



SPECIAL FEATURES

A EXPLORING THE NEXUS BETWEEN MACRO-PRUDENTIAL POLICIES AND MONETARY POLICY MEASURES¹

The financial crisis highlighted the importance of systemic risks and of policies that can be employed to prevent and mitigate them. Several recent initiatives aim at establishing institutional frameworks for macro-prudential policy. As this process advances further, substantial uncertainties remain regarding the transmission channels of macro-prudential instruments as well as the interactions with other policy functions, and monetary policy in particular. This special feature provides an overview and some illustrative model simulations of the macroeconomic interdependence between macro-prudential instruments and monetary policy.

INTRODUCTION

A key lesson emerging from the financial crisis that erupted in 2007 was the inadequacy of the institutional policy frameworks prevailing at the time to deal with the build-up and materialisation of systemic risks. In particular, micro-prudential supervision proved to fall short by not accounting for the externalities associated with the activity of individual banks, i.e. their impact on the risk in the financial system as a whole. This led to the recognition of the importance of having macro-prudential policy arrangements in place to complement other policies, such as monetary and fiscal policy and micro-prudential supervision.

In response to these experiences, substantial efforts have been made to improve institutional arrangements for dealing with systemic risks. Macro-prudential oversight bodies have been set up in all the major economies (such as the European Systemic Risk Board in the EU, the Financial Stability Oversight Committee in the United States and the Financial Policy Committee in the United Kingdom).

Moreover, in the EU, a number of macro-prudential policy instruments are embedded in the legislative texts transposing the Basel III regulatory standards into EU law.² Furthermore, the introduction of the single supervisory mechanism (SSM) will partly lift macro-prudential policy-making to the supranational level, as the ECB-centred SSM will have the ability to implement macro-prudential measures set out in the EU legal acts (i.e. the CRD IV and the CRR).³ Specifically, with the establishment of the SSM, both national competent authorities and the ECB will be the designated authorities for macro-prudential policy for the euro area as well as for countries participating in the SSM. An important element of the SSM regulation is that, if deemed necessary for addressing systemic or macro-prudential risks, the ECB will be empowered to apply higher requirements for capital buffers and other macro-prudential measures beyond those applied by authorities of participating Member States.⁴

The instruments covered by the EU legal texts include counter-cyclical capital buffers, systemic risk buffers, capital surcharges for systemically important financial institutions (SIFIs), sectoral capital requirements/risk weights, leverage ratios, liquidity requirements and large exposure limits

The macro-prudential orientation of financial supervision in the euro area means authorities have effective instruments to intervene in the financial cycle

1 Prepared by Giacomo Carboni, Matthieu Darracq Pariès and Christoffer Kok.

2 Namely the new Capital Requirements Directive (CRD IV) and the Capital Requirements Regulation (CRR).

3 According to the SSM draft regulation. Macro-prudential measures not contained in the CRD IV and CRR will remain in the remit of national authorities.

4 Importantly, the SSM legislation recognises the role of national authorities in the conduct of macro-prudential policy in the EU. Specifically, whenever appropriate or deemed necessary, and without prejudice to the tasks conferred upon the ECB, the competent or designated authorities of the participating Member States shall apply the CRD IV/CRR measures, subject to the requirement of prior notification of their intention to do so to the ECB.

Table A.1 Key macro-prudential instruments

CRD IV	CRR	In addition to the legal texts
Counter-cyclical capital buffer (Art. 124)	Leverage ratio (as of 2019)	Margin and haircut requirements
Systemic risk buffer (Art. 124d)	Liquidity coverage ratio (as of 2015)	Loan-to-value ratio caps
Capital surcharge for SIFIs (Art. 124a)	Net stable funding ratio (as of 2019)	Levy on non-stable funding
Sectoral capital requirements/risk weights (Art. 119)	Sectoral capital requirements/risk weights (Art. 160, 443)	Loan-to-income ratio caps
	Large exposure limits (Art. 443a)	Loan-to-deposit ratio caps
	Increased disclosure requirements (Art. 443a)	

Source: ECB.

(see Table A.1). In addition, a number of macro-prudential instruments not covered by the legal texts are envisaged, such as caps on loan-to-value ratios⁵ or loan-to-income ratios, margin and haircut requirements and loan-to-deposit ratio thresholds.⁶ This broad array of macro-prudential instruments is intended to ensure that the goal of macro-prudential policy, namely of reducing systemic risk, is achieved. Systemic risk is an elusive and multi-layered concept, which can, at a minimum, be characterised along both a time dimension and a cross-section dimension,⁷ and hence it is generally recognised that multiple macro-prudential policy instruments may be needed to prevent the materialisation of systemic risks.

Notwithstanding these advances in the institutional set-up and the identification of relevant policy tools, substantial uncertainties surround the practical implementation of macro-prudential policies in the EU, including how to assess their potential impact on the financial system and the real economy. First of all, there is relatively limited practical experience with macro-prudential policies, at least in the major advanced economies.⁸ Likewise, while substantial conceptual work on defining systemic risk and how to address it has taken place in recent years, a broad consensus still needs to be formed on what the specific policy objectives of the macro-prudential policy-maker should be and how macro-prudential policy should interact with other policy functions (such as monetary policy and micro-prudential supervision). In this context, the Committee on the Global Financial System (2012) distinguishes between two main objectives of macro-prudential policies, namely: (i) increasing the resilience of the financial sector; and (ii) “leaning against the financial cycle”.⁹

Central in the definition of systemic risk is its pervasive nature, as well as its interaction with, and its impact on, the macroeconomic environment. Therefore, in addition to the obvious interrelation with the micro-prudential supervisory tasks of the SSM, due consideration will need to be given to how macro-prudential interventions in the euro area will interact with the conduct of monetary policy. Institutional frameworks are being established with separate decision-making, accountability and

5 One impediment related to using loan-to-value ratio caps on a euro area-wide basis is, however, the persisting differences across euro area countries with regard to the definition of these ratios and methods of collecting and aggregating relevant data. These discrepancies hamper the comparison of loan-to-value ratios and could hinder macro-prudential policy coordination among the euro area countries in the future. It would accordingly be opportune to enhance efforts to harmonise statistics in this field.

6 See also the forthcoming Recommendation of the European Systemic Risk Board on intermediate objectives and instruments of macro-prudential policy for an overview of envisaged macro-prudential instruments in the EU and ECB, “Macro-prudential policy objectives and tools”, *Financial Stability Review*, June 2010.

7 For a detailed discussion on the concept of systemic risk, see ECB, “The concept of systemic risk”, *Financial Stability Review*, December 2009.

8 Lim et al. (2011) provide an overview of lessons from country experiences with macro-prudential policies. In general, emerging market economies have made more extensive use of macro-prudential policies than advanced economies; see C. Lim, F. Columba, A. Costa, P. Kongsamut, A. Otani, M. Saiyid, T. Wezel and X. Wu, “Macroprudential policy: What instruments and how to use them? Lessons from country experiences”, *IMF Working Paper Series*, WP/11/238, International Monetary Fund, 2011.

9 See Committee on the Global Financial System, “Operationalising the selection and application of macroprudential instruments”, *CGFS Papers*, No 48, 2012.

communication structures. But formidable challenges lie ahead with regard to understanding and appropriately exploiting the macroeconomic interdependence between macro-prudential and monetary policies.

Against this background, this special feature surveys the recent literature on the conduct of macro-prudential policy and, in particular, explores its nexus with monetary policy, focusing on the objective of stabilising the financial cycle. It points towards some of the challenges and issues the SSM will face once it takes on its responsibilities as a macro-prudential policy-maker. In investigating the interaction between monetary and macro-prudential policies, the assessment is organised around two distinct, but interrelated dimensions. First, the focus is on the transmission mechanism of individual macro-prudential instruments from a system-wide perspective. Second, the emphasis is placed on the strategic complementarities in leaning against the financial cycle as well as in exceptional crisis circumstances.

THE MACROECONOMIC EFFECTS OF MACRO-PRUDENTIAL INSTRUMENTS: EXISTING EVIDENCE

Before embarking on macro-prudential interventions it will be crucial to conduct a thorough impact assessment. A useful starting point would be the stylised facts that emerge from the empirical literature on how changes in financial regulation affect banks and the wider financial and economic system. In general, policy measures affecting banks' balance sheets are likely to lead to adjustments in bank behaviour.

While there is some empirical evidence of the impact of changing capital requirements on bank loan supply and economic growth, evidence relating to the real economic impact of changes to liquidity requirements as well as asset-side regulation (such as loan-to-value ratios and loan-to-income ratios) is more limited.¹⁰

As regards the impact of changes to bank capital, a number of recent empirical studies suggest that banks typically react in a number of ways. A general finding is that banks, when faced with higher capital requirements (or capital shortfalls), are likely to adjust not only their equity levels (via retained earnings and the raising of capital), but also their lending decisions and credit conditions.¹¹ It is assumed that the reason for such adjustments is that banks target a specific capital (or leverage) ratio and hence deviations from this target will trigger balance sheet adjustments.¹² Such behaviour may, however, vary across individual banks and business models, which suggests that decisions on capital-related macro-prudential interventions should take into account information about the heterogeneity of the banks affected.¹³ Furthermore, analysing the experience with dynamic loan

This special feature explores the nexus between macro-prudential and monetary policies

Regulatory changes provide some indirect evidence of the impact of macro-prudential instruments

Policy measures affecting bank balance sheets are likely to lead to adjustments in bank behaviour...

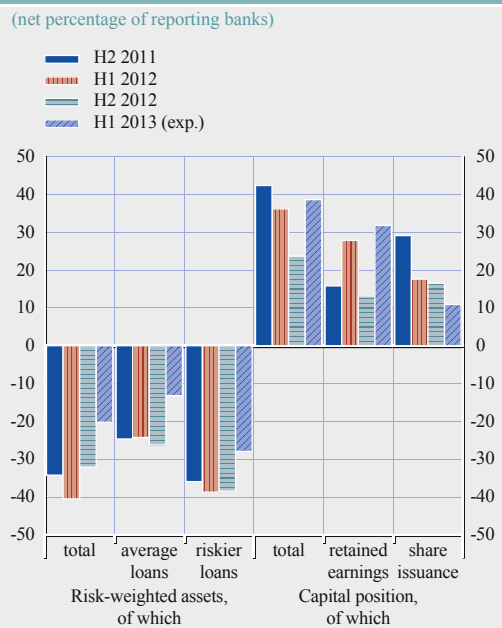
10 For some recent reviews of the literature on the transmission of macro-prudential policies, see IMF, "The interaction of monetary and macroprudential policies: Background paper", 2012, and CGFS, *op. cit.*

11 See, for example, J.M. Berrospide and R.M. Edge, "The effects of bank capital on lending: What do we know, and what does it mean?", *International Journal of Central Banking*, December 2010, W.B. Francis and M. Osborne, "Capital requirements and bank behavior in the UK: Are there lessons for international capital standards?", *Journal of Banking & Finance*, Vol. 36(3), 2012, pp. 803-816, L. Maurin and M. Toivanen, "Risk, capital buffer and bank lending: A granular approach to the adjustment of euro area banks", *ECB Working Paper Series*, No 1499, 2012 and G. Schepens and C. Kok, "Bank reactions after capital shortfalls", paper presented at the EBA research workshop on banks' business models after the crisis, November 2012.

12 See, for example, A.N. Berger, R. DeYoung, M. Flannery, D. Lee and O. Oztekin, "How do large banking organizations manage their capital ratios?", *Journal of Financial Services Research*, Vol. 34(2-3), 2008, pp. 123-149, M. Flannery and K.P. Rangan, "What caused the bank capital build-up of the 1990s?", *Review of Finance*, Vol. 12(2), 2008, pp. 391-429 and R. Gropp and F. Heider, "The determinants of bank capital structure", *Review of Finance*, Vol. 14(4), 2010, pp. 587-622.

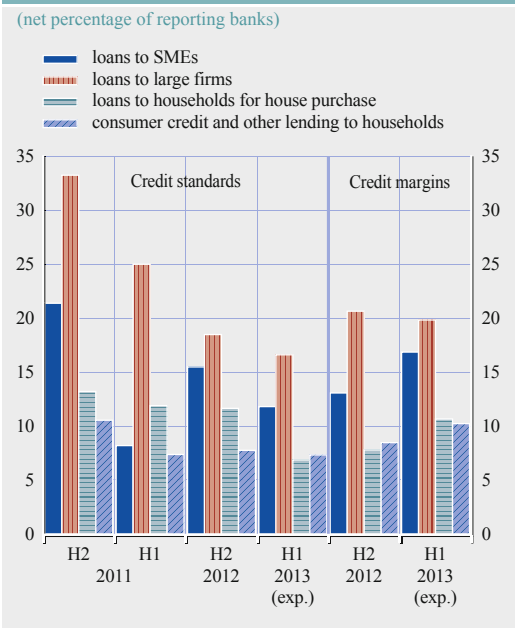
13 See, for example, A. Martin-Oliver, S. Ruano and V. Salas-Fumás, "Banks' equity capital frictions, capital ratios, and interest rates: Evidence from Spanish banks", *International Journal of Central Banking*, March 2013.

Chart A.1 Impact of CRD IV and other changes in regulatory requirements on banks' risk-weighted assets and capital position



Source: ECB's bank lending survey.

Chart A.2 Contribution of CRD IV and other changes in regulatory requirements to the tightening of credit standards



Source: ECB's bank lending survey.

provisioning in Spain, Jimenez et al. (2012) find that counter-cyclical capital buffer requirements (as reflected in the dynamic provisioning) tend to smoothen the credit cycle and can have positive real economic effects.¹⁴

... this is confirmed by the bank lending survey results...

These empirical findings are corroborated by results from the ECB's January 2013 bank lending survey which included responses from participating banks in the euro area on how the CRD IV and other changes in regulatory requirements had affected their balance sheets and credit standards. According to the banks' responses, these regulatory changes had induced a number of the banks to reduce their risk-weighted assets (especially related to riskier loans) and to increase nominal capital levels (via retained earnings and the raising of new capital) (see Chart A.1). At the same time, a number of banks indicated that the new and more stringent regulatory requirements had contributed to the net tightening of their credit standards (and the increase in lending margins) observed over the past two years (see Chart A.2).

...as well as by some recent empirical studies

Overall, much of the available empirical evidence indicates that changes to banks' capital (and liquidity) positions, and the impact thereof on lending behaviour in particular, can potentially have considerable real economic costs, at least in the transition phase. However, these short-term costs should ideally be outweighed by the long-term benefits arising from the policy interventions in terms of reducing the probability of a crisis. Much will depend on the extent to which regulatory

¹⁴ See G. Jiménez, S. Ongena, J.-L. Peydro and J. Saurina Salas, "Macroprudential policy, countercyclical bank capital buffers and credit supply: Evidence from the Spanish dynamic provisioning experiments", *European Banking Center Discussion Papers*, No 2012-011, 2012.

changes are of a transitory or permanent nature, and if the latter, the length of the transition period towards the “steady state” will play an important role.¹⁵

Turning to **asset-side macro-prudential instruments**, there is some (albeit limited) evidence that they can increase the resilience of banks by improving the creditworthiness of borrowers. Specifically, several studies find that tighter loan-to-value ratio caps reduce the sensitivity of households to income and property price shocks.¹⁶

Finally, Lim et al. (2011) suggest that several of the commonly used macro-prudential instruments reduce pro-cyclicality in the financial system.¹⁷ The analysis also suggests that the type of shock matters. Different types of risk call for the use of different instruments.

THE TRANSMISSION MECHANISM OF SELECTED MACRO-PRUDENTIAL INSTRUMENTS

The propagation of macro-prudential instruments is likely to interact with the transmission mechanism of monetary policy decisions, not least as they both affect the behaviour of financial intermediaries.¹⁸ In supporting the stability of the financial system and in seeking to dampen its pro-cyclical tendency, macro-prudential instruments generally involve significant balance sheet adjustments within the financial sector, with effects on credit provision, asset prices and overall financing conditions for households and firms. Those factors may influence the transmission of the monetary policy stance and, ultimately, the outlook for price stability. Conversely, monetary policy will be relevant for macro-prudential oversight as it can affect agents’ decisions on risk-taking, leverage and the composition of assets and liabilities. For instance, the risk-taking channel of monetary policy transmission underlines how protracted loose monetary conditions can foster incentives for financial institutions to take on more risk, thus encouraging leverage and paving the way to the build-up of financial imbalances.¹⁹ More broadly, changes in the monetary policy stance influence borrowers’ decisions on taking on debt by affecting the tightness of their borrowing constraints via the impact on asset prices and borrowers’ net worth and hence on the cost of external financing for borrowers.

A first step in exploring the interaction between macro-prudential oversight and monetary policy is to analyse the macroeconomic propagation of selected macro-prudential instruments, namely: (i) system-wide bank capital requirements; (ii) sectoral capital requirements; and (iii) loan-to-value ratio restrictions.²⁰ Intuitively, the aim of system-wide capital requirements is to increase the resilience of the banking system as a whole by ensuring adequate buffers to cope with potential sizeable losses.

The macroeconomic effects of selected macro-prudential instruments which may be used to lean against the financial cycle...

... interact significantly with interest rate decisions by central banks

15 In this regard, two frequently cited studies are the macroeconomic assessment of the transitory costs during the implementation phase of the Basel III framework carried out by the Macroeconomic Assessment Group of the Financial Stability Board and the Basel Committee on Banking Supervision and the Basel Committee on Banking Supervision’s long-term economic impact study weighing the long-run costs and benefits of the new capital and liquidity requirements embedded in the Basel III proposal; see Financial Stability Board and Basel Committee on Banking Supervision, “Assessing the macroeconomic impact of the transition to stronger capital and liquidity requirements: Final report”, 2010 and Basel Committee on Banking Supervision, “An assessment of the long-term economic impact of the new regulatory framework”, 2010.

16 See, for example, E. Wong, T. Fong, K.-F. Li and H. Choi, “Loan-to-value ratio as a macroprudential tool – Hong Kong’s experience and cross-country evidence”, *Hong Kong Monetary Authority Working Papers*, No 01/2011, 2011.

17 See Lim et al., *op. cit.*

18 An important limitation regarding the analysis presented in this special feature is that it focuses exclusively on the impact of monetary and macro-prudential policies on the banking sector. While in the euro area, banks are the most important part of the financial system, it is conceivable that macro-prudential policies (and monetary policy) could also affect financial intermediation of non-bank financial institutions.

19 See, for example, G. Jiménez, S. Ongena, J.-L. Peydró and J. Saurina, “Credit supply and monetary policy: Identifying the bank balance-sheet channel with loan applications”, *American Economic Review*, Vol. 102(5), 2012, pp. 1-30.

20 In so doing, the assessment abstracts from normative considerations related to how macro-prudential (and monetary) policy should be conducted, and focuses instead on the positive perspective of the impact of macro-prudential instruments and their interaction with the monetary policy stance.

Sectoral capital requirements, on the other hand, make lending to certain classes of borrowers more costly and hence prompt banks to reduce their activity in that segment. Third, restrictions on loan-to-value ratios pertain to the assets side of the banking system, directly affecting the borrowing constraints of banks' customers, and hence make the banking system less vulnerable to borrower defaults.

The academic literature assessing the impact of macro-prudential policy has been promising of late, but the knowledge gap in this respect remains substantial (see Box A.1 for a partial survey of existing studies). In this special feature, a tentative illustration of the transmission mechanism associated with these three key macro-prudential tools is provided using a medium-scale dynamic stochastic general equilibrium (DSGE) model comprising a relatively rich characterisation of the banking sector.²¹ Monetary policy in the model is formalised in terms of an interest rate rule that prescribes a response to inflation, output growth and asset prices.

First, faced with an *increase in system-wide capital requirements* (calibrated as a 1.5 percentage point change in the capital ratio), banks react by charging higher margins on new loans and curtailing the provision of credit symmetrically to both households and non-financial corporations, albeit to different extents (see Chart A.3). In addition, the resulting contraction in both investment and consumption expenditure depresses capital and house prices, which exacerbates the propagation effects through financial accelerator mechanisms (as the decline in collateral values tightens borrowing constraints). The impact on economic activity and inflation is mitigated by significant monetary policy accommodation. Therefore, monetary policy may provide a significant shield for macroeconomic allocations, provided it has scope to respond to bank balance sheet adjustment at times of increasing capital buffers. Conversely, a concomitant increase in capital requirements and the monetary policy rate can be expected to effectively curb bank lending and slow down economic activity.

Second, an *increase in sectoral capital requirements* makes the price of lending to the targeted sector relatively more expensive.²² This triggers relative price and asset price adjustments together with substitution effects in bank lending, whereby loans decline in the target sector while lending to the non-target sector increases (see Chart A.3). Overall, the effects on real GDP and inflation are influenced by the intensity of this substitution and the sectoral distribution of the transmission mechanism. In relative terms, capital requirements targeting loans to non-financial corporations appear to have stronger multipliers on real GDP and consumer price index inflation, thereby leading to a more accommodative monetary policy. Capital requirements targeting housing loans lead to a less clear-cut macroeconomic configuration for monetary policy.

Finally, a *lower cap on loan-to-value ratios* on loans to households constrains the maximum loan that a bank is willing to grant against collateral.²³ The transmission mechanism features some similarities with the case of sectoral capital requirements on housing loans. However, the adverse impact on housing investment and then on output and inflation is more pronounced, partly mitigated by a prompt loosening of the monetary stance (see Chart A.3).

21 See M. Darracq Pariès, C. Kok and D. Rodriguez-Palenzuela, "Macroeconomic propagation under different regulatory regimes: evidence from an estimated DSGE model for the euro area", *International Journal of Central Banking*, December 2011.

22 The shocks to the sectoral capital requirement scenarios are calibrated so as to imply an increase in the lending spread for the target sector (i.e. lending rate minus the deposit rate, where the latter is the interbank rate) which is the same as the increase in the spread in the bank capital shock (in essence, the overall shock in the two sectoral capital requirement scenarios combined is equal to the bank capital shock).

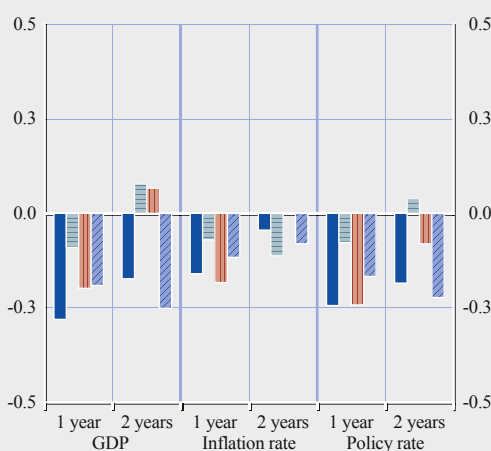
23 The loan-to-value ratio shocks for households are calibrated so as to imply the same peak impact on household loans (in the second year) as the one underpinning the corresponding sectoral capital requirement scenarios.

Chart A.3 Transmission mechanism of selected macro-prudential instruments under endogenous monetary policy

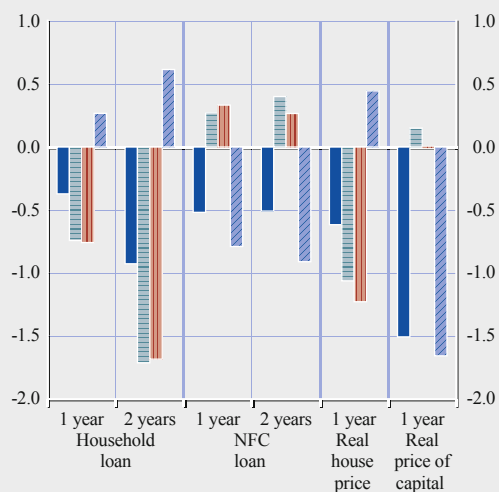
(percentage point difference from baseline)

- bank capital shock
- loan-to-value ratio shocks to households
- sectoral capital requirements on households
- sectoral capital requirements on non-financial corporations (NFCs)

a) Impact on real GDP, inflation and the policy rate



b) Impact on lending, house prices and the price of capital



Source: ECB calculations.

Note: Simulations are carried out using the model developed by Darracq et al. (2011).

Notably, the illustration of the real economic implications derived from these simulations reflects the effects of introducing each of the macro-prudential instruments in isolation, but does not account for the strategic complementarities between macro-prudential instruments and the benefits of combining them.

Box A.1

ACADEMIC PROGRESS IN ASSESSING THE TRANSMISSION MECHANISM OF MACRO-PRUDENTIAL INSTRUMENTS

There is a small but resurgent body of literature on macro-prudential policy impact assessments. Some prominent early contributions identified the relevance of incorporating system-wide financial stability aspects into the overall institutional policy framework governing the monetary and financial system.¹ This insight was rooted in the recognition that financial systems are inherently pro-cyclical and the fact that financial cycles in general are longer than real business

¹ Crockett (2000) provided an early seminal contribution; see A. Crockett, "Marrying the micro- and macro-prudential dimensions of financial stability", *BIS Review* 76/2000, Bank for International Settlements, 2000. See also C. Borio, C. Furfine and P. Lowe, "Procyclicality of the financial system and financial stability: Issues and policy options", *BIS Papers*, No 1, Bank for International Settlements, 2001 and C. Borio, "Towards a macroprudential framework for financial supervision and regulation?", *BIS Working Paper Series*, No 128, Bank for International Settlements, 2003.

cycles.² Hence, there is a risk that financial developments become detached from fundamental real economic developments, which may lead to the build-up of unsustainable financial imbalances whose unravelling (“sudden busts”) could have detrimental short and long-run implications for economic growth. This, it is argued, provides a role not only for monetary policy, but also for macro-prudential policy to mitigate the risks of such divergences between the real and financial cycles.³

The pro-cyclicality of the financial system can be traced to the various distortions inherent in financial relationships stemming from the existence of asymmetric information (e.g. between banks and their borrowers), resulting in adverse selection and moral hazard problems, and limited enforcement technologies, whereby borrowing is constrained by the loss given default and leads to collateral constraints. This combination can result in distorted individual behaviour, whereby intermediaries do not internalise the impact that their default could have on the system and thus may give rise to excessive risk-taking and pro-cyclicality.⁴ In other words, there can be an endogenous build-up of imbalances within the financial system that, in the case of an adverse event, could give rise to a systemic event.⁵ Similarly, once built-up imbalances start to unravel and banks’ balance sheets become impaired, banks and their micro-prudential supervisors may react by shrinking the assets side, but in the process may fail to internalise that this could give rise to a credit crunch and asset fire sales that are likely to further amplify the initial shock.⁶ In the light of these insights, the role of macro-prudential policy should be to pursue a “general equilibrium” and, in doing so, constrain ex ante the risk-taking incentives underlying financial relationships in order to reduce systemic risks over the cycle and across institutions.⁷

Since, as mentioned above, systemic risks can take many forms, the macro-prudential toolkit requires several policy instruments. These tools should be able to cover both the time dimension and the cross-section dimension of systemic risk. Most of the existing literature evaluating the transmission and impact of macro-prudential policies, however, tends to focus on the time dimension,⁸ whereas studies on the cross-section dimension are much less widespread.⁹ In particular, many studies have focused on the effectiveness of counter-cyclical macro-prudential instruments in stabilising the credit cycle, alongside and interacting with the monetary policy function.

2 See, for example, M. Drehmann, C. Borio and K. Tsatsaronis, “Characterising the financial cycle: Don’t lose sight of the medium term!”, *BIS Working Paper Series*, No 380, Bank for International Settlements, 2012.

3 Arguably, however, the identification of financial cycles (and booms in particular) is inherently difficult, which in turn implies that the operationalisation of macro-prudential policies targeting financial cycle stabilisation is challenging.

4 For a few recent references, see G. Lorenzoni, “Inefficient credit booms”, *Review of Economic Studies*, Vol. 75(3), 2008, pp. 809-833, E. Mendoza, “Sudden stops, financial crises, and leverage”, *American Economic Review*, Vol. 100(5), 2010, pp. 1941-66, J. Bianchi, “Credit externalities: Macroeconomic effects and policy implications”, *American Economic Review*, Vol. 100(2), 2010, pp. 398-402 and T. Adrian and H.S. Shin, “Procyclical Leverage and Value-at-Risk”, *Federal Reserve Bank of New York Staff Reports*, No 338, 2008.

5 See, for example, M. Brunnermeier and Y. Sannikov, “A macroeconomic model with a financial sector”, Princeton University, manuscript, 2012 and F. Boissay, F. Collard and F. Smets, “Booms and systemic banking crises”, *ECB Working Paper Series*, No 1514, 2013.

6 See, for example, A. Shleifer and R.W. Vishny, “Unstable banking”, *Journal of Financial Economics*, Vol. 97(3), 2010, pp. 306-318, D. Diamond and R. Rajan, “Fear of fire sales, illiquidity seeking, and credit freezes”, *Quarterly Journal of Economics*, Vol. 126(2), 2011, pp. 557-591 and S.G. Hanson, A.K. Kashyap and J.C. Stein, “A macroprudential approach to financial regulation”, *Journal of Economic Perspectives*, Vol. 25(1), 2011, pp. 3-28.

7 See also IMF, 2013, op. cit.

8 Angelini et al. (2012) provide a comprehensive overview of existing modelling approaches to macro-prudential policy analysis; see P. Angelini, S. Nicoletti-Altimari and I. Visco, “Macroprudential, microprudential and monetary policies: Conflicts, complementarities and trade-offs”, *Banca d’Italia Occasional Papers*, No 140, 2012.

9 A notable exception is C.A.E. Goodhart, A.K. Kashyap, D.P. Tsomocos and A.P. Vardoulakis, “Financial regulation in general equilibrium”, *NBER Working Papers*, No 17909, 2012.

A common thread among these recent studies, while being subject to concrete model specifications overall, seems to be that macro-prudential and monetary policies in many instances can be expected to complement and support each other (as also mentioned above). However, there is also potential for a conflict of interest, or at least trade-offs, between them, such as a monetary policy that is too loose amplifying the financial cycle or, conversely, a macro-prudential policy that is too restrictive having detrimental effects on credit provision and hence monetary policy transmission. This underlines the need to ensure an appropriate institutional framework with effective coordination mechanisms among the different policy functions, with clear delineations of responsibility.¹⁰

¹⁰ See also S.G. Cecchetti and M. Kohler, “When capital adequacy and interest rate policy are substitutes (and when they are not)”, *BIS Working Paper Series*, No 379, Bank for International Settlements, 2012 and K. Ueda and F. Valencia, “Central bank independence and macroprudential regulation”, *IMF Working Paper Series*, WP/12/101, International Monetary Fund, 2012.

MACRO-PRUDENTIAL INTERVENTIONS TO LEAN AGAINST FINANCIAL IMBALANCES: IMPLICATIONS FOR MONETARY POLICY

In principle, price stability and financial stability are complementary and can be mutually reinforcing. Price stability contributes to financial stability by eliminating inflation-related distortions in financial markets, by containing the propagation of shocks via well-anchored inflation expectations and by mitigating pro-cyclicality in the economy. Financial stability facilitates a central bank’s task of maintaining price stability by containing excessive accumulation of credit, limiting unsustainable developments in asset prices and mitigating the pro-cyclical reinforcing loop between real and financial variables. At the same time, as also underscored by the developments prior to the global financial crisis, price stability, while being a necessary precondition, is not sufficient for financial stability. Indeed, in the run-up to the crisis, excessive risk-taking and the accumulation of financial imbalances proceeded together with, and were possibly amplified by, a seemingly favourable perception of risk, contained macroeconomic volatility and remarkable price stability.

The central banking community has long favoured the view that it may be ill-advised for monetary policy to mechanically counteract asset price misalignments and financial imbalances. At the same time, the depth of the current financial crisis calls into question this approach of a “benign neglect” of asset price misalignments and financial imbalances in the conduct of monetary policy. In essence, central banks should consider the possibility of responding to the financial cycle under certain circumstances, in particular if asset price movements are driven by capital flows and credit dynamics are based on unrealistic market expectations.

The ECB’s monetary policy strategy has two distinctive features aimed at preventing the neglect of credit and financial imbalances in its monetary policy actions, namely its medium-term orientation and the prominent role of monetary analysis. Regarding the latter, the ECB’s two-pillar strategy is a strategic device that contributes to limiting the tendency of monetary policy to be pro-cyclical in good times. By exploiting the association between asset price dynamics and monetary and credit developments, the monetary analysis indirectly incorporates asset price developments into policy conduct. By constantly monitoring developments in asset markets and cross-checking them with developments in the credit market and with the evolution of a number of liquidity indicators, the ECB can, at an early stage, contribute to limiting the potential of unreasonable expectations about asset prices developing further. As the recent crisis has illustrated, this monetary policy orientation is a necessary, but not sufficient, precondition for crisis prevention.

In line with the respective mandates and institutional arrangements...

... both macro-prudential interventions and monetary policy can effectively contribute to limiting the build-up of financial imbalances

The ECB’s monetary policy strategy already incorporates information about credit and financial imbalances

Therefore, in principle, monetary policy could certainly complement macro-prudential oversight in limiting the build-up of financial risk, curbing risk incentives and addressing excessive credit growth and leverage. In practice, the precise interaction between the conduct of monetary and macro-prudential policy is likely to be influenced by the degree of concordance between real and financial cycles, which is ultimately related to the underlying shocks driving the economy and the specificities in the transmission mechanism. In a euro area context, another important issue relates to the role of macro-prudential policy in dealing with heterogeneity in credit (and other financial) cycles within a monetary union. For instance, a loose monetary policy in an economy with booming credit and asset markets may encourage excessive risk-taking and fuel imbalances. Against this background, macro-prudential policy may be a valuable tool for aligning incentives in a counter-cyclical direction as well as for addressing country-specific developments that the single monetary policy is not specifically geared towards.

The time dimension of macro-prudential policy and its interaction with monetary policy...

From a research perspective, the investigation of the strategic interaction between macro-prudential and monetary policy has predominantly been carried out using DSGE models incorporating financial frictions. A general conclusion emerging from this literature is that counter-cyclical macro-prudential tools – such as time-varying capital requirements, counter-cyclical capital buffers and caps on loan-to-value ratios – can play a useful role in dampening the volatility of business cycles and can thus potentially be welfare enhancing.²⁴ For instance, the early contribution by Angeloni and Faia (2013) finds that, in a DSGE model where banks can be subject to runs, the optimal policy mix offers some role for monetary policy to lean against asset prices or bank leverage in combination with a counter-cyclical capital buffer rule.²⁵ However, the specific calibration (design and magnitude) of the macro-prudential rule determines its effectiveness in contributing to macroeconomic stabilisation. Angelini et al. (2011) likewise find that the mutual interaction of monetary policy and macro-prudential policy can be beneficial, especially during times when the economy is subject to large shocks, while a lack of coordination between the two policy functions can lead to conflicts of interest.²⁶ Beau et al. (2012) in turn emphasise that the extent to which monetary policy and macro-prudential oversight conflict largely depends on the nature of the underlying shocks affecting the economy at a given juncture.²⁷ Moreover, Lambertini et al. (2011) suggest that using a lean-against-the-wind monetary policy or a counter-cyclical macro-prudential policy can have different welfare implications for different economic agents (e.g. borrowers vs. lenders).²⁸ Darracq et al. (2011) find that macro-prudential policy can be more effective than monetary policy in addressing destabilising fluctuations in the credit markets, thereby alleviating somewhat the need for monetary policy to lean against the wind.²⁹

... has primarily been studied using DSGE models

Results vary depending on whether the macro-prudential policy targets the real economic cycle or the financial cycle

To shed some light on these issues, counterfactual simulations are conducted for the euro area economy assuming two alternative configurations for the systematic response of macro-prudential policy, where the latter is modelled in terms of counter-cyclical capital

24 As current state-of-the-art DSGE models are linear in nature and typically operate with representative agents, they have difficulties encompassing the multi-dimensional and potentially non-linear nature of systemic risk. This limits the scope for carrying out welfare analysis on simulated macro-prudential policies within this model set-up.

25 See I. Angeloni and E. Faia, “Capital regulation and monetary policy with fragile banks”, *Journal of Monetary Economics*, Vol. 60(3), 2013, pp. 311-324. An earlier version of the paper was published as a Kiel Institute for the World Economy Working Paper (No 1569). Another early paper, which focused on housing bubbles, is P. Kannan, P. Rabanal and A. Scott, “Monetary and macroprudential policy rules in a model with house price booms”, *IMF Working Paper Series*, WP/09/251, International Monetary Fund, 2009.

26 See P. Angelini, S. Neri and F. Panetta, “Monetary and macroprudential policies”, *Banca d'Italia Working Papers*, No 801, 2011.

27 See D. Beau, L. Clerc and B. Mojon, “Macro-prudential policy and the conduct of monetary policy”, *Banque de France Working Paper Series*, No 390, 2012; for a similar finding see I. Christensen, C. Meh and K. Moran, “Bank leverage regulation and macroeconomic dynamics”, *Bank of Canada Working Papers*, No 2011-32, 2011.

28 See L. Lambertini, C. Mendicino and M.T. Punzi, “Leaning against boom-bust cycles in credit and housing prices”, *Journal of Economic Dynamics and Control*, forthcoming.

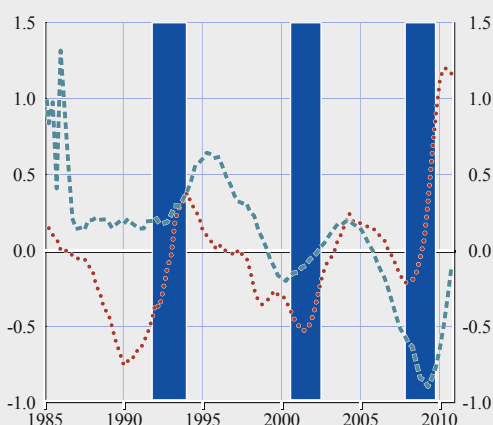
29 See Darracq et al., op. cit.

Chart A.4 Model counterfactuals under alternative systematic responses of macro-prudential policy

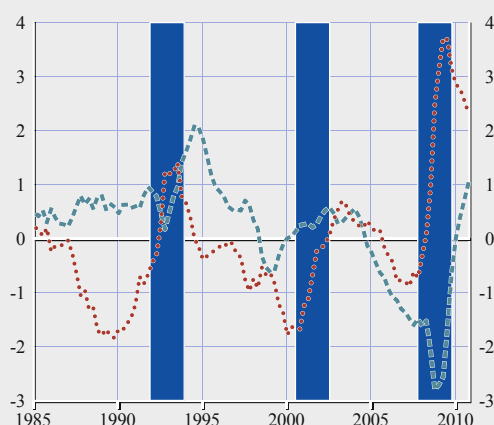
(percentage point deviation from baseline)

- euro area recessionary episodes
- counterfactual under capital rules based on the real cycle
- - - counterfactual under capital rules based on the financial cycle

a) Impact on real GDP



b) Impact on real MFI loans to non-financial corporations



Source: ECB calculations.

Notes: Simulations are carried out using the model developed by Darracq et al. (2011). MFI stands for monetary financial institution.

requirements.³⁰ Specifically, the capital requirements tool is assumed to respond in one configuration to standard real economy variables (such as real GDP and inflation) and in a second configuration to financial-related variables (such as leverage and asset prices). Monetary policy is allowed to respond endogenously to economic developments by adjusting the stance. Overall, two considerations stand out. First, throughout the regular business cycle, the impact of alternative macro-prudential configurations on GDP remains contained overall, while their effects on loans are more pronounced (see Chart A.4, panels a and b respectively). This is particularly evident in the case where the macro-prudential tool is a response to the financial cycle during the run-up to the latest financial crisis. Second, during the first part of the financial crisis (see the shaded areas furthest to the right in panels a and b of Chart A.4), the type of macro-prudential response that is effective in leaning against the financial cycle implies, however, a more adverse drop in loans to non-financial corporations and hence in real GDP. Intuitively, this is due to the change in capital requirements to account for the increase in leverage and in indebtedness ratios in the first part of the crisis.

THE SCOPE FOR MACRO-PRUDENTIAL INTERVENTIONS IN EXCEPTIONAL TIMES OF CRISIS

Once a credible macro-prudential framework has been developed and is understood by market participants, it may be appropriate and feasible to relax macro-prudential tools in times of financial stress. Indeed, the buffers built up during the upturns can be released to mitigate the reinforcing mechanisms at play in the downturn. At the same time, central banks have turned out to be the first line of defence against the risks of financial meltdown and the severe economic downturn

Macro-prudential policy could also play a useful role in macroeconomic stabilisation during crisis times...

³⁰ The counterfactual is conducted using the DSGE model of Darracq et al. (2011), on the basis of the historical shocks extracted from the model estimation over the sample from the first quarter of 1980 to the second quarter of 2008. Notably, this implies that the estimation period only partially covers the period of the financial and sovereign debt crises, during which monetary policy conduct has arguably been different from “normal” times.

*... and could thus
alleviate some
pressure on monetary
policy*

experienced since 2008. While macro-prudential policy should strengthen the resilience of the financial system to economic downturns and other adverse aggregate shocks, monetary policy actions and notably non-standard measures remain very effective crisis management instruments in the context of specific disturbances affecting the functioning of the financial sector. Some research studies support this point. Applying a financial macroeconomic model for Japan, Kawata et al. (2013) find that, while macro-prudential policy is useful in reducing economic fluctuations by preventing the build-up of imbalances, it would need to be complemented by other policies to stimulate the economy during a contraction phase.³¹

At the current juncture, riskier borrowing segments in the euro area, and notably small and medium-sized enterprises (SMEs), are most vulnerable to bank credit supply constraints and excessive risk aversion on the part of lenders. Given the importance of SMEs for the euro area economy, the deterioration of their financial health, especially in stressed euro area countries, and their difficulties in accessing external financing is of particular concern in terms of the impact on capital expenditure and broad economic prospects.

*For example, a
relaxation of capital
requirements may
limit the economic
contraction resulting
from crisis-related
financial
amplification effects*

Taking a theoretical standpoint, we attempt to illustrate how macro-prudential instruments could be considered to address the risk of rationing in some borrowing segments in a situation of heightened bank risk aversion.³² The model simulation is calibrated based on a one percentage point increase in expected default frequencies for non-financial corporations over a three-year horizon. It assumes that macro-prudential policy takes the form of sectoral capital requirements, while monetary policy is allowed to respond endogenously to economic developments. The macroeconomic implications of higher borrower riskiness hinge on the response of the banking system and bank lending policies. First, higher corporate borrower riskiness is priced by banks into the lending rate on new loans. This rise in the cost of financing for firms weighs on capital expenditure by triggering an adverse real-financial feedback loop, whereby weaker investment dynamics and economic growth depress asset prices, further aggravate the financial vulnerabilities of firms and thus lead to additional tightening of financing conditions. Second, it is assumed that lenders also respond to temporarily higher borrower risk by durably increasing their capital buffers to cope with unexpected losses misperceived as being long-lasting. This channel is meant to capture excessive risk aversion of lenders, which in turn leads to further capital constraints and hence deleveraging pressures for banks. In a nutshell, the pro-cyclicality inherent in borrowing constraints and the excessive risk aversion on the part of banking institutions lead to adverse amplification effects above and beyond the impact of higher corporate borrower riskiness per se. It is precisely this amplification mechanism that macro-prudential policy could aim to contain.

Specifically, one may assume that the combined impact of corporate credit risk shocks and bank capital constraints on macroeconomic variables could be partly mitigated by macro-prudential intervention to relax sectoral capital requirements on non-financial corporation loans (see Chart A.5). This policy response is effective in mitigating the large drop in the price of capital and thus contains the adverse reinforcing feedback loop between asset prices, tightening financing conditions and contracting corporate investments.³³ It should be recognised, however, that such a relaxation of macro-prudential requirements could be subject to potential conflicts of interest with micro-prudential supervisors who might have a preference for keeping solvency levels high to

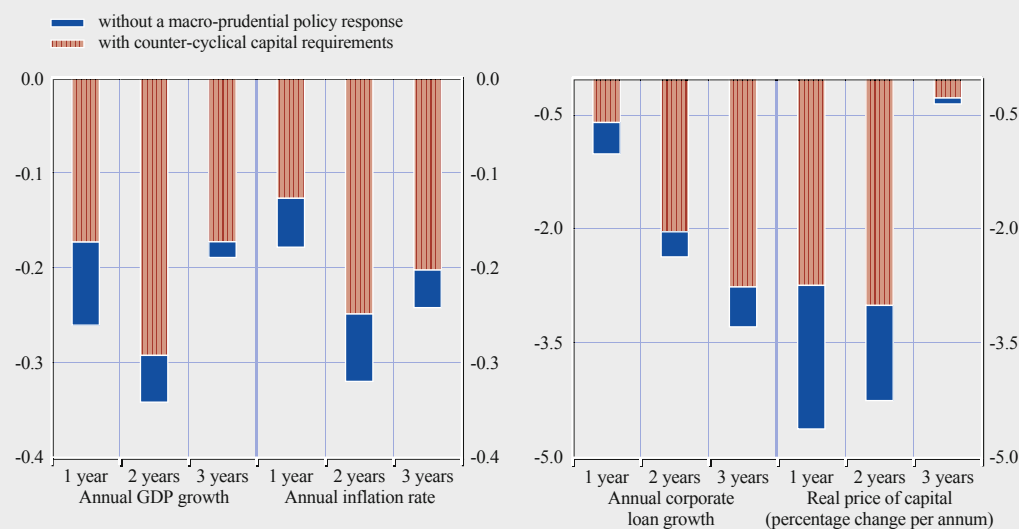
31 H. Kawata, Y. Kurachi, K. Nakamura and Y. Teranishi, "Impact of macroprudential policy measures on economic dynamics: Simulation using a financial macro-econometric model", *Bank of Japan Working Paper Series*, No 13-E-3, 2013.

32 The underlying assumption in this example is that the tightening of credit standards for risky borrowers goes beyond what could be perceived as reasonable based on borrower creditworthiness fundamentals.

33 Macro-prudential policy takes the form of setting the target for bank capital ratios, adjusted over the cycle depending on a set of macroeconomic variables.

Chart A.5 Macroeconomic implications of corporate credit risk shocks

(percentage point difference from baseline)



Source: ECB calculations.

Note: Simulations are carried out using the model developed by Darracq et al. (2011).

accommodate further shocks. Furthermore, it will be challenging to manage market expectations in an uncertain environment, and this will require a careful communication strategy.

CONCLUDING REMARKS

Macro-prudential policy has emerged from the recent financial crisis as a new important policy function. This has been reflected in the establishment of new macro-prudential bodies in the major advanced economies and macro-prudential instruments have also been enshrined in the legislative proposals implementing the Basel III regulatory framework. Furthermore, a clear macro-prudential policy role is envisaged for the ECB in the legislation establishing the SSM.

These developments notwithstanding, much work still needs to be carried out to improve our understanding of the transmission channels of macro-prudential policies, how macro-prudential policy interacts with other policy functions and its effectiveness both in terms of risk prevention and of risk absorption. This special feature has attempted to shed some light on these issues. It has to be recognised, however, that macro-prudential policy-making is still in its infancy and substantial uncertainties about its functioning remain.

With these uncertainties in mind, a key challenge when setting up institutional frameworks for macro-prudential policy-making will be to acquire sufficiently deep knowledge about the effectiveness and impact of alternative macro-prudential policy tools, including how they interact with other policies. Ultimately, a proper impact assessment of macro-prudential interventions is crucial for the precise design and calibration of the instruments.

The establishment of macro-prudential policy functions is an important step forward in preventing and minimising future crises...

... substantial efforts will be needed to deepen knowledge of the transmission and impact of macro-prudential instruments

