The Instruments of Macro-Prudential Policy

Therese Grace, Niamh Hallissey and Maria Woods[1,2]

Abstract

The recent global crisis revealed a role for macro-prudential policy or measures to mitigate systemic risk. In Ireland, the high costs of the recent banking crisis showed that forward-looking risk assessments and pre-emptive policy action are important to ensure that the future probability of such a crisis reoccurring is reduced. Macro-prudential policies primarily aim to complement regulatory oversight of individual firms and build resilience, initially in the banking sector. A secondary (albeit more ambitious) goal is to dampen the volatility of the financial cycle and reduce the potential for destabilising imbalances within the financial system to accumulate. This paper focuses on the banking sector and the various measures available to macro-prudential authorities to mitigate this risk.

1 The authors are respectively policy analyst and senior economists in the macro-prudential policy unit of the Financial Stability Division. The authors would like to thank Mark Cassidy, Gabriel Fagan, John Flynn, Stefan Gerlach and an anonymous referee for helpful comments on earlier drafts. The views expressed in this paper are those of the authors and do not necessarily reflect those of the Central Bank of Ireland.

2 Contact: Central Bank of Ireland–Financial Stability Division, North Wall Quay, Spencer Dock, Dublin 1, Ireland. Emails: therese.grace@centralbank.ie, niamh.hallissey@centralbank.ie and maria.woods@centralbank.ie.

1. Introduction

Although the topics of financial stability or macro-prudential analysis are not new, the recent crisis revealed significant deficiencies in both the analytical framework and the policymaker's capacity to mitigate emerging system-wide vulnerabilities. Macro-financial linkages were not fully appreciated and the transmission of risk across the financial system was severely underestimated. Before the crisis, some macro-prudential policymakers relied on *soft* tools such as communication and market discipline to influence the behaviour of individuals and institutions and to ensure financial stability. The global crisis changed this view and a consensus emerged that *hard* policy measures (e.g., higher capital requirements) were required to tackle systemic risk concerns. Consequently, macro-prudential policymakers have begun to consider the need for policy instruments to build resilience, initially within the banking sector, and to reduce the volatility of the credit cycle. Although the origins of future crises remain unknown, these measures aim to reduce the probability and long-term costs of such events.

Macro-prudential policy issues have particular resonance for Ireland and other countries affected by the recent global financial crisis. Ireland is a predominately bank-based economy and, as such, the private sector is heavily reliant on bank credit to meet consumption and investment shortfalls so a stable banking sector is necessary, among other factors, for sustainable economic growth. Along with structural banking reform and micro-prudential supervision, macro-prudential policies targeted at the banking sector will be important to restore domestic financial stability and address such issues.

Since the crisis, policy-makers in Europe have been given a wide range of instruments with which to address various systemic risks in the banking sector. The new EU banking legislation, the Capital Requirements Directive IV and Regulation (CRDIV/CRR), has expanded traditional micro-prudential regulation to include a range of macro-prudential instruments such as capital buffers for systemic risks. This is in addition to instruments which stem from powers that exist under national legislation. Several European countries have activated macro-prudential instruments over recent years and the use of these instruments is expected to increase.

The aim of this paper is to introduce the various tools of macro-prudential policy, explaining what they are and where they have been used. The paper is structured as follows. Section 2 briefly introduces the concept of systemic risk. Macro-prudential policies aim to mitigate this risk. Section 3 presents the range of instruments available to macro-prudential policy makers. Some cross-country experience with macro-prudential instruments is contained in section 4. This section also outlines who is responsible for macro-prudential policy in Ireland and across Europe. Section 5 concludes.

In Ireland, the Central Bank of Ireland(Central Bank) is the national macro-prudential authority and its policy aims and powers are discussed in its recent macro-prudential policy framework document (See CBI, 2014a for more details). In October 2014, the Central Bank proposed macro-prudential policy measures for new residential mortgage lending (See CBI, 2014b). Following the public consultation, regulations were announced in January 2015.[3] *It should be noted that this paper does not address these policy issues.*

2. Why macro-prudential policy? The concept of systemic risk

The rationale for macro-prudential policy intervention stems from the need to address risks that are not covered by micro-prudential oversight or by other policy areas. Micro-prudential supervision focuses on the financial soundness of individual financial firms such

3 see CBI(2015) for further details.

as banks and other financial intermediaries. Although banks may be individually financially sound, their collective actions may create imbalances within the economy and make the sector vulnerable to negative shocks. Additionally, financial development, innovation and integration have created inter-linkages between banks and between the real economy and the financial sector (i.e., macro-financial linkages).

During a period of general financial stress, interconnectedness among banks can amplify the impact of any shock to the financial sector. If banks are not sufficiently resilient, problems in one bank or sector can lead to problems on a system-wide basis or as a system, banks can be vulnerable to common shocks, resulting in a systemic banking crisis in either case (De Bandt and Hartmann, 2000). Strong macro-financial linkages within an economy imply that systemic banking crises can entail significant economic costs for society as normal lending and other intermediation activities are disrupted. Economic activity is subsequently reduced leading to a further deepening in the banking crisis, as the financial condition of borrowers deteriorates.

The risk of a systemic crisis occurring is called systemic risk. Macro-prudential policies are concerned with reducing the possibility of such an event occurring and therefore take a system-wide perspective. Such policies can be complementary to micro-prudential supervision. To promote financial stability and reduce systemic risk, macro-prudential policy aims to strengthen the resilience of the financial system so that it can withstand adverse macroeconomic shocks. Macro-prudential policies also seek to reduce the potential for significant destabilising vulnerabilities to accumulate, which could lead to systematic financial distress. Therefore a secondary aim of macro-prudential policy is the stabilisation of the credit cycle.

Banks play an important role in the provision of credit to the private sector in certain economies, not least in Ireland. Credit growth, therefore, varies with the financial soundness of the banking sector as well as economic conditions. As entities, banks can be fragile to external shocks, as they engage in maturity transformation (i.e., the average maturity on their loan books exceeds that of their funding) and also operate leveraged positions (i.e., assets exceeding equity). Banks may also follow certain risky business strategies to maximise return and boost future profits. Although it may be individually rational for each bank to engage in such activity, the collective action of a group of banks following this strategy may lead to imbalances and vulnerabilities for the economy as a whole[4].

Further, banks' balance sheets and the creditworthiness of their borrowers are sensitive to macro-economic conditions. Banks demand collateral for certain loans such as mortgages, which creates a link between property market developments and future financial performance. Households and firms can become highly indebted during a period of accommodative lending standards and booming property prices. Property price cycles, therefore, can amplify credit/leverage cycles and vice versa, resulting in real effects.[5] Once economic/property and financial conditions begin to deteriorate, indebted banks, households and firms all need to delever to repair balance sheets so the credit/leverage and property cycles work in reverse leading to a significant decline in economic activity.

In Ireland, the main domestic banks all increased their exposure to the real estate sector to generate returns and expanded their loan books with cheap sources of wholesale funding in the pre-crisis period.[6] Therefore the profile of credit and funding risks were similar across the system. As the domestic private sector is mainly reliant on bank credit, households and firms in Ireland increased

4 De Nicolò *et al*., (2012), suggest that the presence of strategic complementarities, where the pay-off from a certain strategy increases the more players are involved, may induce banks to act in a collective fashion. Gorton and He (2008) contend that there is a coordination failure among banks in that they fail to take into account the destabilising behaviour of the system as a whole.

5 These *financial accelerator* effects are discussed in Bernanke, Gertler and Gilchrist (1996) and Geanakoplos (2010).

6 See Honohan (2010) and Regling and Watson (2010) for a full description of the origins of the Irish crisis.

their indebtedness significantly pre-crisis. The property, economic and financial/liquidity cycles were, thus, all closely intertwined and the dynamics of each had an amplifying effect on the other before 2007. Both banks and the private sector were therefore vulnerable to a reversal in property prices, higher interest rates or an adverse shock prior to the global financial crisis. Since the crisis, credit dynamics have been weak as both banks and the private sector continue to engage in deleveraging.

Volatile movements in the credit cycle and the associated financial stability risks relate to the time-varying or cyclical element of systemic risk. Another dimension of systemic risk that should be considered relates to the structure of the financial system. Structural systemic risk arises when the distribution of risk is skewed and concentrated in a small number of institutions or markets or if financial services are focused on one sector such that the financial system becomes vulnerable to adverse shocks (BOE, 2011). The imbalances arising from the credit cycle can lead to structural systemic risks. A pursuit of common business strategies by banks such as property-related lending can lead to concentrated exposures and leaves the banking sector vulnerable to a shock in this market.

The phenomenon of *systemically important* banks emerged during the crisis. Such entities require funding from the state when they experience distress in order to prevent contagion across the financial system. The high degree of interconnectedness among banks and their dominant position in national intermediation activities means that failure or distress of such entities could have significant destabilising effects on both local and international economies through direct and indirect financial networks.

Figure 1 links the instruments of macro-prudential policy to its intermediate objectives, as defined by the ESRB.[7] The intermediate objectives of macro-prudential policy aim to target both the time-varying and structural dimensions of systemic risk. Intermediate objectives dealing with excessive credit growth/leverage and excessive maturity mismatch are closely related to the time-varying element of systemic risk. Limiting exposure concentration and reducing the misaligned incentives of systemically important banks and interconnectedness are related to the cross-sectional dimension. For more information on the intermediate objectives in an Irish context see CBI, (2014a).

3. How to mitigate systemic risk - instruments of macro-prudential policy[8]

There are two broad types of instruments, those that can be used to increase the resilience of banks (e.g., capital, liquidity-based tools, large exposure limits) and those that affect the credit terms offered to borrowers for collateralised lending (e.g., asset-based tools). The different instruments have different purposes and can be used to address different types of risk. Capital instruments increase resilience to shocks; liquidity instruments address funding risks and credit-related instruments constrain a build-up of risks in the real estate sector and increase resilience to shocks in this sector.

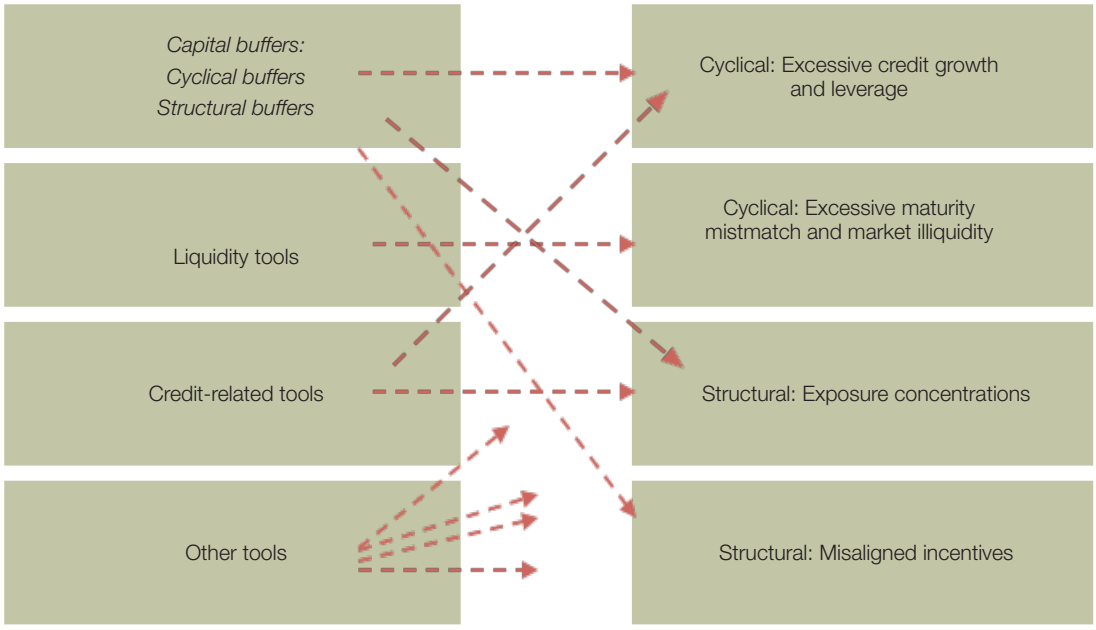
Some instruments can be used to address both cyclical and structural systemic risks. For example, the countercyclical capital buffer and the systemic risk buffer both require banks to increase high quality capital levels in response to risks. However, the countercyclical capital buffer is to be used to build up capital buffers during good times, to increase resilience to shocks in bad times. The systemic risk buffer, on the other hand, is to be used to mitigate long-term non-cyclical risks, such as concentration risk or risks around the structure of the banking sector.

The following sub-sections consider some macro-prudential instruments according to the different category of instrument: capital, liquidity,

7 Intermediate objectives of macro-prudential policy are outlined in further detail in ESRB "Recommendation on intermediate objective and instruments of macro-prudential policy", Official Journal of the European Union (ESRB/2013/1).

8 This section draws on ESRB (2014a), among other noted references.

Figure 1: Linking tools to intermediate objectives



Source: Adapted from IMF (2013) and ESRB (2013)

and other instruments which target bank balance sheets, and credit-related instruments (Figure 1 and Table 1). See CB1(2014a) for further details of legal basis for these instruments in Ireland. Box 1 also discusses who is in charge of macro-prudential policy measures across Europe.

3.1 Capital tools

Capital tools, or buffers, require banks to hold high quality, loss-absorbing capital against various risks. These buffers may be for cyclical reasons or to address structural issues such as common exposures or the structure of the banking sector. Table 1 outlines the different buffers.

While these buffers address different risks, the transmission mechanism through which they work is the same.[9] To meet the higher capital requirement, banks may raise equity and / or delever if they cannot draw on voluntary buffers. Equity can be raised by re-pricing loan portfolios (i.e., increasing lending spreads), decreasing dividends and bonuses, or by raising new equity. Higher capital levels directly increase banks' capacity to absorb losses, which promotes resilience. The credit cycle may also be impacted. An increase in lending spreads may negatively affect credit demand as credit is more costly, while credit supply may be reduced if banks chose to reduce assets. The effectiveness of the buffers may be lessened due to a reduction in voluntary buffers, avoidance, or disintermediation. Banks may also transfer risks off-balance sheet or activity could move to less regulated sectors.

Expectations of market participants play an additional role in the transmission mechanism and can be influenced by the credibility of the policy signal. Banks are allowed to gradually increase their capital to meet the higher capital buffers so long as earnings distribution is limited. Chart 1 shows the different levels at which the various buffers can be set.

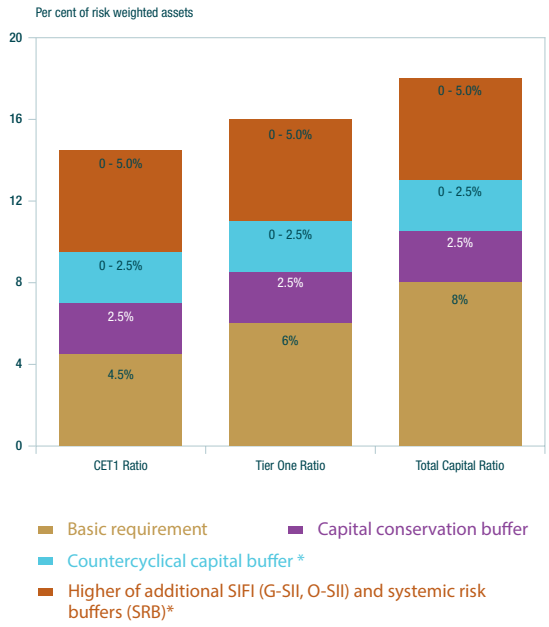
For non-risk based capital measures, such as the leverage ratio, the aim is to ensure that banks do not excessively expand their assets relative to their capital base. The leverage ratio, which is the ratio of tier one capital to total exposures (including both on and off balance sheet activities), should be less cyclical

9 For further detail on the transmission mechanism of macro-prudential policy instruments, see CGFS (2012).

Table 1: Macro-prudential instruments

	Instrument	How it works	Cons	Effectiveness	Risk
Capital tools	Counter-cyclical capital buffer (CCB) *From Jan 16*	- Increases resilience by building up buffers when credit growth is high. - May slow credit growth with higher cost of funds. -Lowered during stressed periods.	- Less effective if banks have excess capital buffers. - Uncertain impact on credit growth. - May lead to shift to less risky assets.	- Capital instruments increase loss-absorption capacity, strengthening the resilience of the financial system, leaving it better able to withstand both institution-specific and sector-wide shocks. - Little experience with the specific buffers. - The G-SII / O-SII buffers are part of global efforts to reduce probability of default of these institutions.	Excessive credit growth and leverage
	O-SII buffer *From Jan 2016*	- Increases resilience and reduces moral hazard of systemically important banks by forcing them to hold higher capital.	- Could lead to deleveraging of balance sheets and/or higher cost of credit for customers. - Could be viewed as 'too big to fail' leading to expectations of a bailout.		Systemically important institutions
	Systemic risk buffer *On request to the Minister for Finance*	- Buffer to prevent and mitigate long term non-cyclical systemic risk not covered by other buffers. - Can be used to limit concentration of exposures and excessive leverage.	- Onerous procedural requirements for activation above 3%. - Could lead to deleveraging of balance sheets and/or higher cost of credit for customers.		Concentration and inter-connectedness (structural)
	Leverage ratio (LR) *Reporting requirement until 2018*	- Limits leverage and acts as a backstop to risk-based capital buffers. - Safeguards against error in the risk based requirements.	- Blunt tool. - May lead to shift to riskier assets to compensate for increased cost of funds.	Research shows that LR tended to outperform risk-weighted capital ratios in predicting bank failure during the crisis (IMF, 2009)	Excessive credit growth and leverage
	Sectoral capital requirements (SCR) *Currently*	- Increases resilience by building up buffers to losses in real estate. - May slow credit growth with higher cost of funds. - Targeted measure.	- Less effective if banks have excess capital buffers. - Could be circumvented via optimisation of internal models. -May displace risk to other sectors.	Studies find an increase in SCR leads to only a modest tightening in credit conditions (BOE, 2014)	Excessive credit growth and leverage
Liquidity tools	Time-varying LCR / NSFR	- Mitigates negative effects from market illiquidity / excessive maturity and liquidity mismatch. - Increases resilience to liquidity risk. - Builds on an existing microprudential requirement.	- Full (100%) LCR not required until 2018, although can be front-loaded. - Final regulatory definition of NSFR not yet finalised. - Complexity in adding a time-varying dimension. - Limited international experience.	These tools still at a conceptual stage and there is little experience with macro-prudential use of funding instruments. New Zealand introduced a core funding ratio in 2010.	Funding risks
	Loan-to-deposit ratio (LDR) *Currently available*	- Increases bank resilience by reducing reliance on short-term wholesale funding. - Constrains credit growth during an upturn.	- Crude measure which doesn't consider full balance sheet. - May lead to deleveraging and / or intensive deposit competition - Barrier to entry for new banks.	IE introduced LDR targets (2010 to 2012). Improved funding position but may also have contributed to deposit competition (Kelly et al., 2014 and EC, 2012).	Funding risks
Other balance sheet tools	Exposure limits *Currently available*	- Reduces systemic risk from concentration and interconnectedness by putting an upper bound on losses from counterparty default and from network effects. - Reduces risk of contagion.	- Could affect smaller banks more. - Could lead to reduction in interbank funding. - Could lead to increase in exposure to common counterparties. - Limited experience as a macro tool.	ECB (2013) found that in a simulated interbank network, contagion losses decline when the large exposure limit of 25 per cent is lowered.	Concentration and inter-connectedness
	Disclosure *Currently available*	- Increases market discipline and creates incentives for banks to manage risks prudently. - Reduces market uncertainty and the probability of information contagion.	Could lead to adverse market reaction and increase stress on riskier banks.	The US / EU stress tests led to improved market conditions through the information released on banks' risks.	All risks
	Pillar 2 *Currently available*	- Flexible tool for addressing a wide range of systemic risks. - Can include increased capital or liquidity requirements, limitation of operations, and additional disclosure.	- Lack of transparency. - Could be used to circumvent procedures around other tools. - Needs coordination between macro and micro-prudential authorities.	Pillar 2 measures have same economic impact as comparable macro-prudential instruments.	All risks
Credit-related tools	LTV *Currently available*	- Increases resilience of banks / households by reducing sensitivity to property price movements. - Directly targeted at real estate. - Directly affects credit cycle.	- Can lead to increase in unsecured lending to meet deposit needs - Not strictly countercyclical as loan size rises in line with property prices. - May affect certain cohorts more than others (FTBs).	Literature examining effectiveness of LTV / LTIs show that these tools can slow mortgage growth, reduce potential for housing bubbles, and reduce severity of downturns (IMF 2013). Significant international experience with these measures, particularly in Asia.	Excessive credit growth and leverage
	LTI / DTI *Currently available*	- Increases household / bank resilience through lower probability of default. - Directly targeted at real estate. - Directly affects credit cycle. - More binding than LTVs as incomes grow slower than house prices.	- Difficult to monitor whether income correctly defined. - LTI may be circumvented by taking out multiple loans. Non-issue for DTI. - May affect certain cohorts more than others (FTBs).		Excessive credit growth and leverage

Chart 1: Regulatory Capital Ratios under CRR/CRD IV



Note: *Possible upper bounds but can be higher. Chart excludes additional Pillar 2 requirements that could be set following supervisory review process and banks' own voluntary capital buffers. The SRB would be cumulative with G-SII / O-SII if SRB refers to domestic exposures only.

Source: Adapted from European Commission (2013).

than risk-weighted capital ratios, given the tendency of risk-weights to fall in good times, when measured risk is low. Thus the leverage ratio could be seen as an automatic stabiliser, given that it requires (minimum) capital levels to move in a linear fashion with total assets. Varying the leverage ratio for macro-prudential purposes would ensure that the leverage ratio would continue to act as a backstop, even when risk is priced lower in good times. This would reduce the build-up of vulnerabilities associated with excessive leverage in the banking system. Given that the leverage ratio does not take the risk profile of the bank into account, however, it should be used in tandem with regulatory capital ratios for a complete assessment.

In terms of measuring the effectiveness of the buffers, there have been a number of studies looking at the potential economic impact of higher capital requirements under Basel III during the transition period (MAG, 2010) and over the longer-term (BCBS, 2010). These studies investigate the impact on resilience, the credit cycle and on output. BCBS (2010) find that a one percentage point increase in capital requirements reduces the probability of a systemic crisis occurring by 25 to 30 per cent, depending on the initial level of capital. In terms of the impact on spreads, the MAG (2010) estimate that a one percentage point increase in required capital ratios leads to a median increase in lending spreads of 15 bps after 18 quarters. Under the assumption of permanently higher capital ratios, there is evidence of a reduction in risk weighted assets (RWA) /lending volumes. MAG (2010) finds a 1.4 per cent decrease in lending volumes relative to the baseline scenario after 18 quarters if the target ratio is increased by one percentage point.

A one percentage point increase in capital requirements is found to lead to a decline in GDP of 0.19 per cent below baseline, after 18 quarters, allowing for international spill-overs (MAG, 2010). The result would be higher if banks voluntarily chose a shorter transition period or hold additional buffers. The results may be smaller if banks chose to change business models towards safer assets or increased efficiency which might offset the need to increase spreads or reduce risk weighted assets.

As the various buffers in the CRD are new instruments, there is little evidence for their impact on resilience and the credit cycle. The main objective of using capital-based instruments aimed at systemic banks is to strengthen the resilience of these institutions and the resilience of the financial system as a whole. Laeven *et al*., (2014) confirm that requiring large banks to hold more capital is a powerful tool to reduce systemic risk. They find that higher capital reduces the likelihood of bank failure (lower individual risk) and the impact of the bank's failure on the rest of the financial system and the broader economy (lower systemic risk).

3.2 Liquidity tools

Liquidity risk is the risk of the failure of banks' normal funding and refinancing channels. Macro-prudential liquidity instruments aim to mitigate this risk. Both quantity-based (e.g., liquidity coverage ratio (LCR), net stable funding ratio (NSFR), loan-to-deposit (LTD), or loan-to-

stable funding (LTSF) limits) and price-based instruments (e.g., general liquidity surcharge and liquidity surcharge for systemically important institutions) can reduce reliance on vulnerable non-core funding. By constraining access to wholesale funding, liquidity tools can complement the credit-dampening effects of counter-cyclical capital buffers or sectoral capital requirements.

Some instruments focus on building liquid-asset buffers so that funding obligations can be met, even in a stressed scenario, over a certain time horizon. The LCR requirement, for example, aims to ensure that banks have sufficient high quality liquid assets to cover stressed net cash outflows over a 30 day-horizon. The ratio between the liquid assets and outflows should be 100 per cent. The ratio of liquid assets to total assets could also be used. Other instruments aim to ensure the stability of the funding base so that banks are not relying on short-term volatile sources of funding. The NSFR (i.e., the ratio of available to required stable funding) seeks to put a floor on the amount of long-term funding banks hold against less liquid assets. A core funding ratio, such as is used in New Zealand (see section 4 for more detail), or a loan–to-deposit/stable funding ratio has a similar objective. Macro-prudential policy responses to liquidity risk can take the form of a (potentially time varying) add-on or adjustment to the minimum regulatory levels for both the LCR and the NSFR or the simpler ratios could be used either as static or time-varying requirements.

A general liquidity surcharge could take the form of a levy in relation to a bank's liquidity risk - the charge would increase as a bank's funding maturities get shorter or less stable sources of funding are used. These price-based instruments aim to cover the potential social costs associated with a materialisation of systemic risk arising from funding vulnerabilities and could also be applied to systemically important banks.

3.3 Other balance sheet tools - large exposure limits

Exposure limits, which are designed to limit concentration from a micro-prudential perspective, can also be used for macro-prudential purposes. Large exposures are defined in the Capital Requirements Directive as exposures that are 10 per cent or more of a bank's capital base and require monitoring. The current limit on large exposures to a single counterparty or a group of connected counterparties is 25 per cent of a bank's capital. There are certain exceptions to this, including sovereign exposures, and exemptions are often granted for inter-group exposures. Supervisors also review sectoral, geographical and currency concentrations as part of the Supervisory Review Process. Further restrictions on large exposures to a particular sector or asset class could be applied using pillar 2[10] or using Article 458 from the Capital Requirements Regulation[11] in the case of intra-financial exposures.

These instruments address contagion risks by limiting banks' exposures to a particular area. ECB (2013) found that in a simulated interbank network, contagion losses decline when the large exposure limit of 25 per cent is lowered. This results in a lower degree of concentration of interbank connections. It also found that the forced reduction of counterparty concentration risk seems to benefit the safest part of the banking system; the weaker banks are less affected by changes in the large exposure limits, potentially as they have less scope for diversification.

3.4 Credit-related tools

Sectoral imbalances may require that a targeted approach is taken in order to be effective. In addition to sectoral capital requirements, risks posed by the real estate sector can be addressed by directly restricting the amount that can be borrowed relative to the value of the underlying collateral (a loan to value (LTV) limit)

10 Tightening a range of micro-prudential requirements if the supervisory review process reveals that a bank or group of banks is contributing to/affected by systemic risk.

11 Known as the 'flexibility package', Article 458 gives the macro-prudential authority wide ranging powers to act to limit the build-up of systemic risk. However, in order to preserve the Single Market, there are significant procedural aspects to be followed before a country can implement this measure. Tools include imposing stricter requirements for; the level of own funds, liquidity requirements, risk weights for property sectors, and measures for intra-financial exposures. Increased disclosure requirements can also be applied to improve market discipline.

or income of the borrower (a loan to income (LTI) or debt service to income (DSTI) limit). The legal basis for these asset-based macro-prudential measures comes from national legislation in Ireland.

The transmission mechanism for measures which affect the terms and conditions of new lending is somewhat different. These asset-based measures may strengthen the resilience of the banking sector by reducing the probability of default and loss-given-default on property exposures. Specifically, the financial position of borrowers is strengthened as less leverage reduces the vulnerability to adverse shocks and banks have more collateral to cover losses if a default occurs. A reduction in the feedback between property and credit caused by less credit may serve to further dampen both credit and property cycles. Property demand may be further affected if such policy measures alter market participants' expectations regarding future property prices. Banks may also adopt tighter risk management practices to this sector on the introduction of such measures. In any case, such measures would complement supervisory monitoring of credit risk policies at an individual bank level.

There is a significant literature on the effectiveness of LTV/LTI caps as these macro-prudential policies have been in place in a number of countries prior to the crisis (see IMF (2013a) for an overview). An IMF (2013) survey shows that the most commonly used real estate tool is the limit on LTV ratios, followed by sectoral capital requirements and LTI caps. There is some evidence supporting the resilience argument for LTVs and their impact on credit growth. The empirical evidence is however mixed for the impact on house prices. It should be noted that a number of country-specific factors such as institutional features, stage in economic development/cycle, interaction with other policies (e.g., fiscal, monetary), initial financial position of the banking sector all play a role in determining the outcome/transmission mechanism of instruments.

3.5. Selection criteria and operational challenges

There are many considerations in the selection of a particular instrument or combination of instruments. This includes economic and legal aspects. Naturally, instruments with high effectiveness in addressing the targeted risk and low social costs are optimal. Considerations in practice include whether an instrument targets the specific risk identified; is proportionate to the level of risk; provides few opportunities for leakages; is transparent; causes limited negative distortions to the financial system; and has limited cross-border spill-overs.

Timing will be an important consideration for macro-prudential policy measures. If a measure is implemented too early, banks and other market participants may devise methods to circumvent the measure thereby reducing its effectiveness. Releasing an instrument will depend upon the scale of financial stress. If a systemic banking crisis is underway, there is a trade-off between market requirements for higher capital and the need to protect the system from deleveraging. CGFS (2012) suggest that waiting until systemic risks abate may be prudent. If financial imbalances reduce without a crisis, countercyclical policies may be released.

As noted earlier, some of the instruments are new. The use of these instruments internationally depends on the prevailing macroeconomic and institutional features and so it is difficult to infer precise policy conclusions from individual country experiences. Therefore, it is globally acknowledged that macro-prudential policy implementation will involve "learning by doing". There are also known limitations to macro-prudential policy. Macro-prudential policies may be circumvented by banks, if poorly designed. Additionally, other financial intermediaries not subject to the measures (e.g., shadow banking entities or foreign branches) may adopt business strategies that undermine the intention of the policy. Arbitrage or policy *leakages* are, therefore, key areas of concern for macro-prudential policymakers when designing and monitoring measures.

Monetary policy can also reduce the effectiveness of macro-prudential policies, particularly if these policies have conflicting objectives (e.g., expansionary monetary or fiscal policies and measures to tighten macro-prudential policy). Both monetary and macro-prudential policies influence the quantity

and cost of credit and therefore interact, leading potentially to conflicts but also to complementarity, in particular when the real and financial cycles move together. The potential for conflict is the main reason why the objectives of both monetary and macro-prudential policies need to be carefully considered (Spencer, 2014).

Other policy areas also interact with macro-prudential policies, for example fiscal policy. In research on how effective non-interest rate policies are at controlling mortgage credit and house price appreciation, Kuttner and Shim (2013) find that besides macro-prudential instruments such as LTV and DSTI caps, the tax treatment of housing has a significant effect on credit and house price growth. In asset markets numerous policy initiatives can address imbalances in supply and demand, for example, zoning laws and planning regulations in the housing market.

4. Where are macro-prudential policy measures used?

As a relatively new policy area, other country experiences with macro-prudential policies are an important source of information. Macro-prudential policies have been targeted at different systemic risks, depending on the severity and the nature of risks in different countries, although trying to limit the risk of domestic mortgage lending has been one of dominant policy actions across countries. These policies were used widely in Asia after the crisis of the 1990s, and are becoming increasingly popular in Europe in recent years. IMF (2014b) presents the results of the IMF database on macro-prudential measures across 46 different countries since 2000. These countries have used a variety of instruments to mitigate systemic risks in the financial sector and influence capital flows.

4.1 Country characteristics

There are many ways by which individual country experiences can be aggregated. These include by the type of systemic risk, by the instrument used, or by whether a country is a developed or an emerging market. However, when considering country experiences, context in the form of the structural features of the economy and banking system is very important. Country characteristics which can shape the type of macro-prudential policy used includes the size, concentration, and interconnectedness of the financial system, the economic and financial data available, the growth of credit in relation to GDP, the strength of the legal framework, the degree of alignment of the financial and economic cycles, and the degree of economic diversification (IMF 2014c).

In addition to these factors, whether a country has control over monetary or exchange rate policy will have a large bearing on the type of instrument it can use to address a systemic risk. For countries in a currency union, the monetary policy stance set for the union may not be appropriate across all countries. Macro-prudential policies can be used to address emerging imbalances that this can cause. Brzoza *et al*., (2013) finds that the counter-cyclical application of macro-prudential tools can partly make up for the loss of independent monetary policy in the periphery, once it is set individually for each region. Similar considerations apply to countries which have reduced exchange rate flexibility, where macro-prudential policy can be used to counter the build-up of systemic risk from credit booms. For countries with monetary policy and exchange rate flexibility, macro-prudential policy still plays an important role, as outlined in section 3.5.

4.2 Country experiences

Tables 3a and 3b show a non-exhaustive list of countries which have taken macro-prudential measures and categorised them according to monetary policy regime based on IMF (2014). The impact of each measure is included, where available.

Credit-related instruments such as limits on high LTV, DTI/LTI lending have been widely used across all countries, but particularly in Asia over the past decade. Hong Kong has had an LTV cap since the early 1990s and Korea since 2002. Many European countries have moved to introduce these limits since the crisis, including Norway, Sweden, Finland, and the United Kingdom.

Experience with the macro-prudential use of *liquidity instruments* is quite limited. These

Box 1: Who is in charge of macro-prudential policy in Ireland and across Europe?

The ESRB issued a detailed recommendation to all Member States in Europe in 2011 to enshrine the role of the macro-prudential authority in national legislation. Although the ESRB called for central banks to play a leading role in macro-prudential policy, the macro-prudential authority could also be a supervisory authority, a newly established institution or a board of relevant authorities. The main message of the recommendation was that the macro-prudential authority must have powers and instruments in order to allow it to identify risks and take action when necessary.

In addition to the ESRB recommendation, the new European banking regulation called the Capital Requirements Directive IV and Regulation (CRD IV\CRR) contains a package of macro-prudential tools. While most of the banking regulation is the responsibility of the supervisory authority, the CRD IV \CRR allows Member States to assign these macro-prudential tools to a special macro-prudential authority, or the 'designated authority'. The CRD IV \ CRR came into force in January 2014 and all Member States responded by assigning a macro-prudential authority.

In Ireland, the Central Bank of Ireland (Central Bank) has a financial stability mandate and is also the national macro-prudential authority as defined by the ESRB recommendation[12]. The Central Bank is also the designated macro-prudential authority under the CRD IV\ CRR. Such powers supplement existing legislation that is in place to address financial stability concerns. Under the Single Supervisory Mechanism (SSM) legislation, macro prudential policy will be a shared competency between the ECB and the Central Bank which means that both the ECB and the Central Bank can act to apply the macro-prudential tools in the CRR/CRD IV, in close consultation with each other to ensure consistent and coordinated actions. The Central Bank has agreed a framework for macro-prudential policy which is outlined in CBI (2014a).

The type of national institutional framework varies across Europe (Table A). While the central bank is the authority in charge of macro-prudential tools in the majority of countries, several countries have assigned these instruments to a committee. In the UK, although the central bank is the designated authority for the CRD / CRR, key decisions on macro-prudential policy are taken by the Financial Policy Committee (FPC). This is a cross-institution committee which is housed in the Bank of England. As noted, for the euro area countries, macro-prudential policy is a shared competency with the ECB within the SSM and thus interaction with the ECB is part of the macro-prudential framework in these countries.

Table A: Authorities responsible for macro-prudential supervision in Europe

Agency	Euro area	Non-euro area	Total
Central Bank	11	6	17
Supervisory Authority	4	1	5
Ministry of Finance	0	1	1
Committee	4	2	6

Source: The Land In Between, Dirk Schoenmaker, Duisenberg School of Finance (March, 2014).

There are pros and cons to each of the different institutional frameworks shown above, and the appropriateness of each will depend on the individual country's institutions and preferences. What is important is that all key functions of macro-prudential policy are assigned to a body that has the power, capability, and institutional knowledge to use them.

12 Recommendation of the ESRB of 22 December 2011 on the macro-prudential mandate of national authorities (ESRB/2011/3), OJ 2012/C 41/01.

instruments are particularly important for small open economies with differentials between domestic and foreign policy rates (IMF 2014c). New Zealand introduced a core funding ratio in 2008 to reduce the amount of funding sourced from short-term wholesale markets. This reduces the rollover risk associated with higher offshore debt. Korea introduced a stability levy on non-core foreign exchange liabilities, which is a countercyclical tool which can be used when capital flows increase to unsafe levels. While not always considered a macro-prudential tool, capital flow measures (CFMs), which are designed to reduce the risk of large capital inflows, do act to counter systemic risks from capital flows (IMF, 2013). Policies such as those to discourage foreign-currency borrowing can be considered as both macro-prudential and capital flow measures (IMF 2014). There has been considerable experience in central and eastern European countries with macro-prudential measures to reduce lending in foreign currency. The high level of foreign-exchange lending was due in part to large capital inflows in these countries, with foreign banks entering the market and competing for market share. The measures introduced across the region include changes to reserve requirements, foreign currency liquidity requirement limits, and limits on the amount of foreign currency loans to unhedged borrowers that banks could extend.

Counter-cyclical *capital requirements* such as the Basel III countercyclical capital buffer (CCB) and dynamic provisioning are a recent addition to the regulatory framework and have not been introduced in many countries. Examples, however, include Switzerland's introduction of the CCB in 2013, Spain's experience with dynamic provisioning, and experience with sectoral capital requirements in India[13] and Ireland. Sweden and Norway have recently introduced CCBs on domestic exposures.

5. Conclusion

Systemic events such as sector-wide banking crises have significant real effects as shown by the recent global and domestic crisis. Macro-prudential policy seeks to reduce the probability and scale of future systemic crises. Strengthening the resilience of the banking sector and reducing the possibility of systemic vulnerabilities to accumulate are the high-level targets of this policy area. Recent financial crises showed that such vulnerabilities can emerge through the pro-cyclicality of bank lending and macro-financial linkages. Highly interconnected financial systems dominated by large and sometimes complex banks can also amplify the impact of such weaknesses in a downturn.

Policy makers now have a range of instruments to tackle systemic risk. This paper provides an overview of these instruments, discussing the various aims and transmission mechanisms of each. Cross-country experience is also included. There are a number of operational challenges. Macro-prudential policy is a new area of responsibility for many central banks and there is limited experience with some of the new instruments. The transmission mechanism of macro-prudential policy and the overall impact of its instruments can be directly affected by other policies and may be subject to arbitrage or policy leakages. The long-term net benefits of certain measures are, therefore difficult to measure in advance. The costs of the global financial crisis imply that overcoming the implementation challenges may be worthwhile. Effective macro-prudential policies will be welfare-improving and supportive of long-term growth prospects

13 See Chakrabarty (2014) for further information on the introduction of higher risk weights in India on commercial real estate lending in 2005/2006.

Table 3a: International experience with macro-prudential policy measures[14]

Country	Instrument used	Risk addressed	Effectiveness
Countries with independent monetary policy and floating currencies			
Poland	Series of measures to limit FX-lending incl. higher DSTI ratios for FX-loans, higher risk weights for FX-loans. Borrowers can only borrow same currency as income (Jan 14).	Risks to mortgage repayment capacity from exchange rate fluctuations or increases in foreign interest rates.	FX-lending has reduced due to the financial crisis. However, macro-prudential tightening has continued (ECB 2014).
Canada	80% LTV cap with mandatory mortgage insurance, capped 25 year loan term, maximum total debt service ratio of 44%. Time varying. Canada has taken four macro-prudential policy measures since 2008 to tighten to these requirements.	Risk in domestic mortgage market	Introduced after period of strong house price and credit growth. Difficult to separate impact of the financial crisis. IMF (2014a) shows that the moderation in house prices and mortgage credit since 2010 has been due in part to policy measures. Mortgage arrears rate in mortgage loan insurance portfolio remain low.
New Zealand	Proportionate LTV cap at 80% (2013), temporary restriction.	Risks in housing market with high house price growth, overvalued housing stock, high exposure of banks to mortgages and high household indebtedness.	Early indications of moderating credit growth and house price inflation since LTV introduction. Proportion of high LTV lending has fallen significantly. Difficult to disentangle effects of increase in interest rates in 2014 (RBNZ, 2014).
	Core funding ratio of 75% in 2010.	Risk of disruption to funding markets.	Has reduced the reliance on short-term wholesale funding markets.
Sweden	85% LTV cap (2010) Higher capital for mortgages (2013) 1% CCB on domestic exposures (2015).	Risk in domestic mortgage market from high bank exposure to mortgages, high household indebtedness, high share of high DTI and LTV loans	Introduced after period of strong house price and credit growth. The LTV cap has significantly decreased the number of new mortgages with loans over 85pc of the market value. The rate of credit growth has slowed since 2010.
	3% SRB and 2% Pillar 2 for 4 systemic banks (2015)	Systemic risk	Not yet binding. Banks already have very high capital ratios.
UK	Proportionate LTI cap at 4.5 times	Insurance against the risk that there is greater momentum in the housing market than anticipated and that, as a result, lenders face growing demand for loans at very high LTIs.	Only implemented in late 2014
Australia	Increase in risk weights for self-verified mortgages and non-prime home loans in 2004.	Risk from strong house price growth in tandem with higher risk lending.	Seen as having helped to change bank lending behavior and limit the growth of this market.
Norway	LTV cap of 90% (Mar 2010), reduced to 85% (Dec 2011).	Risks in mortgage market with strong price growth and high household indebtedness.	Introduced after period of strong house price and credit growth. Gradual reduction in high LTV lending. ECB (2014) found that house prices continued to rise post announcement of cap but credit growth slowed somewhat.
	Countercyclical capital buffer of 1% from June 2015. 2% capital buffer for systemically important institutions (July 16) and systemic risk buffer of 3% (June 14).	Risk from financial imbalances in the economy. Systemic risk	Not yet binding. Banks already have very high capital ratios.
Korea	LTV cap (2002), differentiated by property type, adjusted counter-cyclically. DTI cap (2005), differentiated by property type, adjusted counter-cyclically.	Aimed at stabilising house prices.	Evidence shows that these measures have had effects on volume and on prices. The measures have also been shown to alter expectations. (Igan and Kang, 2011).
	Macro-prudential Stability Levy (MSL) (2011), price-based tax on banks' non-core foreign currency liabilities.	Risk from excessive dependence on short-term non-core foreign exchange (FX) borrowings.	IMF (2013) states that although early days, the measure appears to have been effective in curbing banks' reliance on short-term FX funding and in reducing vulnerabilities from FX mismatches and their links to exchange rate volatility.

14 For further detail on individual macro-prudential measures, see IMF Article IV consultations for the different countries.

Table 3b: International experience with macro-prudential policy measures[15]

Country	Instrument used	Risk addressed	Effectiveness
Countries with exchange rate anchors			
Croatia	A wide range of instruments including changes to reserve requirements, higher risk weights and liquidity requirements on foreign currency exposures.	Risk from capital flows and foreign currency lending.	Difficult to assess effectiveness due to many policy changes. Some of these changes were necessitated due to arbitrage activity. Some effect on increasing bank resilience to shocks (ECB 2014).
Hong Kong	LTV cap (1990s), differentiated by property and borrower type, adjusted counter-cyclically, in conjunction with mortgage insurance. DTI cap.	High bank exposure to residential mortgages, lack of control over monetary policy, high and volatile property price growth.	Bank losses remained low during Asian crisis after severe falls in property values (BOE 2011). Delinquency ratio of insured portfolio remains low.
Singapore	LTV cap for 1st (80%), 2nd (50%), subsequent (40%), and non-individual (20%) mortgages and mortgages with a long term (from 2013). Mortgage servicing requirement of 30% (2013).	Risks to financial stability from rising house prices and credit growth.	Share of borrowers with just one mortgage increased and speculative transactions fell after introduction of LTV cap (IMF 2014b).
Switzerland	Counter-Cyclical Capital buffer on real estate exposures (Feb 2013)	Sustained growth in the domestic credit and real estate markets over recent years, and the removal of interest rate flexibility with the exchange rate floor	Premature to draw conclusions as to the success of the CCB to date. It is worth noting that the buffer was activated while other regulatory instruments were already in place.
Countries in a currency union			
Finland	90% LTV cap; 95% for FTBs, based on fair value of all collateral.	High house prices and high household sector indebtedness.	Previously introduced as guidelines but will only be binding from 2016.
Ireland	Higher RW for higher LTV residential mortgages and on CRE lending (2006/7).	Risk of system-wide expansion of property-related credit.	These measures were not effective given the late timing of deployment and the limited effect on capital requirements (Honohan (2010).)
Netherlands	LTV cap of 100% by 2018 (Aug 2011).	Risks in mortgage market.	Difficult to separate effect of LTV cap on announcement and the impact of the crisis in 2011 on house prices and credit growth.
	Systemic risk buffer for large banking groups	Reduce the risk of systemic banks failing.	To be be phased in between 2016 and 2019.
Spain	Rules-based dynamic provisioning introduced in 2000.	Motivated by a sharp increase in credit risk on Spanish banks' balance sheets following a period of significant credit growth during the late-1990s. Risk from high credit growth and low credit costs.	IMF (2011) finds that the instrument was effective in helping to cover rising credit losses during the crisis, but the coverage was less than full because of the severity of the actual losses.

15 For further detail on country classifications, see IMF Annual report on exchange arrangements and exchange restrictions 2014. For further detail on individual macro-prudential measures, see IMF Article IV consultations for the different countries.

References

BCBS (2010), "An assessment of the long-term economic impact of stronger capital and liquidity requirements", Basel Committee on Banking Supervision, August 2010

BOE (2011), "Instruments of macro-prudential policy", Discussion paper, Bank of England, December.

BOE (2014), "The Financial Policy Committee's powers to supplement capital requirements", Policy Statement, Bank of England, January.

Bernanke, B., Gertler, M. and S. Gilchrist, (1996), The Financial Accelerator and the Flight to Quality'', The Review of Economies and Statistics, 78(1). pp. 51-82.

Brzoza-Brzezina, M., Kolasa, M. and K. Makarski (2013), "Macroprudential policy instruments and economic imbalances in the euro area", ECB Working Paper Series No. 1589, September 2013

CBI (2014a), A Macro-Prudential Policy Framework for Ireland", Central Bank of Ireland.

CBI (2014b), "Macro-prudential policy for residential mortgage lending" consultation paper CP87, Central Bank of Ireland.

CBI (2015), "Information Note: Restrictions on Residential Mortgage Lending", Central Bank of Ireland, January.

CGFS (2012), "Operationalising the selection and application of macroprudential instruments", CGFS Papers No. 48, Committee on the Global Financial System, December.

Chakrabarty, K., (2004), "Framework for the conduct of macroprudential policy in India: experiences and perspective", Banque de France Financial Stability Review No. 18, April 2014.

De Bandt, O. and P. Hartman, (2000), "Systemic Risk: A Survey", ECB Working Paper No.35, European Central Bank.

De Nicolò., G., Favara, G., and L., Ratnovski (2012), "Externalities and macroprudential policy", IMF Staff Discussion Note, June 7, 2012 (SDN/12/05), International Monetary Fund.

ECB (2013) "Gauging the effectiveness of cross-sectional macro-prudential tools through the lens of interbank networks", Financial Stability, Review Special Feature C, 2013, November.

ECB (2014), "Recent experience of European countries with macro-prudential policy", Financial Stability May 2014.

European Commission (2012), "Economic Adjustment Programme for Ireland. Summer 2012 Review", European Economy Occasional Papers 115, Summer 2012. European Commission.

European Commission (2013), Frequently Asked Questions on CRD IV/CRR, March.

ESRB (2011), "Recommendation of the ESRB of 22 December 2011 on the macro-prudential mandate of national authorities" (ESRB/2011/3), OJ 2012/C 41/01.

ESRB (2013), "Recommendation on intermediate objective and instruments of macro-prudential policy", Official Journal of the European Union (ESRB/2013/1).

ESRB (2014a), "Flagship Report on Macro-prudential Policy in the Banking Sector", March.

ESRB (2014b), "The ESRB Handbook on operationalizing macroprudential policy in the banking sector", March (ESRB/2014), European Systemic Risk Board.

Gorton, G. and P. He., (2008), "Bank Credit Cycles", *Review of Economic Studies*, 75(4).

Honohan, P. (2010), *The Irish Banking Crisis – Regulatory and Financial Stability Policy 2003-2008*. Report for Commission of Investigation into the Banking Sector in Ireland, May 2010

Igan, D. and H. Kang (2011), "Do Loan-to-Value and Debt-to-Income Limits Work? Evidence from Korea", International Monetary Fund, December.

IMF (2009), Global Financial Stability Report, April.

IMF (2011), "Macroprudential Policy: What Instruments and How to Use Them? Lessons from Country Experiences", International Monetary Fund, October.

IMF (2013), "Key Aspects of Macroprudential Policy-Background Paper", International Monetary Fund, June.

IMF Annual report on exchange arrangements and exchange restrictions 2014.

IMF (2014a), "With Great Power Comes Great Responsibility: Macroprudential Tools at Work in Canada", International Monetary Fund, May.

IMF (2014b), "Macroprudential policy and capital flow measures in Asia: use and effectiveness", Regional Economic Outlook: Asia and Pacific, April.

IMF (2014c), "Staff Guidance note on macroprudential policy", International Monetary Fund, December.

Kelly, J., O'Donnell, N., Sherman. M., and M. Woods,(2014), "Do Irish Households Respond to Deposit Rates?", *Economic Letter,* Vol.2014. No.2, Central Bank of Ireland.

Kuttner, K. and I. Shim, (2013), "Can non-interest rate policies stabilise housing markets? Evidence from a panel of 57 countries", BIS Working Papers No. 433, Bank for International Settlements, November.

Laeven,L., Ratnovski, L., and Tong, H. (2014) "Bank size and systemic risk"; *IMF Staff Discussion Note*, SDN/14/04.

MAG (2010), "Assessing the macroeconomic impact of the transition to stronger capital and liquidity requirements", Interim Report Macroeconomic Assessment Group (BIS and FSB), August 2010.

RBNZ (2014), "RBNZ Financial Stability Report", November. Reserve Bank of New Zealand.

Regling, K. and M. Watson (2010), *A Preliminary Report on the Sources of Ireland's Banking Crisis*, Report for Commission of Investigation into the Banking Sector in Ireland, May 2010.

Spencer, G., (2014), "Co-ordination of Monetary Policy and Macro-prudential Policy", Speech delivered to Credit Suisse Asian Investment Conference in Hong Kong, 27 March 2014.