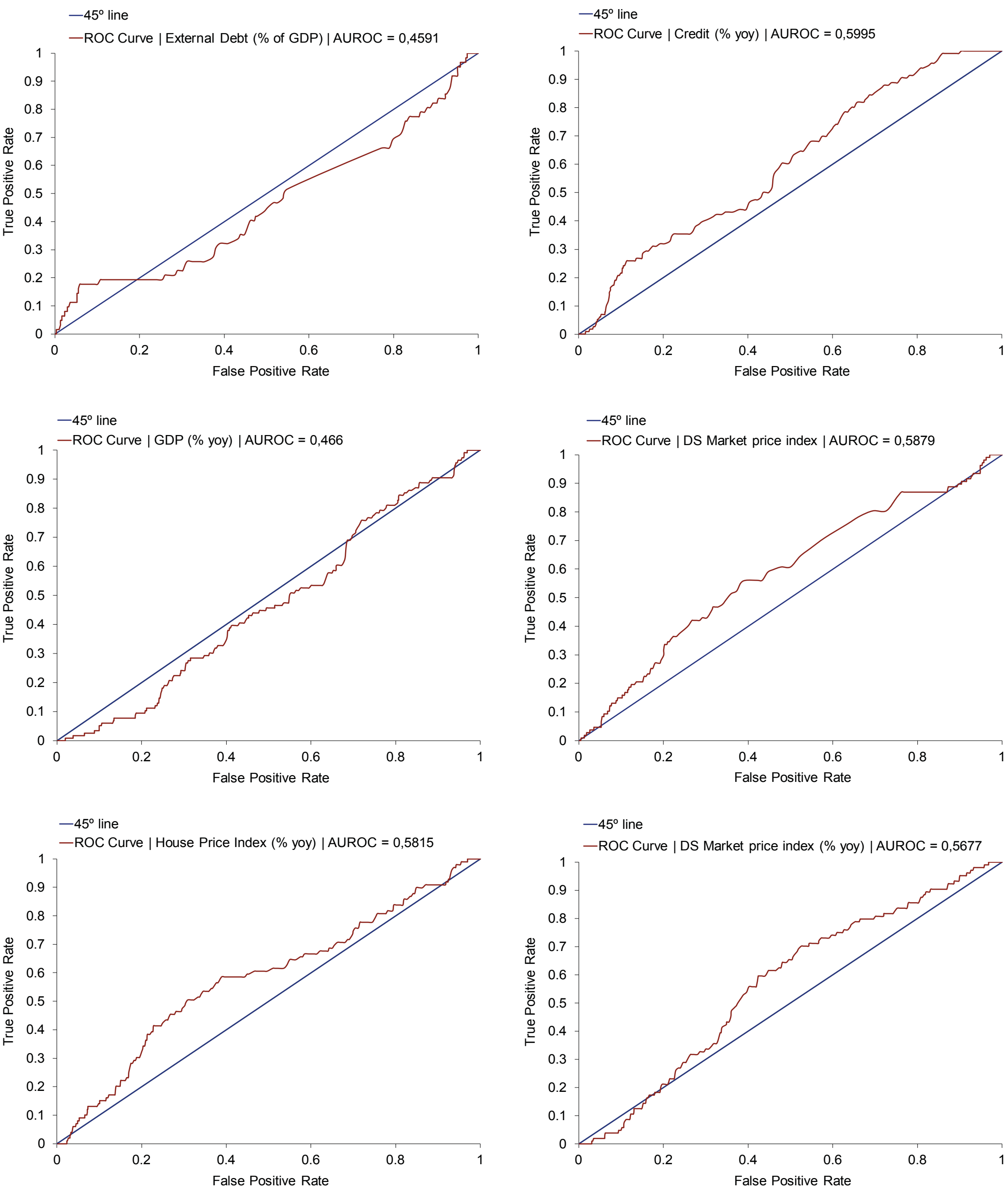
Annex (to be continued)

ROC CURVES FOR SEVERAL INDICATORS



Annex (continued)

ROC CURVES FOR SEVERAL INDICATORS



OPTION TRADE VOLUME AND VOLATILITY OF BANKS' STOCK RETURNS*

*Rafael Barbosa*** | *Martín Saldías***

ABSTRACT

This article focuses on the linkages between the trading activity in option markets and the volatility of their corresponding underlying stocks. More specifically, we try to answer the question of whether the trading volume in the option markets has explanatory power over the volatility of the underlying stocks. We focus on option and stock prices information from 16 large European and US banks between 2004 and 2008. Our results show that option trading volume has explanatory power over returns' volatility and it is robust after controlling for increased overall volatility and shifts in the volatility regime in the early stages of the crisis. The analysis of this particular linkage is scarce in the existing literature and almost non-existent for the European banking sector.

1. INTRODUCTION

The analysis of volatility of stock returns draws a lot of attention in the financial economics literature. In the case of banks' stocks, this is also related to its connection to overall market instability. Although volatility does not necessarily imply financial instability and it is common to come across periods of price turmoil without any reflection in liquidity or solvency concerns, it is also very rare to witness the latter without the former. In a sense, volatility seems to be a necessary ingredient in the recipe for market instability. It is therefore very relevant to identify and analyze the determinants of equity returns' volatility to understand and assess financial instability.

One of the most consensual of these determinants of volatility in the literature is stock trading volume. Several papers have demonstrated that there is a positive relationship between the two. However, due to its growing relevance in the last decades recent work has started to study whether derivative markets in general and equity option markets in particular may contain relevant information about stock volatility. Moreover, in recent times, large institutional market players have been showing an increasing interest towards options as a risk mitigating strategy. This can represent an inflow of highly informed market players that contribute to deepen the informational potential of this market in relation to the underlying market.

Along these lines, this article explores the relationship of trading activity in options of banks and the volatility of their corresponding underlying stocks. In particular, we focus on the role of trading volume in regulated option markets as an explanatory variable of the volatility of the underlying stocks. We focus on option and stock prices information from 16 large European and US banks between 2004 and 2008 and conduct an analysis based on extended EGARCH models.

Our results show that the contemporaneous trading volume in the options market helps explain the volatility of the underlying stock for a representative sample of some of the largest banks in Europe and the US. Furthermore, this relationship does not seem to be affected by periods of increased market volatility like the subprime crisis. This research can thus be a valuable contribution to the analysis of banks' stocks volatility and help assess market instability.

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* The authors thank Paulo Rodrigues for valuable comments and suggestions. The opinions expressed are those of the authors and not necessarily those of Banco de Portugal or the Eurosystem. Any errors and omissions are the sole responsibility of the authors.

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Usually, the search for information about volatility in option markets is focused on the study of implied volatilities. Christensen and Prabhala (1997) claim that implied volatility outperforms past volatility in forecasting future volatility and even subsumes the information content of past volatility in some specifications. However, the previously mentioned link between stock volume and stock volatility begs the question of whether the trading activity in the option market may also contain relevant information about this subject.

The first paper to study this relation directly was Park, Switzer and Bedrosian (1999), motivated by similar work concerning the linkages between stock return volatility and trading volume in futures market, namely Bessembinder and Seguin (1992). The authors find that the unexpected trading activity in option markets indeed holds strong explanatory power over the volatility of the underlying stock returns, while expected volume only impacts a minority of firms and with lesser magnitude. More recently, Ni, Pan, and Poteshman (2008) find that a non-market maker net demand for volatility constructed from the trading volume of individual equity options is informative about the future realized volatility of underlying stocks (with a positive impact).

Ho, Zheng and Zhang (2012) provide the motivation of this article. In their work, a sample of the 15 stocks with highest option trade volume in the New York Stock Exchange from 2002 until 2006 is analyzed. Their findings are consistent with the theory that a higher level of trading activity in the option market leads to a higher degree of volatility in the underlying stock.

Intuitive reasons to explain this phenomenon are put forward in the paper by Ni, Pan and Poteshman (2008), claiming that investors choose to trade on private information about volatility in the option market. This happens to a large extent because option markets allow investors to perform option spreads and combinations, some of which are prime instrument for when investors have information about the magnitude of future volatility but not on the future direction of returns of the stock. This is consistent with another finding of the paper, in which the predictive power of option volume increases in the days leading up to earning announcements by the firms, when information asymmetry also reaches its peak.

These combinations allow investors to create strategies which can be delta neutral, *i.e.* not sensitive to directional changes in the underlying, but are instead very dependent on its volatility.

Although there are many possible combinations for option trading strategies, a number of them are most popular among investors. Chaput and Ederington (2002) tackled this issue and also assessed whether trading volume is relevant relative to the total number of trades in the market. Their results point out first to the fact that combination trades account for 55% of total trades and 75% of trading volume. Second, the most heavily traded of all combinations are straddles, ratio spreads, vertical spreads, and strangles[1]. These figures leave an open window concerning the possibility that informed traders are using these combinations to capitalize on the future volatility of the underlying stocks.

In this article, the methodology used to study the impact of option volume on return volatility will be based on Ho *et al.* (2012), in which an EGARCH approach is used to model the conditional heteroskedasticity of the returns, using as explanatory variables of interest two ratios that according to the authors, provide a valuable approach because it allows us to evaluate market sentiment in comparison with the past.

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[1] A Straddle is constructed by buying a call and a put, both with same exercise price and same time to maturity. A Strangle is similar to a straddle, but the call has an exercise price higher than the put. Call (Puts) Ratio spreads consist of buying X calls (puts) and sell Y calls (puts) with a different strike and with X>Y. Vertical spreads are directional spreads, and therefore are not of interest for the subject of this paper.

The data set used consists of daily option information on several large banks and spans from January 2nd 2004 to December 31st 2008.[2] As such, the last period includes the onset of the Subprime financial crisis, an element of interest in our analysis and that will allow us to study whether the potential informative content of option volume on stock volatility may have changed during a period of market instability. Additionally, some of the banks in our sample underwent singular circumstances, such as recapitalizations and mergers.

Our analysis focuses on banks because they are consistently a preferred choice of investors in option markets, which can strengthen the link between this type of derivatives and the underlying stock.[3] Moreover, the diversity in the size of the banks under analysis can actually be a plus in the sense that it allows us to determine whether there is evidence that the potential explanatory power of option trading activity over volatility holds even for companies with a more modest volume of traded options. Swidler and Wilcox (2002), similarly to Christensen and Prabhala (1997), have shown that equity options on banks, through implied volatilities, forecast the volatility of the underlying stock. Therefore, it is relevant to study the role of trading volume in this dynamic.

We find evidence that the option volume variables that we include have a positive effect on the conditional volatility, even after controlling for the notoriously high volatility that took over the financial markets in late 2007. Stock volume also exerts the same type of influence.

The rest of the paper is structured as follows. Section 2 describes the methodology. Section 3 describes the data and discusses particular cases of interest concerning the analysis. Section 4 presents the results. Finally, section 5 concludes.

2. METHODOLOGY

As it is common in the literature, volatility models of financial market returns often incorporate conditional heteroskedasticity from the family of GARCH models. Accordingly, the baseline model in this paper is an EGARCH model (Christie, 1982 and Nelson, 1991) that accounts for conditional heteroskedasticity and also captures asymmetry in volatility clustering.

Asymmetric volatility is a frequent phenomenon observed in financial data and refers to the fact that large positive deviations from the mean do not have the same impact on volatility as negative shocks. In fact, downward moves are usually associated to a greater effect on volatility, a characteristic that standard ARCH and GARCH models are unable to capture.

In order to model this additional feature of stock returns, usually referred to as leverage effects, Nelson (1991) proposed the Exponential GARCH (EGARCH) which does not impose any non-negativity restriction on the parameters. Assuming a Gaussian innovation distribution, the baseline model assumes the following form for the variance equation:

$$\log\left(\mathrm{h}_{\mathrm{t}}\right) = \omega + \beta_1 \left| \frac{\varepsilon_{\mathrm{t}-1}}{\mathrm{h}_{\mathrm{t}-1}} - \sqrt{\frac{2}{\pi}} \right| + \gamma \frac{\varepsilon_{\mathrm{t}-1}}{\mathrm{h}_{\mathrm{t}-1}} + \beta_2 \log\left(\mathrm{h}_{\mathrm{t}-1}\right) \tag{1}$$

where β_1 is the ARCH term, β_2 the GARCH, while the γ parameter captures the leverage effect. If the latter is significant and negative, there is statistical evidence of asymmetry in stock return volatility, and thus that negative shocks are more prone to increase volatility than positive shocks.

In order to study the impact of option trading volume upon volatility we will use two measures put forward by Ho *et al.* (2012), called RCALL and RPUT ratios. They aim to capture the intensity of trading activity relatively to the last 60 trading days[4] and are defined as follows:

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[2] June 30th 2009 for three Banks. See Table 1 for details.

[3] Despite this fact, this does not mean that all banks in the sample have especially large option trading activity. We chose, however, the banks with largest trading volumes over the time span.

$$RCALL60_t = \frac{Call\,Trading\,Volume\,at\,time\,t}{Mean\,of\,Call\,Volume\,in\,the\,past\,60\,days} \tag{2}$$

$$RPUT60_t = \frac{Put\,Trading\,Volume\,at\,time\,t}{Mean\,of\,Put\,Volume\,in\,the\,past\,60\,days} \tag{3}$$

The final version of the model, as in Ho *et al.* (2012), combines the baseline model (1) with the log of the two option ratios and the log of stock volume (SVOL) in the variance equation. The mean equation associated with the variance equation in that paper is an ARMA (p,q) model.

For the sake of simplicity, we will, by default, perform the regressions including only a constant in the mean equation. Additionally, we will also use log difference instead of standard logs in our regressions. This is what the model looks like after these adjustments:

$$\log\left(h_t\right) = \omega + \beta_1\left|\frac{\varepsilon_{t-1}}{h_{t-1}} - \sqrt{\frac{2}{\pi}}\right| + \gamma\frac{\varepsilon_{t-1}}{h_{t-1}} + \beta_2\log\left(h_{t-1}\right) + \beta_3\text{dlog}\left(RCALL60_t\right) + \beta_4\text{dlog}\left(RPUT60_t\right) + \beta_5\text{dlog}\left(SVOL_t\right) \tag{4}$$

In our analysis it will also be extremely important to account for overall market volatility, specifically since the onset of the financial crisis. This phenomenon was a driver of alarm and soaring volatility in the returns of nearly all financial instruments across the globe. Merely observing the volatility charts for the banks at our disposal (Chart 1), it is clear that there are permanent shifts in the pattern of volatility. It would be unwise to model the volatility of the stocks in our sample without having this into account. The reasons are addressed, for instance, in Hamilton (1994), where the author warns about the risk that changes in volatility regime can create distortions, such as the illusion of long term persistence in the estimates of the terms regarding conditional heteroskedasticity. He draws a parallel between this phenomenon and the demonstration of Perron (1989), in which he proves that changes in regimes can give the spurious impression of unit roots in the level of a series.

In order to address this issue, we conduct structural break tests on the return volatility of the banks in our sample. These tests are based on the methodology devised by Kokoszka and Leipus (2000) and used, for instance in Rodrigues and Rubia (2011), which is an improvement over the cumulative sums of squares tests (CUSUM) applied to ARCH models proposed in Inclán and Tiao (1994), in the sense that it allows for the relaxation of the assumption that the variable under analysis must be iid The most attractive aspect of these tests is that it endogenously infers the most likely break positions.

The results of the break tests are consistent. The vast majority of banks present two breaks: the first takes place around July 2007, while the second takes place more than one year after that, in October 2008. These periods are coincidental with two major events in the subprime crises: the first with the emergence of financial problems in Northern Rock that would later have to be nationalized; the second with the bankruptcy of Lehman Brothers. The difference in estimates of the dates between banks for both breaks is not greater than two weeks. Both the 2007 and the 2008 breaks translate into upward volatility jumps.

In order to model this abnormality in the volatility of returns we decided to include dummy variables to distinguish the three regimes. The first is a low volatility regime that lasts until June 2007. The second is characterized by a medium volatility regime and comprises the period from the beginning of July 2007 until the end of September 2008. Finally, the last regime, starting in October 2008, can only be described as a volatility whirlwind. We expect that if any relation exists it survives the inclusion of these new control variables.

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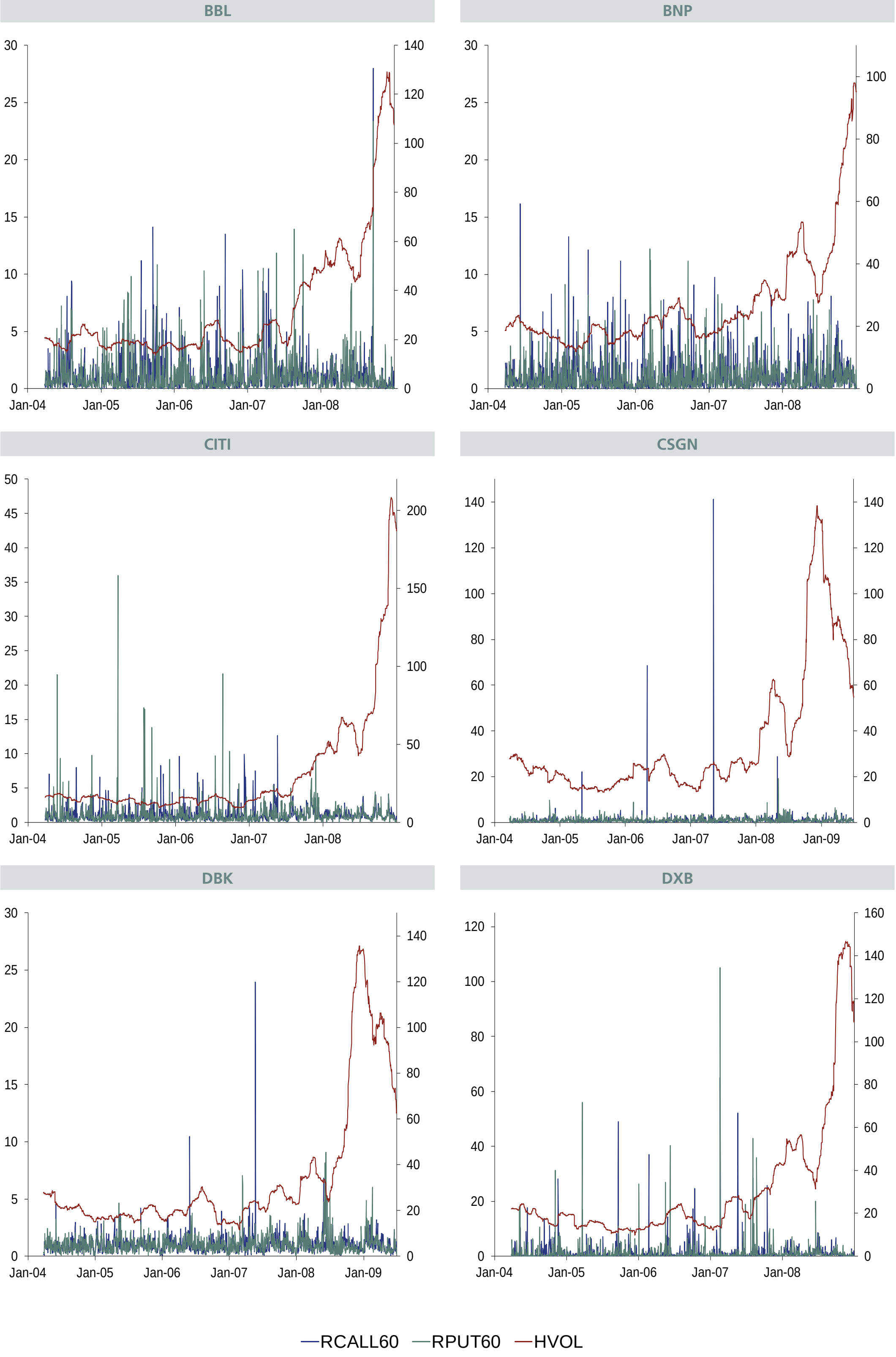
[4] Other time horizons were also used to test for robustness, namely 30 and 90 days. These robustness tests showed similar results and are not reported.

Chart 1 (continue)

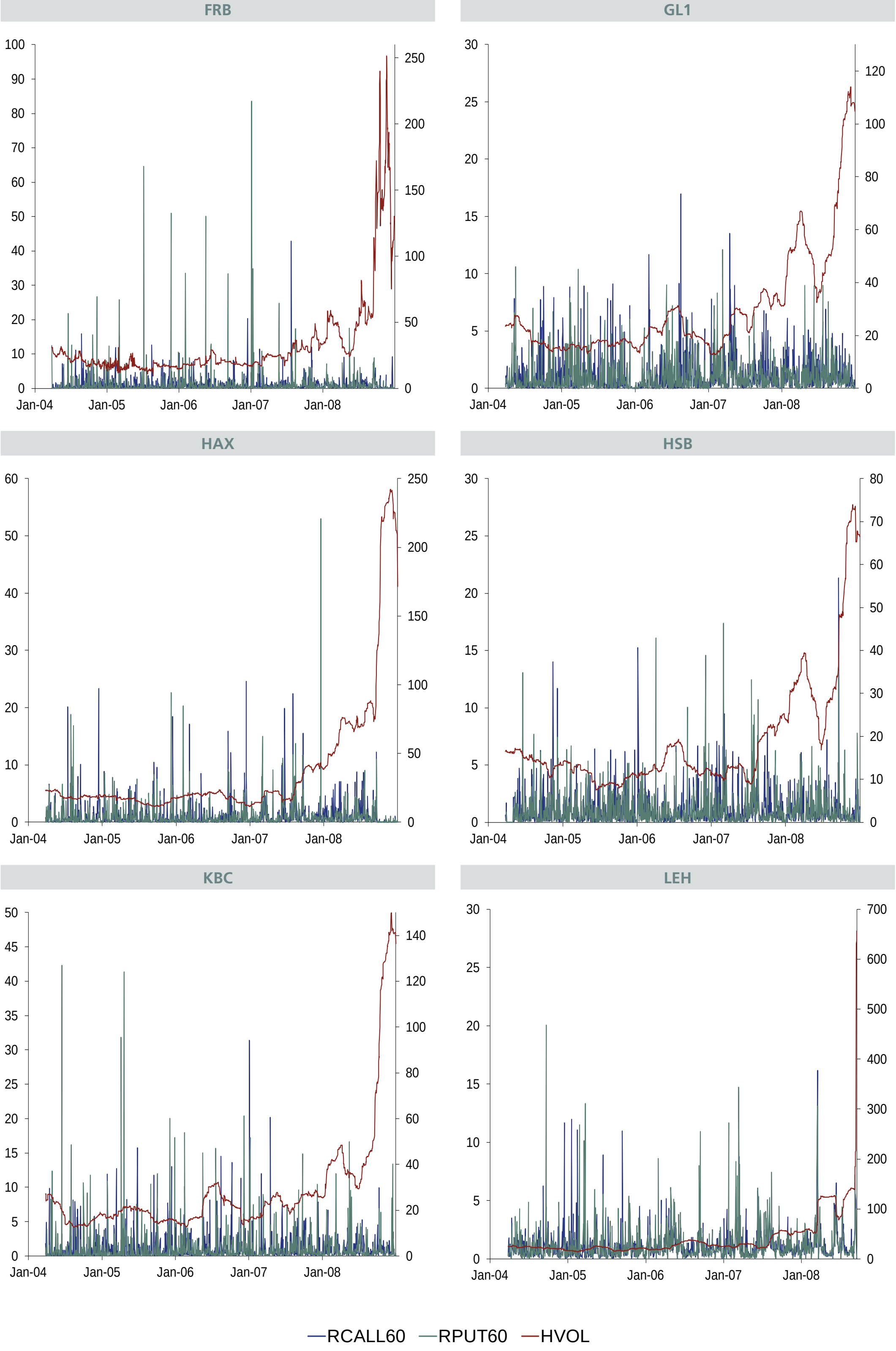
GRAPHS OF HISTORICAL VOLATILITIES (HVOL), RCALL60 AND RPUT60 (LHS)



Sources: Bloomberg, Eurex, CBOE, Euronext and authors' calculations.

Chart 1 (continuation)

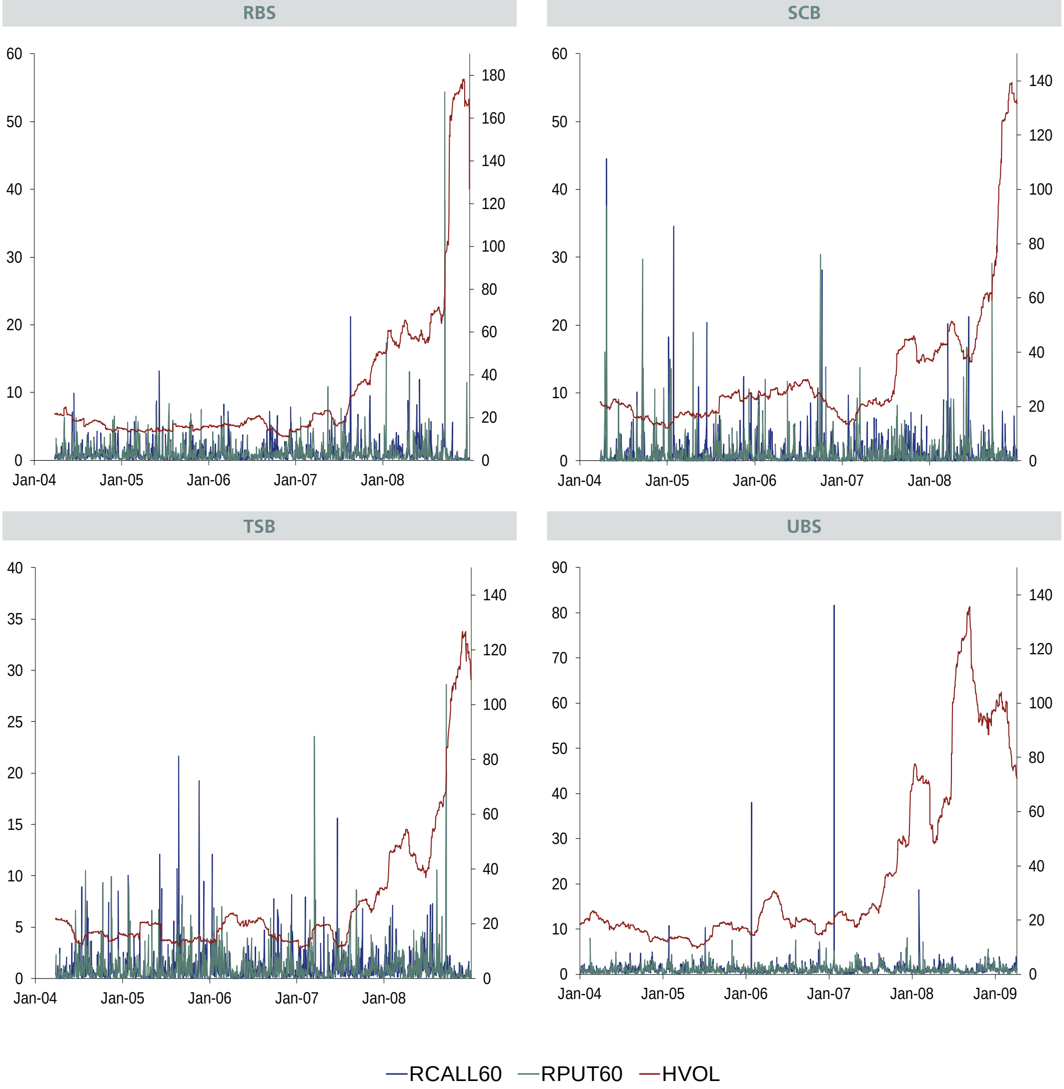
GRAPHS OF HISTORICAL VOLATILITIES (HVOL), RCALL60 AND RPUT60 (LHS)



Sources: Bloomberg, CBOE, Eurex, Euronext and authors’ calculations.

Chart 1 (continuation)

GRAPHS OF HISTORICAL VOLATILITIES (HVOL), RCALL60 AND RPUT60 (LHS)



Sources: Bloomberg, CBOE, Eurex, Euronext and authors' calculations.

Taking into consideration that the dates for the breaks present a considerable consistency (with differences for the estimates of different banks not surpassing two weeks) and for the sake of simplification, we decided to impose the same date for all banks. In the case of the first structural break the selected date was July 1st 2007 and for the second, October 1st 2008. It is important to mention that the first dummy assumes the value of 1 on July 2007, and then remains at this level until the end of the sample period. This implies that the coefficient on the final dummy (starting in October 2008) will capture the potential incremental increase in unconditional volatility in relation to the period immediately preceding it, *i.e.*, the medium volatility regime, and not the initial one. This will allow us to compare directly whether there was a greater increase in unconditional volatility from the first regime to the second or from the second to the third. With this addition, the model presented in (4) becomes:

$$\log\left(h_t\right) = \omega + \beta_1\left|\frac{\varepsilon_{t-1}}{h_{t-1}} - \sqrt{\frac{2}{\pi}}\right| + \gamma\frac{\varepsilon_{t-1}}{h_{t-1}} + \beta_2\log\left(h_{t-1}\right) + \beta_3\text{dlog}\left(RCALL60_t\right) + \beta_4\text{dlog}\left(RPUT60_t\right) + \beta_5\text{dlog}\left(SVOL_t\right) + \beta_6 SUBP_t + \beta_7 SUBP2_t \quad (5)$$

Alternatively, we also stressed the robustness of our model by including a market volatility variable instead of the dummies. We measured market volatility (MVOL) using the VIX volatility Index for American and British banks and the VSTOXX Volatility Index for all other European Banks to control for any variation in the volatility of stock returns that was due to overall instability in the market, rather than to bank specific drivers. This specification is presented below.

$$\log\left(h_t\right) = \omega + \beta_1 \left| \frac{\varepsilon_{t-1}}{h_{t-1}} - \sqrt{\frac{2}{\pi}} \right| + \gamma \frac{\varepsilon_{t-1}}{h_{t-1}} + \beta_2 \log\left(h_{t-1}\right) + \beta_3 \text{dlog}\left(RCALL60_t\right) + \beta_4 \text{dlog}\left(RPUT60_t\right) + \beta_5 \text{dlog}\left(SVOL_t\right) + \beta_6 MVOL_t \quad (6)$$

For reasons presented in Section 1 and based on the findings of Ho *et al.* (2012) and Poteshman *et al.* (2008), we expect to find that, throughout these models, both the stock and option trading volume variables are significant and that they positively affect the volatility of the underlying stock.

3. DATA

The dataset comprises daily stock and option prices of 16 large banks between January 2004 and December 2008 (June 2009 for three banks). Stock prices are retrieved from Bloomberg, while option information to compute the RCALL and RPUT ratios come from three sources, namely CBOE, Euronext and Eurex. These option databases are very rich, containing information for all listed option contract maturities and strike prices on any given day. Therefore, in order to acquire a figure for total traded options in one day, we had to aggregate the volume of every contract that was traded during that day. The list of stocks included in our sample, corresponding code, data source and data availability is available in Table 1.

Besides diversity, our sample stands out due to the size and systemic importance of several of the banks included. In Table 2 we can see a list of the banks with highest systemic risk in Europe in 2012 as presented in Engle, Jondeau, and Rockinger (2012). Out of the top 10 banks indentified, eight of them are part of our sample.[5] These are naturally also the banks with largest asset size and which draw most attention in the financial markets. This can be seen by glancing through the figures for average stock trading volume in Table 2, which shows that the shares of most of these banks are traded millions of times per day.

Tables 3 and 4 present some important descriptive statistics for each bank throughout the period under analysis. Table 3 shows the mean and standard deviation of daily total traded volume of calls (TVOLC) and puts (TVOLP), as well as open interest (TOIC and TOIP) and number of shares traded (SVOL). We can see that the sample is very diverse, ranging from the less traded Belgian banks like Fortis or KBC, with average option trading volume ranking in the hundreds, to tens of thousands of traded options on average every day in the case of Deutsche Bank or Lloyds Banking Group. The difference is equally striking in what concerns the underlying stock, although obviously at a much larger scale, with the most heavily traded stocks being traded several dozen million times per day.

It is also worthwhile to point out that for most of the sample, call trading volume is larger than put trading volume, a finding consistent with Poteshman *et al.* (2008) and Ho *et al.* (2012). This feature is likely to be a consequence of the fact that many investors, especially the most novice, have a tendency to favor being on the long side of the market. Another theory is that short-term traders prefer to trade in-the-money calls since they have higher delta and gamma and can therefore provide faster profits.

In Table 4 we can see information on option contracts for each firm, more specifically average and standard deviation of the total number of contracts listed (TOT), of number of contracts that are actively traded (POSV) and of those with positive open interest (POSOI), as well as a measure of relative traded contracts (RV) which is the ratio of POSV and TOT, *i.e.* the number of traded contracts as a percentage of listed contracts. All these measures are presented for calls and puts separately. In this regard, there is still some disparity in the number of contracts listed and traded between both types of options, in

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[5] Deutsche Banke, Barclays, BNP Paribas, RBS, Société Générale, HSBC, Lloyds and UBS.

Table 1

DESCRIPTION OF BANKS UNDER ANALYSIS

Code	Bank	Country	Source
BLL	*Barclays*	UK	*Euronext*
BNP	*BNP Paribas*	France	*Euronext*
CITI	*Ctitigroup*	USA	*CBOE*
CSGN	*Credit Suisse*	Switzerland	*Eurex*
DBK	*Deutsche Bank*	Germany	*Eurex*
DXB	*Dexia*	Belgium	*Euronext*
FRB	*Fortis*	Belgium	*Euronext*
GL1	*Société Générale*	France	*Euronext*
HAX	*Halifax/HBOS*	UK	*Euronext*
HSBC	*HSBC*	UK	*Euronext*
KBC	*KBC*	Belgium	*Euronext*
LEH	*Lehman Brothers*	USA	*CBOE*
RBS	*Royal Bank of Scotland*	UK	*Euronext*
SCB	*Standard Chartered Bank*	UK	*Euronext*
TSB	*Lloyds Banking Group*	UK	*Euronext*
UBS	*UBS*	Switzerland	*Eurex*

Source: Banco de Portugal.

Note: The data on options comes from three sources: First, the NYSE LIFFE NextHistory Equity Derivatives EOD which contains daily data on option contracts traded on Liffe for Amsterdam, Brussels, Lisbon, London and Paris. Second, the Eurex, which includes information on the German and Swiss Banks studied and, finally, the CBOE from where data on the American Banks was gathered. The variables available included in the database and that were used are type of contract (Put or Call), exercise price, price of underlying stock and trading volume. Data is available for all firms from 01/01/2004 until 31/12/2008, except CSGN, DBK and UBS, for which data is available until 30/06/2009 and LEH, for which data is available until 17/09/2008.

Table 2

RANKING OF EUROPEAN FINANCIAL INSTITUTIONS ACCORDING TO SYSTEMIC RISK

Ranking	Institution	Country	SRISK (mM €)	Leverage	Mkt. Cap. (mM €)
1	Deutsche Bank	Germany	162	84.8	26.1
2	Barclays	UK	141.9	69.4	28.3
3	Credit Agricole	France	134.5	151.6	11.6
4	BNP Paribas	France	131	44.3	43.3
5	RBS	UK	126.2	96.8	17.6
6	Societe Generale	France	88.7	73.6	16.4
7	ING Group	Netherlands	86.4	51.7	23.3
8	HSBC	UK	76.5	16.5	126.2
9	Lloyds Banking	UK	73.2	39.1	29.5
10	UBS	Switzerland	72.7	34	34.1

Sources: Engle, R., Jondeau, E. and Rockinger, M. (2012), "Systemic Risk in Europe", (December 1, 2012), *Swiss Finance Institute Research Paper No. 12-45.*

Note: This table, found in Engle, Jondeau, and Rockinger (2012), reports the ranking of European financial firms by SRISK (a measure of systemic risk) as of 30th August 2012. For each firm, we report the name, country, SRISK (in billion euros), leverage, and market capitalization (in billion euros).

Table 3

OPTION AND STOCK VOLUME STATISTICS

		TvolC	TVolP	TOIC	TOIP	SVOL
BLL	MEAN	720	599	57 456	63 990	50 232 250
	ST DEV	1 407	1 218	54 021	61 891	36 189 067
BNP	MEAN	3 774	3 371	153 943	185 390	4 692 472
	ST DEV	7 255	6 496	135 967	196 232	2 687 544
CITI	MEAN	14 645	11 852	1 228 046	1 130 797	4 315 337
	ST DEV	19 651	19 274	876 549	790 445	6 721 819
CSGN	MEAN	10 954	9 895	539 860	575 602	7 501 691
	ST DEV	36 557	15 513	189 686	163 158	4 550 479
DBK	MEAN	17 922	19 785	828 724	896 227	6 343 930
	ST DEV	15 823	21 350	201 257	185 812	4 227 158
DXB	MEAN	213	148	8 763	8 397	2 813 596
	ST DEV	561	409	3 594	2 884	2 868 950
FRB	MEAN	76	56	3 249	2 431	10 349 337
	ST DEV	148	161	1 421	1 305	12 991 144
GL1	MEAN	3 416	2 547	128 948	132 994	3 313 260
	ST DEV	6 975	5 059	113 740	134 334	2 879 435
HAX	MEAN	231	287	16 885	18 861	26 980 858
	ST DEV	619	821	21 640	21 081	32 959 915
HSB	MEAN	900	784	112 281	116 874	50 883 210
	ST DEV	1 398	1 192	65 787	69 026	25 565 666
KBC	MEAN	131	115	5 851	4 571	706 306
	ST DEV	292	281	3 275	2 807	434 287
LEH	MEAN	4 583	6 349	213 705	268 524	12 416 269
	ST DEV	12 564	16 460	216 362	275 169	30 963 942
RBS	MEAN	538	504	53 141	54 407	5 260 241
	ST DEV	1 869	1 991	79 578	77 528	3 374 273
SCB	MEAN	67	64	3 521	4 345	9 279 104
	ST DEV	134	130	1 843	3 335	6 603 881
TSB	MEAN	649	508	40 732	41 874	85 744 720
	ST DEV	1 149	1 039	17 647	19 581	61 956 876
UBS	MEAN	12 991	12 596	582 554	505 334	13 712 210
	ST DEV	33 661	22 094	361 177	271 337	11 828 664

Sources: Bloomberg, CBOE, Eurex and Euronext.

Note: TVolC (TVolP) is the total number of Calls (Puts) traded per day; TOIC (TOIP) is the Open Interest of Calls (Puts) per day; SVOL is the total number of stocks traded per day.

line with what we observed in terms of trading volume. The smaller number of average listed contracts is around 50, while on the opposite end we have the largest banks with about 250 contracts available per day. However, the value for relative traded contracts (RV) is much more homogeneous, with most banks presenting figures around the 10% mark. The only exceptions to this seem to be the American banks (Lehman and Citigroup), possibly evidencing a greater dynamism in the US options market and also more heterogeneous beliefs amongst investors. We can also see that the value for RV is usually very similar for calls and puts of a given bank.

Chart 1 depicts the historical volatility of all the stocks in our sample as well as the option ratios used in our analysis, presented in equations (2) and (3). We can easily observe the increased volatility in the final months of the observation period across all banks in our sample, as we would have expected. It is worthwhile to observe that the rolling window in RCALL and RPUT prevents the appearance of sustained drifts in these variables.

Table 4

OPTION CONTRACTS STATISTICS

		CALLS				*PUTS*			
		TOT	POSV	POSOI	R	TOT	POSV	POSOI	R
BLL	MEAN	136.4	10.2	78.5	9%	136.4	12.5	83.6	11%
	ST DEV	42.2	4.5	23.0	5%	42.2	5.5	21.8	5%
BNP	MEAN	128.3	7.9	48.1	6%	128.3	8.6	57.0	7%
	ST DEV	25.4	6.2	25.3	4%	25.4	6.0	24.6	4%
CITI	MEAN	99.5	56.5	92.3	57%	99.5	49.1	92.1	49%
	ST DEV	9.7	17.1	19.5	16%	9.7	15.5	19.4	15%
CSGN	MEAN	258.7	30.1	164.4	12%	258.6	32.7	182.9	13%
	ST DEV	82.8	16.4	64.1	5%	82.8	16.9	57.8	6%
DBK	MEAN	249.4	44.9	169.5	18%	249.4	48.1	178.4	20%
	ST DEV	96.2	21.2	74.0	6%	96.2	23.2	66.1	6%
DXB	MEAN	55.6	4.0	35.0	7%	55.6	2.8	34.0	5%
	ST DEV	23.3	4.3	17.3	6%	23.3	3.6	15.4	5%
FRB	MEAN	64.5	3.0	36.7	5%	64.5	1.7	30.2	3%
	ST DEV	39.5	3.0	21.5	4%	39.5	2.2	10.9	4%
GL1	MEAN	148.0	7.6	54.2	5%	148.0	7.9	61.3	6%
	ST DEV	73.8	6.5	30.3	4%	73.8	5.6	24.3	4%
HAX	MEAN	72.07	4.65	36.28	10%	72.07	5.64	39.03	12%
	ST DEV	83.20	4.24	33.27	9%	83.20	5.51	31.86	9%
HSB	MEAN	99.5	7.1	52.9	7%	99.5	7.8	55.8	8%
	ST DEV	15.4	4.4	19.6	4%	15.4	5.3	20.3	5%
KBC	MEAN	52.8	4.5	31.2	8%	52.8	3.9	33.3	7%
	ST DEV	14.7	3.9	13.1	7%	14.7	4.4	12.7	7%
LEH	MEAN	93.0	25.1	82.8	25%	93.0	22.7	78.9	22%
	ST DEV	25.2	21.0	30.8	14%	25.2	21.5	30.2	14%
RBS	MEAN	127.1	9.3	59.7	8%	127.1	10.7	65.3	9%
	ST DEV	62.1	6.0	33.7	4%	62.1	7.2	27.2	5%
SCB	MEAN	34.4	3.3	22.5	10%	34.4	3.5	23.5	10%
	ST DEV	15.5	2.8	8.1	8%	15.5	2.7	8.2	8%
TSB	MEAN	96.6	8.2	48.9	8%	96.6	9.1	58.8	9%
	ST DEV	34.3	5.2	25.1	5%	34.3	6.2	22.2	5%
UBS	MEAN	239.6	32.5	157.9	14%	239.6	36.0	172.2	15%
	ST DEV	98.8	18.9	88.6	6%	98.8	22.3	77.4	7%

Sources: CBOE, Eurex, Euronext and authors' calculations.

Note: TOT is the total number of option contract types for a specific bank per day; POSV is the number of contracts that presented positive trading volume in a day; POSOI is the number of option contracts that presented positive open interest in a day. R is the ratio between POSV and TOT, that is, the contracts with positive trading volume as a percentage of all available contracts.

For this reason, observing the absolute volume of traded options may also be relevant to understand the dynamics of this market during the period under analysis. In Chart 2 we present the 12-month moving average of this variable for calls and puts of all banks in the sample. Although there is some heterogeneity across banks, the most usual pattern is an upward trend in traded volume of all options starting roughly in early 2007 and which lasts until the third quarter of 2008. At this point, there seems to be stabilization and in some cases even an inversion of this trend, arguably caused by the sharp fall in liquidity following the bankruptcy of Lehman Brothers. During the peak of trading activity we can also detect that for most banks put volume surpasses call volume, in contrast to what we observe for most of the sample period, which can be interpreted as market perception of future generalized decline in stock prices.

Before moving to the estimation results, it is also important to mention peculiarities in some of the banks in our sample during the period under analysis. First and foremost there is the case of Lehman Brothers, which, as is known, went bankrupt on October 15th 2008, thus being the bank with the least amount of time in our sample as well as deserving special treatment concerning the year before bankruptcy throughout which Lehman incurred in constant and heavy losses. Secondly, Citigroup received $25 billion of financial help in the form of TARP (Troubled Asset Relief Program) Federal funds in November 2008. Last of all, there is the case of the Royal Bank of Scotland (RBS) which benefited from a recapitalization with government money in October 2008.

4. Model Estimation

4.1. EGARCH (1,1)

Estimation results from the benchmark model defined in equation (1) are presented in Table 5. The model specification for each bank has been determined by ARCH LM tests and an analysis of the correlograms of squared residuals. These indicate that the EGARCH (1,1) specification is the best suited for the great majority of banks considered, with the only exception of Lehman Brothers. This bank presents long term persistence, possibly due to the extreme volatility it was subject to in the months preceding its bankruptcy.

Estimation results show that all ARCH and GARCH terms are statistically significant at 5% and 10% significance level. Almost the same thing happens with the leverage effects coefficient, except for the case of Société Generale, for which there is no evidence of asymmetry. This first set of results is in line with those in Ho *et al.* (2012) and successfully captures the dynamics of stock prices volatility in our sample.

4.2. The Role of Options Trading Volume

Model specifications regarding the inclusion of our option volume variables follow those in Ho et al. (2012), and are presented in equation (4) in Section 2. However, in our specification, the RCALL60, RPUT60 and SVOL series enter the EGARCH equations after a transformation, using their log-differences. This implies that we are studying the impact of trading volume shocks in the volatility of the returns of the underlying stock. In addition, we also estimate a model excluding the stock volume (SVOL), as shown below in equation (4’).

$$\log\left(\mathrm{h}_{\mathrm{t}}\right) = \omega + \beta_1 \left| \frac{\varepsilon_{\mathrm{t}-1}}{\mathrm{h}_{\mathrm{t}-1}} - \sqrt{\frac{2}{\pi}} \right| + \gamma \frac{\varepsilon_{\mathrm{t}-1}}{\mathrm{h}_{\mathrm{t}-1}} + \beta_2 \log\left(\mathrm{h}_{\mathrm{t}-1}\right) + \beta_3 \mathrm{dlog}\left(\mathrm{RCALL60}_{\mathrm{t}}\right) + \beta_4 \mathrm{dlog}(\mathrm{RPUT60}_{\mathrm{t}}) \tag{4'}$$

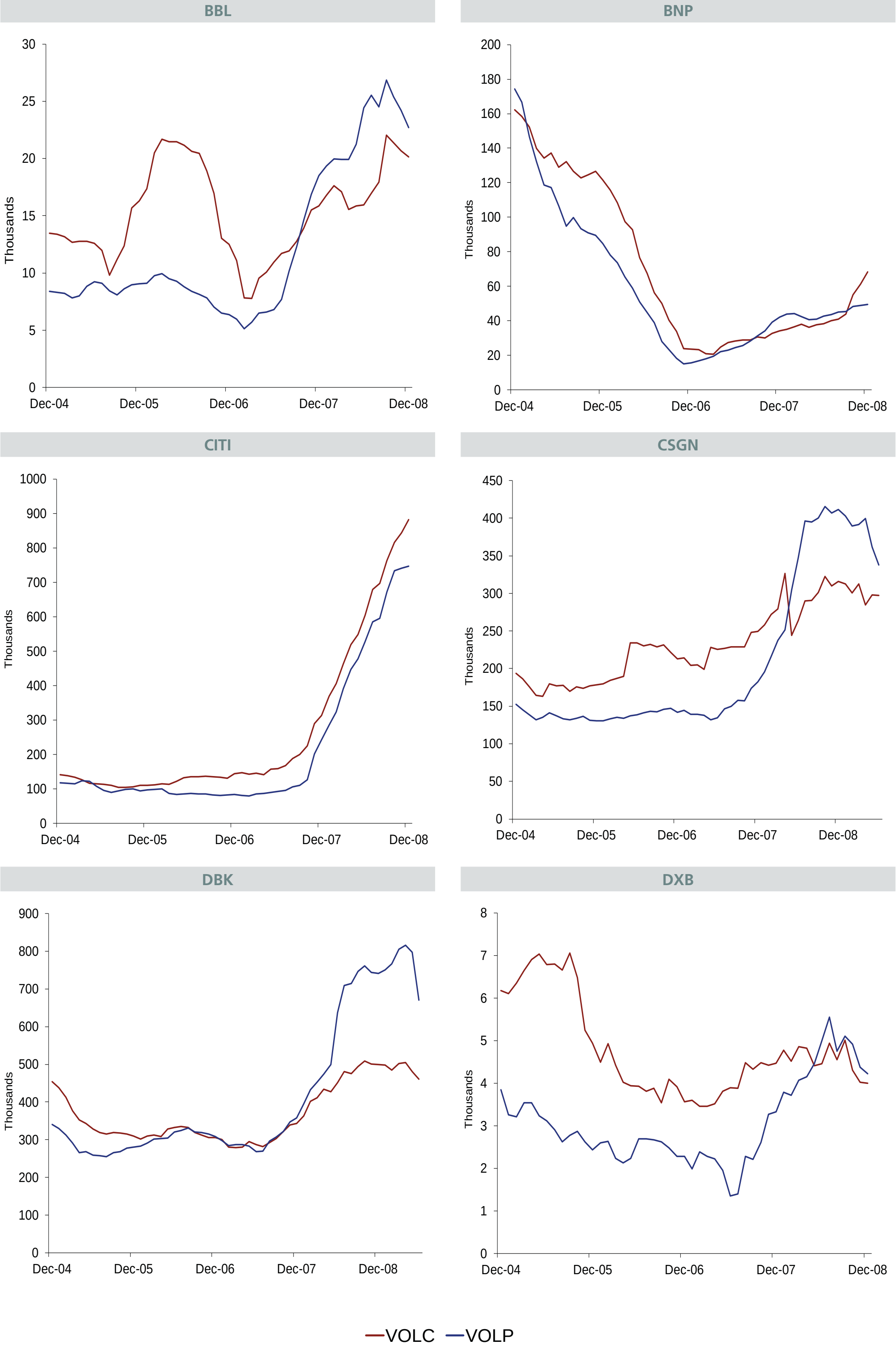
Tables 6 and 7, respectively, report the results of the estimation of models (4’) and (4). First, we notice that the growth of option volume holds in general its explanatory power over stock volatility, since for all firms at least one of the two ratios is significant and positive. In fact, only Fortis (FRB) and Lloyds banking Group (TSB) fail to show both call and put variables as significant drivers of volatility.

The explanatory power of option volume appears to become less robust after accounting for stock volume, though. Despite this, only Deutsche Bank (DBK), fails to present a positive and significant coefficient at a 5% significance level for at least one of the two option volume ratios. This result is also particular, as the coefficient for RCALL60 is significant, but actually negative. As for stock volume, CITI is the only exception to the trend that attributes a positive correlation of this variable with volatility.

The EGARCH terms, including the asymmetry coefficient, did not change considerably from the plain EGARCH (1,1) specification in either of these models. There is a slight decrease in the estimates for the coefficients of the ARCH terms, but for all banks the differences are either too small to matter, or there is no discernible trend across all banks that allows us to draw any conclusions. These results are largely in line with findings in Ho *et al.* (2012), both in terms of sign and significance of the option volume coefficients.

Chart 2 (continue)

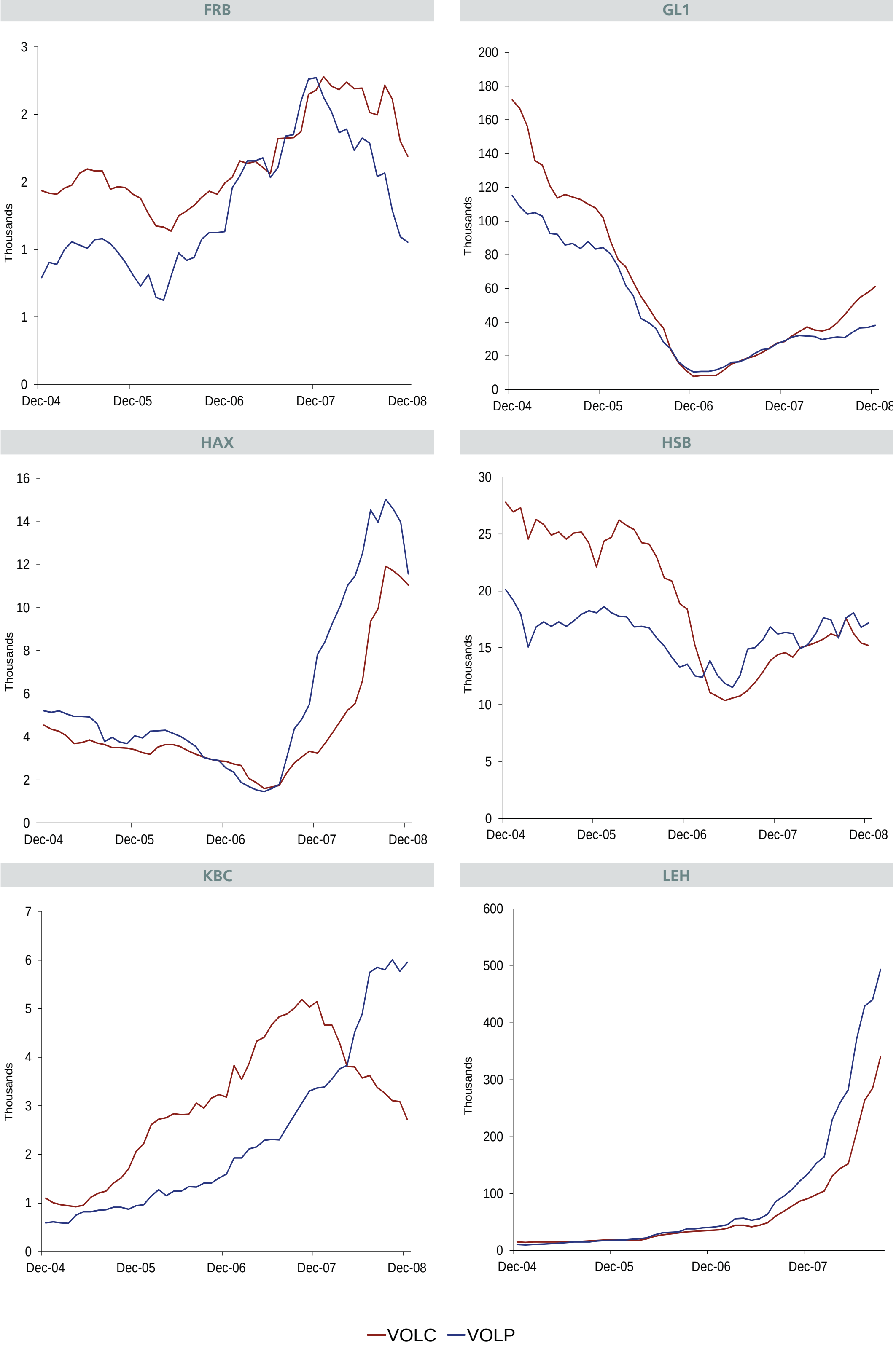
TOTAL CALL (VOLC) AND PUT (VOLP) VOLUME (12 MONTH MOVING AVERAGE)



Sources: Eurex, CBOE and Euronext.

Chart 2 (continuation)

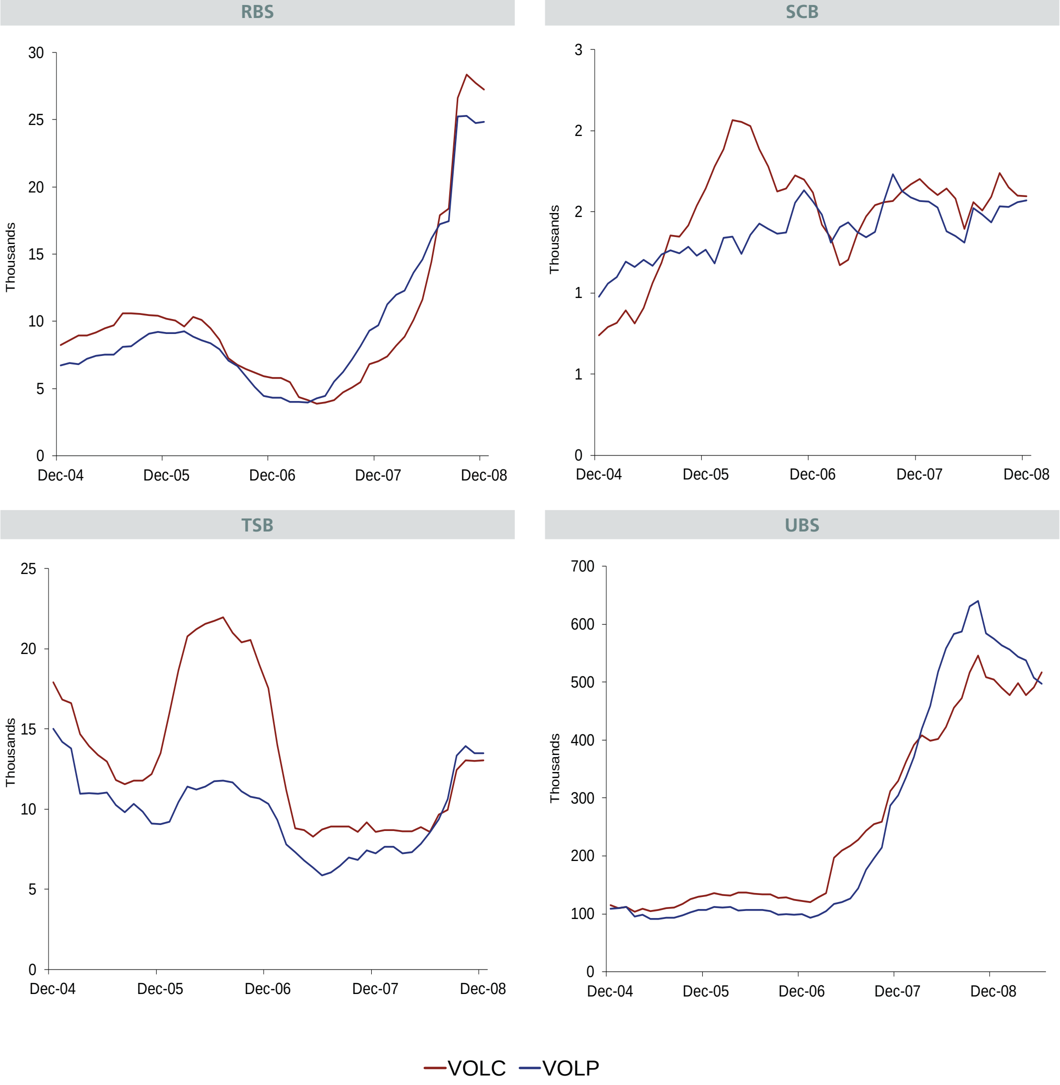
TOTAL CALL (VOLC) AND PUT (VOLP) VOLUME (12 MONTH MOVING AVERAGE)



Sources: CBOE, Eurex and Euronext.

Chart 2 (continuation)

TOTAL CALL (VOLC) AND PUT (VOLP) VOLUME (12 MONTH MOVING AVERAGE)



Sources: CBOE, Eurex and Euronext.

4.3. Accounting for Structural Breaks and Market Volatility

As mentioned in Section 2, sudden shifts in the volatility regime may create distortions in the estimates of the coefficients of the GARCH models and even induce persistence in volatility.

Accordingly, in equation (5) we assess this possibility by introducing two dummies that also capture these shifts through two structural breaks in volatility identified by the CUSUM tests ($SUBP_t$ and $SUBP2_t$).

Table 8 reports the results and shows that, with the exception of Lloyds Banking Group (TSB) and UBS, all banks present at least one break at a 10% significance level. Regarding the 2007 dummy there is a considerable number of banks for which the break in unconditional volatility does not seem to hold explanatory power. Concerning the 2008 dummy, the results are more conclusive, not only are there more banks for which it appears to be a relevant variable, but also, the magnitude of the coefficient is, in general, greater. Comparing the magnitude of both dummy coefficients, we can infer that the increase in volatility from the second regime to the final is, for all banks except HSBC, greater than the one that

Table 5

EGARCH(1,1) WITHOUT EXOGENOUS VARIABLES ASSOCIATED WITH EQUATION (1)

$$\log\left(h_t\right) = \omega + \beta_1 \left| \frac{\varepsilon_{t-1}}{h_{t-1}} - \sqrt{\frac{2}{\pi}} \right| + \gamma \frac{\varepsilon_{t-1}}{h_{t-1}} + \beta_2 \log\left(h_{t-1}\right)$$

Bank	ω	$\beta 1$	γ	$\beta 2$
BLL	**-0.204**	**0.15**	**-0.087**	**0.989**
BNP	**-0.089**	**0.091**	**-0.056**	**0.997**
CITI	**-0.283**	**0.22**	**-0.128**	**0.986**
CSGN	**-0.225**	**0.172**	**-0.056**	**0.988**
DBK	**-0.204**	**0.154**	**-0.076**	**0.989**
DXB	**-0.268**	**0.232**	**-0.053**	**0.989**
FRB	**-2.824**	**0.04***	**-0.118**	**0.532**
GL1	**-0.219**	**0.182**	-0.064	**0.99**
HAX	**-0.209**	**0.182**	**-0.065**	**0.991**
HSB	**-0.136**	**0.121**	**-0.055**	**0.994**
KBC	**-0.169**	**0.137**	**-0.06**	**0.992**
LEH	**-0.351**	**0.297**	**-0.164**	**0.982**
RBS	-0.269	**0.759**	**0.304**	**1.041**
SCB	**-0.257**	**0.177**	**-0.113**	**0.985**
TSB	**-0.231**	**0.187**	**-0.049***	**0.989**
UBS	**-0.194**	**0.165**	**-0.088**	**0.991**

Source: Authors' calculations.

Note: All estimates use the Bollerslev and Wooldridge (1992) heteroskedasticity consistent standard errors. Figures in bold represent coefficients that are significant at the 5% level. Figures in bold with a * represent coefficients that are significant at the 10% level.

occurred from the low volatility regime to the medium volatility regime. This provides statistical evidence that the conditional variance of the returns of these companies suffered, in general, permanent shifts in the vicinity of the events captured by the dummy variables.

Concerning the exogenous variables that were already present in the previous model, changes are mostly negligible, pointing to the fact that the inclusion of the structural breaks does not affect the explanatory power of the three variables linked to trading activity.

Finally, we analyze the estimation results for the model associated with equation (6), in which we try to assess the role of market volatility in explaining the volatility of stock returns and check whether the previous results concerning the trading volume variables still hold.

The estimation results are presented in Table 9. The Market volatility variable is statistically significant for 9 out of the 16 banks under analysis. Most of the British banks, five out of six, actually show a practically null coefficient. This result, coupled with fact that the structural breaks in the previous model failed to capture shifts in volatility for only two banks, leads us to believe that using the dummies may capture the exogenous volatility more accurately.

Nevertheless, regarding stock volume, the coefficients show very little change after including the market volatility variable. For the RCALL and RPUT variables the differences are not very big either. The only cases in which there was some relevant variation was FRB, for which the RCALL variable lost its significance entirely, and DBK where the coefficient for RCALL appears once again significant at a 5% level, like it did in the model without market volatility or structural breaks.

The most relevant impact of including the market volatility variable in the EGARCH coefficients is felt in the asymmetry parameter. The number of banks that present no evidence of leverage effects has lowered from three (BNP, FRB and LEH), in the model with only option and stock volume variables, to only one (LEH) in the model with a market volatility variable.

Table 6

EGARCH(1,1) WITH OPTION VOLUME VARIABLES ASSOCIATED WITH EQUATION (4′)

$$\log\left(\mathrm{h}_{\mathrm{t}}\right)=\omega+\beta_1\left|\frac{\varepsilon_{\mathrm{t}-1}}{\mathrm{h}_{\mathrm{t}-1}}-\sqrt{\frac{2}{\pi}}\right|+\gamma\frac{\varepsilon_{\mathrm{t}-1}}{\mathrm{h}_{\mathrm{t}-1}}+\beta_2\log\left(\mathrm{h}_{\mathrm{t}-1}\right)+\beta_3\mathrm{dlog}\left(\mathrm{RCALL60}_{\mathrm{t}}\right)+\beta_4\mathrm{dlog}(\mathrm{RPUT60}_{\mathrm{t}})$$

Bank	ω	$\beta 1$	γ	$\beta 2$	RCALL	RPUT
BLL	**-0.171**	**0.154**	**-0.075**	**0.993**	**0.192**	**0.249**
BNP	**-0.103**	**0.09**	**-0.062**	**0.996**	**0.165**	**0.091**
CITI	**-0.176**	**0.177**	**-0.052**	**0.996**	**1.034**	**0.615**
CSGN	**-0.162**	**0.123**	**-0.06**	**0.992**	**0.633**	**0.565**
DBK	**-0.141**	**0.123**	**-0.078**	**0.994**	**0.448**	**0.335**
DXB	**-0.16**	**0.151**	**-0.06**	**0.995**	**0.157**	**0.132**
FRB	0.002	**0.157**	-0.013	**1.013**	0.052	**0.208**
GL1	**-0.198**	**0.161**	**-0.085**	**0.991**	**0.153**	**0.161**
HAX	**-0.184**	**0.19**	**-0.068**	**0.995**	**0.14**	**0.167**
HSB	**-0.204**	**0.164**	**-0.061**	**0.991**	**0.332**	**0.195**
KBC	**-0.148**	**0.141**	**-0.044**	**0.995**	**0.188**	**0.113**
LEH	0.015	**0.192**	-0.021	**1.019**	**0.489**	**0.697**
RBS	**-0.14**	**0.165**	**-0.064**	**0.998**	**0.143**	**0.192**
SCB	**-0.205**	**0.167**	**-0.105**	**0.99**	**0.085**	**0.185**
TSB	**-0.143**	**0.12**	**-0.066**	**0.99**	**0.031**	0.001
UBS	**-0.158**	**0.145**	**-0.077**	**0.994**	**0.767**	**0.733**

Source: Authors' calculations.

Note: Formulas for RCALL and RPUT variables are presented in equations **(2)** and **(3)**, respectively. All estimates use the Bollerslev and Wooldridge (1992) heteroskedasticity consistent standard errors. Figures in bold represent coefficients that are significant at the 5% level. Figures in bold with a * represent coefficients that are significant at the 10% level.

Table 7

EGARCH(1,1) WITH OPTION AND STOCK VOLUME VARIABLES ASSOCIATED WITH EQUATION (4)

$$\log\left(h_t\right)=\omega+\beta_1\left|\frac{\varepsilon_{t-1}}{h_{t-1}}-\sqrt{\frac{2}{\pi}}\right|+\gamma\frac{\varepsilon_{t-1}}{h_{t-1}}+\beta_2\log\left(h_{t-1}\right)+\beta_3\mathrm{dlog}\left(RCALL60_t\right)+\beta_4\mathrm{dlog}\left(RPUT60_t\right)+\beta_5\mathrm{dlog}\left(SVOL_t\right)$$

Bank	ω	$\beta 1$	γ	$\beta 2$	RCALL	RPUT	SVOL
BLL	**-0.114**	**0.114**	**-0.064**	**0.997**	**0.076**	**0.167**	**1.039**
BNP	-0.012	**0.034**	-0.017	**1.002**	**0.068**	-0.003	**1.688**
CITI	**-0.174**	**0.176**	**-0.051**	**0.996**	**1.013**	**0.602**	0.085
CSGN	**-0.122**	**0.11**	**-0.038**	**0.996**	**0.435**	**0.368**	**1.112**
DBK	**-0.064**	**0.074**	**-0.027**	**1**	**-0.168**	-0.072	**2.309**
DXB	**-0.114**	**0.122**	**-0.059**	**0.998**	**0.073**	**0.067**	**1.083**
FRB	-0.079	**0.107**	-0.04	**1.001**	0.019	**0.048**	**1.617**
GL1	**-0.068**	**0.081**	**-0.031**	**1**	**0.056**	**0.105**	**1.623**
HAX	**-0.157**	**0.168**	**-0.045**	**0.997**	**0.05**	**0.076**	**1.219**
HSB	**-0.143**	**0.126**	**-0.041**	**0.995**	**0.231**	**0.15**	**0.913**
KBC	**-0.069**	**0.094**	**-0.043**	**1**	**0.055**	0.036	**1.399**
LEH	-0.067	**0.16**	0.006	**1.007**	**0.309**	**0.424**	**1.205**
RBS	**-0.071**	**0.098**	**-0.037**	**1.001**	0.06	**0.102**	**1.325**
SCB	**-0.11**	**0.108**	**-0.081**	**0.996**	0.016	**0.105**	**1.022**
TSB	**-0.064**	**0.086**	**-0.038**	**1**	**0.137**	0.04	**1.047**
UBS	**-0.146**	**0.143**	**-0.064**	**0.996**	**0.624**	**0.58**	**0.912**

Source: Authors' calculations.

Note: Formulas for RCALL and RPUT variables are presented in equations **(2)** and **(3)**, respectively. SVOL is the stock trading volume variable. All estimates use the Bollerslev and Wooldridge (1992) heteroskedasticity consistent standard errors. Figures in bold represent coefficients that are significant at the 5% level. Figures in bold with a * represent coefficients that are significant at the 10% level.

Table 8

EGARCH(1,1) WITH VOLUME VARIABLES AND STRUCTURAL BREAKS ASSOCIATED WITH EQUATION (5)

$$\log\left(h_t\right)=\omega+\beta_1\left|\frac{\varepsilon_{t-1}}{h_{t-1}}-\sqrt{\frac{2}{\pi}}\right|+\gamma\frac{\varepsilon_{t-1}}{h_{t-1}}+\beta_2\log\left(h_{t-1}\right)+\beta_3\text{dlog}\left(RCALL60_t\right)+\beta_4\text{dlog}\left(RPUT60_t\right)+\beta_5\text{dlog}\left(SVOL_t\right)+\beta_6SUBP_t+\beta_7SUBP2_t$$

Bank	ω	β1	γ	β2	RCALL	RPUT	SVOL	SUBP	SUBP2
BLL	**-0.338**	**0.096**	**-0.068**	**0.971**	**0.082**	**0.157**	**1.039**	**0.053**	**0.06**
BNP	-0.031	0.02	-0.015	**0.998**	**0.069**	-0.005	**1.676**	0.002	**0.012**
CITI	**-0.331**	**0.178**	-0.044	**0.98**	**1.017**	**0.598**	0.059	**0.043**	**0.043***
CSGN	**-0.217**	**0.116**	**-0.035**	**0.986**	**0.444**	**0.36**	**1.142**	0.012	**0.022***
DBK	**-0.265**	**0.09**	**-0.058**	**0.979**	**-0.146***	-0.083	**2.272**	0.007	**0.076**
DXB	**-0.294**	**0.126**	**-0.065**	**0.979**	**0.07**	**0.065**	**1.099**	**0.033**	**0.067**
FRB	**-0.301**	**0.099**	**-0.064**	**0.976**	0.039	**0.038***	**1.58**	**0.027***	**0.119**
GL1	**-0.126**	**0.064**	**-0.028***	**0.992**	**0.056**	**0.11**	**1.626**	0.011	**0.034**
HAX	**-0.324**	**0.161**	**-0.047**	**0.979**	**0.053**	**0.067**	**1.224**	**0.044**	**0.062**
HSB	**-0.309**	**0.112**	-0.029	**0.978**	**0.218**	**0.15**	**0.931**	**0.041**	0.031
KBC	**-0.368**	**0.093**	**-0.063**	**0.967**	**0.056**	0.02	**1.426**	**0.037**	**0.112**
LEH	**-0.334**	**0.206**	-0.046	**0.98**	**0.494**	**0.534**	**0.413**	**0.034***	**0.565**
RBS	**-0.168**	**0.073**	**-0.045**	**0.988**	0.049	**0.099**	**1.332**	0.025	**0.037**
SCB	**-0.322**	**0.121**	**-0.083**	**0.974**	0.025	**0.1**	**1.025**	**0.03**	**0.054**
TSB	-0.114	**0.059**	**-0.043**	**0.993**	**0.131**	0.037	**1.042**	0.011	0.023
UBS	**-0.161**	**0.145**	**-0.067**	**0.994**	**0.624**	**0.574**	**0.924**	-0.001	0.009

Source: Authors' calculations.

Note: Formulas for RCALL and RPUT variables are presented in equations **(2)** and **(3)**, respectively. SVOL is the stock trading volume variable. SUBP and SUBP2 are dummies included to capture the structural breaks in volatility in July 2007 and October 2008. All estimates use the Bollerslev and Wooldridge (1992) heteroskedasticity consistent standard errors. Figures in bold represent coefficients that are significant at the 5% level. Figures in bold with a * represent coefficients that are significant at the 10% level.

Table 9

EGARCH(1,1) WITH VOLUME VARIABLES AND MARKET VOLATILITY ASSOCIATED WITH EQUATION (6)

$$\log\left(h_t\right)=\omega+\beta_1\left|\frac{\varepsilon_{t-1}}{h_{t-1}}-\sqrt{\frac{2}{\pi}}\right|+\gamma\frac{\varepsilon_{t-1}}{h_{t-1}}+\beta_2\log\left(h_{t-1}\right)+\beta_3\text{dlog}\left(RCALL60_t\right)+\beta_4\text{dlog}\left(RPUT60_t\right)+\beta_5\text{dlog}\left(SVOL_t\right)+\beta_6MVOL_t$$

Bank	ω	β1	γ	β2	RCALL	RPUT	SVOL	MVOL
BLL	**-0.145**	**0.115**	**-0.065**	**0.994**	**0.077**	**0.166**	**1.044**	0.000
BNP	**-0.121**	**0.033**	**-0.028***	**0.991**	**0.071**	0.000	**1.683**	**0.001**
CITI	**-0.294**	**0.182**	**-0.048***	**0.986**	**1.028**	**0.611**	0.000	**0.002**
CSGN	**-0.323**	**0.115**	**-0.026***	**0.978**	**0.447**	**0.346**	**1.192**	**0.002**
DBK	**-0.468**	**0.090**	**-0.035**	**0.964**	**-0.173**	0.000	**2.324**	**0.004**
DXB	**-0.209**	**0.123**	**-0.062**	**0.990**	**0.071**	**0.069**	**1.114**	**0.001**
FRB	**-0.524**	**0.123**	**-0.065**	**0.963**	0.000	**0.047**	**1.621**	**0.005**
GL1	**-0.173**	**0.068**	**-0.035**	**0.989**	**0.057**	**0.110**	**1.644**	**0.001**
HAX	**-0.172**	**0.168**	**-0.046**	**0.996**	**0.050**	**0.076**	**1.221**	0.000
HSB	**-0.217**	**0.126**	**-0.038***	**0.988**	**0.229**	**0.150**	**0.914**	0.000
KBC	**-0.413**	**0.126**	**-0.055**	**0.971**	**0.059**	0.000	**1.435**	**0.003**
LEH	1.201	**0.159**	0.000	**1.007**	**0.309**	**0.425**	**1.201**	0.000
RBS	**-0.108**	**0.100**	**-0.036**	**0.998**	0.000	**0.108**	**1.347**	0.000
SCB	**-0.235**	**0.123**	**-0.086**	**0.985**	0.000	**0.103**	**1.036**	**0.001***
TSB	**-0.090**	**0.074**	**-0.040**	**0.997**	**0.138**	0.000	**1.064**	0.000
UBS	**-0.183**	**0.145**	**-0.063**	**0.993**	**0.623**	**0.574**	**0.932**	0.000

Source: Authors' calculations.

Note: Formulas for RCALL and RPUT variables are presented in equations **(2)** and **(3)**, respectively. SVOL is the stock trading volume variable. MVOL is a measure of market wide volatility (VIX index for English and American banks and VSTOXX index for all others). Figures in bold represent coefficients that are significant at the 5% level. Figures in bold with a * represent coefficients that are significant at the 10% level.

5. CONCLUSION

This article studies the link between the trading activity in banks equity options market and the volatility of the corresponding underlying stock. Our approach differs from previous work in three main aspects. First, our focus rested upon option trading volume, rather than implied volatility. Second, our sample is unique both in terms of sector and geography, since our sample includes only large banks coming from various countries on both sides of the Atlantic. Finally, and most importantly, our sample is also very diverse concerning different patterns of volatility that emerged as a consequence of a period of financial crisis, allowing us to study the dynamics created by this fact.

Using conditional volatility models, we are able to capture the dynamics of the volatility of most of the stocks in our sample. In addition, we check the robustness of our models by identifying sudden changes in the pattern of volatility during the period under analysis for all banks, caused by the subprime crisis, in two alternative ways. First, we introduce dummy variables to capture these breaks. As an alternative, we also included a market volatility variable to capture the volatility changes that are common to the entire market.

The results show the presence of breaks in volatility in both models. The results of the various models are consistent with the fact that both stock trading volume and option trading volume have a statistically significant and positive impact on volatility, meaning that the more options are traded in a given day, the more likely it is that the stock return will be very high or very low. This result shows that investors may be trading private information about volatility in the option market. This can be important in understanding the interconnectedness between the two markets, contribute to better model the volatility of stock returns and potentially help to predict market instability.

For this reason, future extension of this research should address the forecasting potential of this relation, in order to incorporate this information in a forward-looking model of market volatility.

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