

A MACRO-PRUDENTIAL POLICY FOR FINANCIAL STABILITY*

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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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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 arbitrage¹, 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 stability³, 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

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.

almost exclusively at banks, on the assumption that financial markets could be disciplined through auto-regulation.

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 difficult⁵ 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 markets⁶, without, however, completely dismissing the impact that global imbalances might have had on the liquidity conditions of the US economy.

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 of 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

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

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.

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,

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 definition of intermediate targets confers a greater operability and transparency to the policy.

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

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 analyse the system’s resilience to shocks), Network Analysis (which analyse the system’s inter-connectedness 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 analyse 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 monitoring 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.

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.

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 buffer¹³ 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

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).

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.

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.

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 transactions¹⁶, 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

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.

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.

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) recommendation¹⁷ – 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 sector¹⁸, 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.

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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Macro-prudential policies aimed at mitigating systemic financial risks have become part of the policy toolkit in many emerging markets and some advanced countries. Their effectiveness and efficacy are not well-known, however. Using panel data regressions, we analyze how changes in balance sheets of some 2800 banks in 48 countries over 2000–2010 respond to specific policies. Controlling for endogeneity, we find that measures aimed at borrowers – caps on debt-to-income and loan-to-value ratios, and limits on credit growth and foreign currency lending – are effective in reducing leverage, asset and noncore to core liabilities growth during boom times. The macro-prudential policy is drafted and implemented by the macro-prudential authority of the country, which, depending on the structure of the financial system and the form of its supervision, may be the central bank or an inter-institutional forum representing several public authorities. What is the purpose of makroprudencial policies? Macro-prudential policies aim to: identify, monitor and assess the type and size of risks that threaten financial stability; strengthen financial system capacities to avoid or cope with these risks with as little loss as possible. Institutional framework. Macro-prudential strategy. Instruments of Macroprudential Policy. Systemic risk assessment. Macroprudential policy – definition and scope. This section recalls the definition of macroprudential policy offered in previous Board papers (IMF, 2011a), and develops the appropriate scope of macroprudential policy, drawing on a number of further studies. Adverse aggregate shocks; (ii) macro-financial feedback mechanisms that result in an overexposure to such adverse aggregate shocks; and (iii) linkages within the financial system that increase the vulnerability of the system to idiosyncratic or aggregate shocks. 10. Externalities can arise when the financial system amplifies adverse shocks to the economy (Hanson and others, 2011). Financial stability is affected by a range of policies other than macroprudential policies, both ex ante and ex post. Macroprudential policy is modelled by introducing a new agent, the macroprudential regulator, who can set minimum capital requirements for banks. We assume that parameter values are such that the capital requirement is binding, and analyse the effect on the equilibrium of the model of increasing the requirement. Our numerical results show that the optimal combination of both policies is closer in terms of both financial stability and social welfare to the optimal stand-alone macroprudential policy, which are in turn higher than those that can be obtained with the optimal stand-alone monetary policy.