



# IMF Working Paper

---

## An Overview of Macroprudential Policy Tools

*Stijn Claessens*

**IMF Working Paper**

Research Department

**An Overview of Macroprudential Policy Tools**

**Prepared by Stijn Claessens<sup>1</sup>**

December 2014

**This Working Paper should not be reported as representing the views of the IMF.**

The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

**Abstract**

Macroprudential policies – caps on loan to value ratios, limits on credit growth and other balance sheets restrictions, (countercyclical) capital and reserve requirements and surcharges, and Pigouvian levies – have become part of the policy paradigm in emerging markets and advanced countries alike. But knowledge is still limited on these tools. Macroprudential policies ought to be motivated by market failures and externalities, but these can be hard to identify. They can also interact with various other policies, such as monetary and microprudential, raising coordination issues. Some countries, especially emerging markets, have used these tools and analyses suggest that some can reduce procyclicality and crisis risks. Yet, much remains to be studied, including tools' costs – by adversely affecting resource allocations; how to best adapt tools to country circumstances; and preferred institutional designs, including how to address political economy risks. As such, policy makers should move carefully in adopting tools.

JEL Classification Numbers: E43, E58, G18, G28

Keywords: Financial stability, financial intermediation, externalities, market failures, procyclicality, systemic risks

Author's E-Mail Address: [sclaessens@imf.org](mailto:sclaessens@imf.org)

---

<sup>1</sup> I would like to thank Charles Calomiris, Andy Jobst, Luc Laeven, Erlend Nier, Inci Otker-Robe, Lev Ratnovski, and other colleagues at the IMF for comments and Joshua Bosshardt for data support. The paper draws on joint work with Swati Ghosh, Roxana Mihet, Lev Ratnovski, Fabian Valencia, and on work of other colleagues at the IMF.

## Contents

Page

I. Introduction .....	3
II. Motivation for macroprudential policies.....	5
III. Interactions with other policies and international dimensions.....	8
A. Macroprudential and monetary policies.....	8
B. Interactions with other policies .....	10
C. International coordination .....	11
IV. Possible macroprudential tools and actual uses.....	13
A. The Toolkit Available .....	13
B. Actual Use of Macroprudential Policies .....	15
V. Research and other evidence on experiences .....	16
A. Aggregate, Cross-Sectional Studies, Focusing on Procyclicality .....	16
B. Case and Other Studies on Procyclicality and Cross-Sectional Risks .....	17
C. Costs and Tradeoffs.....	20
VI. Broader lessons and remaining issues for research and policy making.....	21
References.....	23
Tables	
1. The Macroprudential Toolkit.....	36
2. Overall Use of Macroprudential Instruments .....	37

## I. INTRODUCTION

This paper reviews existing research on the motivations for macroprudential policies, possible specific tools, actual usage, and lessons from experiences. The recent wave of financial crises has led to a greater recognition of the large and at times adverse real economic effects of finance. It has also made clear that existing tools – whether microprudential, monetary, fiscal, or other policies – even when conducted properly and effectively in their own ways, do always not suffice to assure financial stability. Combined with a broader rethinking of macroeconomic and financial policies (e.g., Akerlof et al., 2014), this has led to a call for macroprudential policies, i.e., those policies aiming to reduce systemic risks arising from “excessive” financial procyclicality and from interconnections and other “cross-sectional” factors.

While the need for macroprudential policies is now largely accepted, many questions remain, starting from their motivations.<sup>2</sup> In principle, macroprudential policies should be motivated by externalities and market failures arising from various financial frictions and market imperfections that exist even when microprudential supervision and monetary policy are conducted effectively (which regrettably is often not the case in practice). Few theoretical analyses exist, however, to guide macroprudential policies this way and hardly any have been formally tested. Consequently, most often the design of policies has not started from first principles, but more arising from generic concerns. Related, the set of policies currently being considered is mostly based on existing microprudential and regulatory tools (i.e., caps on loan to value ratios, limits on credit growth, additional capital adequacy requirements, reserve requirements and other balance sheets restrictions), which have been given additional, macroprudential objectives, with forms of “Pigouvian” taxes and levies added.

Even though both the motivations and expected effectiveness of various policies are not well known, usage has often proceeded on an ad-hoc or experimental bases, especially in emerging markets. Evaluations of usage to date, mostly aimed at affecting developments in credit and housing markets, suggest that some tools can help reduce financial procyclicality and lower crisis risks. Notably, caps on loan to value and debt service to income ratios seem to help in reducing booms, and thereby busts, in real estate markets, major sources of instability. Reserve requirements and targeted levies on foreign exchange exposures also help in reducing system-wide vulnerabilities. And progress is being made to reduce the systemic risks created by large financial institutions using, among others, macroprudential policies.

Still, it is not well-known how policies are most effectively calibrated to circumstances (e.g., when and how much to raise or lower a countercyclical capital requirements) and adapted to

---

<sup>2</sup> Clement (2010) identifies the term macroprudential to be first used in the late 1970s in work on international bank lending carried out by the Euro-currency Standing Committee at the BIS. Crocket (2000) was among the first to draw attention in public forums to the need for macroprudential policies. Elliot et al. (2013) reviews the history of “macroprudential” policies in the US. Earlier literature reviews are Galati and Moessner (2011) and Hanson, Kayshap, and Stein (2011), and a recent review of empirical work is Galati and Moessner (2014). For a collection of papers, see Claessens et al. (2011). And for an extensive treatment, see Freixas, Laeven, and Peydró (2015).

country characteristics (e.g., which tools to use given specific financial market structures). Knowledge on which policies and how to use them for risks in capital markets is very limited. Neither is much known about the costs of policies. By definition, macroprudential policies distort some behaviors. Unless perfectly targeted at the source, i.e., where the externalities or market failures arise, which is unlikely, policies can worsen some resource allocations. And by constraining actions of agents, they can increase overall systemic risks.

Questions also arise on the best institutional design for usage, e.g., who is made in charge of macroprudential policies. Should these policies be conducted by the central bank, an existing microprudential or market conduct supervisory agency, a new “macroprudential” agency, or a committee composed of various agencies and others (such as representatives from the ministry of finance)? Institutional designs matter as the conduct of macroprudential policies can interfere with the primary objective of some agencies. A central bank may have more difficulty communicating its monetary policy stance when also in charge of macroprudential policy. And a microprudential authority may be less able to execute its goals when its staff needs multiple skills and is confronted with (at times conflicting) goals. A big concern would be if adopting these policies reduces the importance given to assuring properly conducted monetary policy – e.g., as when these policies become a substitute for monetary policy – or improving microprudential supervision, as these policies are essential in their own right and likely more important overall for reducing systemic risks.

A major issue, closely related to institutional design, is how the political economy of macroprudential policies will play out. By involving the government more directly into the allocation of resources, it (or the specific agencies in charge) will become (more) exposed to outside pressures. This risk needs to be acknowledged explicitly and addressed in institutional design(s), including accountability and transparency. Some policies may for example need to be presented to parliament for broader, public approval, to avoid exposing regulatory agencies to political risks (of ex-post not having “prevented” a crisis when it decided ex-ante not to set too low a LTV so as to allow first-time buyers to acquire a home).

Overall, while the greater system-wide focus is clearly welcome in light of recent crises, many unknowns still exist and a large research agenda remains. In the meantime, policy makers may want to move cautiously with adopting macroprudential tools and prioritize the ones they do and clearly taste their objectives. If in the end, only few policies are actually adopted, a key objective and possible main achievement could still be attained: which is greater appreciation of a more system-wide view of finance in all its aspects and of the various policies that can reduce the risk of crises and lower any excessive procyclicality.

The paper proceeds as follows. Section 2 presents the literature analyzing the motivations for macroprudential policies, considering both time-series, “procyclicality,” and cross-sectional, systemic risk, dimensions. Section III reviews the knowledge on the interactions of macroprudential policies with other policies, notably monetary, and international dimensions. Section 4 describes possible tools, choices and calibration strategies, and use to date. Section 5 presents findings of existing research and case-studies. Section 6 concludes with lessons and outstanding policy issues, including thinking on institutional design and for research.

## II. MOTIVATION FOR MACROPRUDENTIAL POLICIES

*Financial crises have led to (renewed) attention on macroprudential policies.* The recent global financial crisis and its aftermath have been painful reminders of the multifaceted interactions between macroeconomic and financial market developments, “macro-financial linkages.” They have led to (a call for) the adoption of macroprudential policies (as well as the review and reform of other financial policies and institutions).<sup>3</sup> The fundamental rationales behind such policies, however, are not always clearly articulated. Proponents do not always start from the key externalities and market failures associated with activities of financial intermediaries and markets that can lead to excessive procyclicality and the buildup of systemic risk. While proper underlying focuses, procyclicality and systemic risks can arise from many factors, including aggregate shocks (e.g., commodity price shocks) and policy deficiencies (arguably, procyclicality and systemic risks mostly largely relate to weaknesses in the conduct of microprudential and monetary policies). These causes require their own approaches, including fixing deficiencies. These are not all causes that need to be addressed by macroprudential policies. Even though macroprudential policies can mitigate say the general financial or business cycle, or the presence of insufficiently disciplined large financial institutions, only externalities justify a macroprudential approach.

Identifying precisely the source of externalities operating through the financial system thus help determine the corresponding, specific macroprudential policies. While many, policy-oriented papers, notably at the BIS, had drawn attention to the need for a macroprudential approach (e.g., Borio, 2003, Borio and White 2003, White, 2006), these mostly did not adopt the formal perspectives of externalities. Several recent papers, however, have identified the externalities that can give rise to procyclicality and systemic risk, with Brunnermeier et al. (2009) one of the first to do so. De Nicolò, Favara and Ratnovski (2012), on which this section heavily draws, classify the ones known as follows (see also Allen and Carletti, 2011, Bank of England, 2011, Schoenmaker and Wierdsma, 2011):

1. Externalities related to *strategic complementarities*, that arise from the strategic interactions of banks and other financial institutions and agents, and which cause the build-up of vulnerabilities during the expansionary phase of a financial cycle;
2. Externalities related to *fire sales and credit crunches*, that arise from a generalized sell-off of assets causing a decline in asset prices, a deterioration of balance sheets of intermediaries and investors, and a drying up of financing, especially during the contractionary phase of a financial (and business) cycle; and
3. Externalities related to *interconnectedness*, caused by the propagation of shocks from systemic institutions or through financial markets or networks (“contagion”).

While one can classify externalities in other ways, the literature generally makes a similar distinction, that is, between externalities that are more of a *time-series* nature, i.e., give rise to

---

<sup>3</sup> For more policy-oriented reviews see IMF (2013c and 2013d) and ECBS (2014). Claessens and Kodres (2014) review financial reforms in general; see FSB (2014) for policy makers’ assessment.

procyclicality in good and bad times (under 1 and 2), and those more of a *cross-sectional* nature, i.e., due to interconnectedness (under 3). Table 1 organizes these along the vertical axis, with specific groups of tools (to be reviewed in section 4) along the horizontal axis. I review specific externalities under each heading next.

*Externalities related to strategic complementarities.* These externalities arise during the buildup of risks in the boom period and are due to various reasons, albeit many not well understood. Historical experiences suggest that financial intermediaries tend to assume exposures to common credit and liquidity risk in the upswing of a business cycle, amplifying financial cycles and contributing to asset price volatility.

One reason is because of strategic complementarities arising in market interactions between rational agents, meaning that the payoff from a certain strategy increases with the number of other agents undertaking the same strategy. One source relates to increased competition in boom times, which can affect economy-wide credit standards. In the presence of imperfect information, banks need incentives to assess borrowers' risk. In boom times, incentives are less to screen potential borrowers due to lower rents prompted by fiercer competition. As a result, they reduce screening intensity and increase lending, worsening the pool of borrowers (Ruckes, 2004; Dell'Ariccia and Marquez, 2006; Gorton and He, 2008). This reverses with lower credit origination and less competitive pressures in the contractionary phase.

Other sources are reputational concerns and incentive structure for financial managers. When managers care about perceptions of ability, their credit, investment or other policies may be influenced by those of others (Rajan, 1994). Excessive long-term risk-taking can arise under pay for short-term performance (Acharya, Pagano, and Volpin, 2013). Benchmarking in various forms can lead to externalities, e.g., an institution reporting poor performance will be evaluated more leniently if many others do so similarly. Institutions then have incentives to maintain risky lending, hide losses or otherwise copy each others' behavior until the buildup of risks forces them to "coordinate" to a strategy of loss recognition and external financing contracts (Allen and Saunders, 2003, review). Complementarities can come from institutional rules, such as mark-to-market (fair value) accounting or the required use of (similar) "value-at-risks" models (Adrian and Shin, 2010, 2014). Other sources appear more behavioral, as when investors chase similar investment opportunities (Shleifer 2000, and Barberis, 2013, review) or 'neglect' the possibility of rare but large shocks (Gennaioli et al., 2013).

Externalities can also arise from the optimal ex-ante response of agents to ex-post government interventions. The prospect of a bailout can mean strategic complementarities, as it can lead institutions, especially banks, to engage ex-ante in correlated asset choices. Anticipating that simultaneous failures trigger a bailout (to prevent a financial meltdown), banks may find it optimal to correlate risks to maximize the probability that any failure is a joint failure (Farhi and Tirole, 2012; Acharya and Yorulmazer, 2007). As firms mimic each others' strategy, overall vulnerabilities increase whether through correlated asset choices, maturity and exchange rate mismatches or otherwise (Ratnovski, 2009; Allen and Carletti, 2011). These vulnerabilities in turn can lead to or deepen a financial bust.

*Externalities Related to Fire Sales and Credit Crunches.* A fire sale occurs when an investor is forced to liquidate an asset at a time when potential buyers are also troubled. Given limited buyers, the asset is sold at a price below its fundamental value, causing losses to the seller (Shleifer and Vishny 1992; Allen and Gale 1994). Not only does this asset fetch a lower price, but similar assets held by other financial institutions may also decline in value. This reduces the capitalization and ability to post assets as collateral of all financial institutions, forcing them to liquidate other assets. The new round of selling triggers further losses, new selling, etc., thus creating a pecuniary externality.

Fire sales and credit crunches are an obvious possibility for banks since they issue liquid liabilities to fund illiquid assets, exposing them to the risk of having to liquidate investments prematurely, as happened in the Great Depression (Rajan and Ramcharan, 2014). Although guarantees and central bank support, such as deposit insurance and liquidity facilities, reduce the likelihood of fire sales, their effectiveness can be limited when banks also rely on wholesale funding, as many did before the crisis. Or when other important players in the intermediation process, such as broker-dealers and ‘shadow banks,’ that do not (formally) benefit from such support, have to sell assets they can also depress the values of (similar) assets banks hold.

Fire sales can also trigger an external financing, credit crunch with adverse real consequences. As banks balance sheets are impaired they will cut back on their financing. And as asset prices decline and collateral becomes less valuable, final borrowers (corporations, households and sovereigns) have less access to finance, which worsens the real economy (Goldstein, Ozdenoren and Yuan, 2013). Even more generally, small financial shocks can trigger demand and other real sector externalities, including from capital flows, and aggravated by the zero lower bound on interest rates (see Korinek, 2011; Schmitt-Grohe and Uribe, 2012; Farhi and Werning, 2013; Korinek and Simsek, 2014).

Even though fire sales and credit crunch externalities manifest themselves in a downturn, the imbalances that sow the risks are often built up in booms. The reason is that atomistic agents take prices as given, but on aggregate the equilibrium price depends on their joint behavior. As they do not internalize the possible effects of a generalized fire sale on ex-post borrowing capacity, agents may overborrow, leading to excessive leverage and inflated asset prices (Bianchi, 2011, Caballero and Krishnamurthy, 2003, 2004, Lorenzoni, 2008, Jeanne and Korinek, 2010, and Stein, 2012; Manconi et al., 2012; Merrill et al., 2012; see Brunnermeier, Eisenbach and Sannikov, 2013, for a review).

*Externalities Related to Interconnectedness.* Banks and other financial institutions are very interconnected, with distress or failure of one affecting others. Spillovers can arise because of bilateral balance sheets (interbank) and other exposures (Allen and Gale, 2000; Diamond and Rajan, 2011; Perotti and Suarez, 2011), asset price movements (as discussed above), or aggregate feedback from the real economy (Bebchuk and Goldstein, 2011). Financial institutions can reduce but not entirely eliminate these risks as interconnectedness is often beyond their individual control and actors do not internalize their implications for systemic risk (Acemoglu et al., 2013). Also, interconnectedness may arise for genuine mutual hedging and diversification motives (Wagner, 2011). Related, as the financial networks literature

(Allen and Gale, 2007; Gaia et al., 2011) has shown, while high interconnectedness mitigates the impact of small shocks by spreading them, it can amplify large shocks since they can reach more counterparties.

Interconnectedness externalities are particularly strong for systemically important financial institutions (SIFIs).<sup>4</sup> Unlike smaller institutions, distressed SIFIs cannot easily be wound down, since they are often complex, operate internationally, provide unique services, or are backbones of the financial infrastructure, making them “too big to fail” (Strahan 2013 reviews). Historically, most interventions in SIFIs are then also de facto bailouts, which protect creditors (and sometimes even shareholders and often management) from the full scale of losses. The anticipation of bailouts perversely affects the (risk-taking) incentives for SIFIs and other market participants. It introduces a race among institutions to become systemically important, as this lowers the cost of funding, and reduces market discipline for creditors of SIFIs, especially the riskiest ones (Ueda and Weder di Mauro, 2012). In turn, these behaviors lead to aggregate risk-shifting and distorted competition (see IMF, 2014b).

The externalities of a *time-series* nature can interact with those of a *cross-sectional* nature to create systemic risks. Rapid growth of large financial institutions during a boom means procyclicality gets reinforced by contagion risks. Conversely there can be complementarities in the tools to be used to mitigate either source of externalities.

### III. INTERACTIONS WITH OTHER POLICIES AND INTERNATIONAL DIMENSIONS

Macroprudential policies are not the only policies aimed at economic (including price) and financial stability. Others include monetary, microprudential, fiscal, as well as competition policies. Macroprudential policies interact with these. Furthermore, some macroprudential policies can be motivated by the need to correct for the “distortions” introduced by other policies. Macroprudential policies can also have international spillovers, both inward and outward, and consequently there can be overlap and interrelationships with capital flow management (CFM) policies. How to coordinate macroprudential policies with these other policies? I review the (limited) literature on this briefly next, focusing mostly on interactions between monetary and macroprudential policies as most relevant and most studied.

#### A. Macroprudential and monetary policies

Both macroprudential and monetary policies are useful for countercyclical management: monetary policy primarily aimed at price stability; and macroprudential policies primarily aimed at financial stability. Since these policies interact with each other, each may enhance or diminish the effectiveness of the other. IMF (2013a and 2013b) reviews the (limited) literature on the

---

<sup>4</sup> While historically “systemic importance” has been associated with institutions’ size, recent events suggest a more complex picture, with interconnectedness determined by interbank market linkages and effects amplified by high leverage (Drehmann and Tarashev, 2011; Laeven, Ratnovski and Tong, 2014). Interconnectedness and systemically importance may also be present with and among nonbanks (e.g., hedge funds, money market mutual funds, or shadow banking), or institutions that support market infrastructure, such as central clearing counterparties.

conduct of both policies in the presence of these interactions. It first presents an ideal, but unrealistic benchmark, in which both policies perfectly achieve their objectives. It then addresses three questions: If macroprudential policies work imperfectly, what are the implications for monetary policy? If monetary policy is constrained, what is the role for macroprudential policies? And with institutional and political economy constraints, how can both be adjusted?

*Benchmark world, when policies work perfectly.* Monetary policy alone cannot be expected to achieve financial stability effectively or efficiently because its causes are not always related to the interest rate level or the degree of liquidity in the system (which monetary policy can affect). For mitigating the effects of financial distortions or when financial distortions are more acute in some sectors of the economy than in others, monetary policy is too blunt a tool. Pricking an asset price bubble for example can require large changes in the policy rate (Bean and others, 2010). Similarly, using macroprudential policies primarily for managing aggregate demand may create additional distortions by imposing constraints beyond where financial instability originates. For example, to limit general credit growth may be too harmful from an aggregate economic perspective. It is thus desirable, when both policies are available, to keep monetary policy primarily focused on price stability and macroprudential policies on financial stability.

Monetary policy, however, does affect financial stability: (i) by shaping ex-ante risk-taking incentives of individual agents, affecting leverage and short-term or foreign-currency borrowing (Dell’Ariccia and Marquez, 2013, review); or (ii) by affecting ex-post the tightness of borrowing constraints, possibly exacerbating asset price and related externalities and leverage cycles. Similarly, macroprudential policies can affect overall output by constraining borrowing and hence expenditures in one or more sectors. These side effects imply that one needs to consider how the conduct of both policies is affected. Most analytical papers to date find the sole presence of side effects to have no major implications for the conduct of both policies when policies operate perfectly.<sup>5</sup> In particular, most Dynamic Stochastic General Equilibrium (DSGE) models suggest that monetary policy not to change markedly when macroprudential policies are also used, even when different types of shocks are considered. A big caveat is that most models employ limited representations of financial systems and related financial frictions, and often use assumptions that imply linear relationships, making both policies operate mostly similar (see Benes, Kumhof, and Laxton, 2014a and 2014b, for DSGE-models with non-linearities).

*When either macroprudential or monetary policies work imperfectly.* In the real world policies do not operate perfectly. Furthermore, neither policy is immune to political pressures and time inconsistency issues. As such, the conduct of both may need to be adjusted to consider the weaknesses in the other, but how is conceptually and empirically unclear. Weaknesses in macroprudential policies mean monetary policy more likely needs to respond to financial conditions. Indeed, in models where macroprudential policy is absent or time invariant, but with financial “distortions” still present, optimal monetary policy responds to some degree to financial conditions, in addition to output and inflation (Curdia and Woodford, 2009, Carlstrom and Fuerst, 2010, Adam and Woodford, 2013). By extension, with imperfectly targeted or effective macroprudential policies, monetary policy may need to

---

<sup>5</sup> Farhi and Werning (2013), however, develop a model with financial frictions and nominal rigidities where even with perfectly operating policies, monetary policy might have take on a role in assuring financial stability.

respond to financial conditions and “lend a hand” in achieving financial stability, also because of its more general reach (e.g., as “it gets in all of the cracks;” see Stein, 2013). This “leaning against the wind” argument is, however, not generally accepted (e.g., compare Bernanke and Gertler, 2001, with BIS, 2014; see also Yellen, 2014).

Similarly, macroprudential policy may need to respond to aggregate developments related to financial activities when monetary (and other) policies are constrained, as with economies pegging their exchange rate or in currency unions. The case of the euro area shows the economic (and financial) risks that arise when booms are not (or cannot) mitigated at the national level. When the effective monetary stance gives rise to macroeconomic imbalances or excessively strong overall risk-taking incentives, national macroprudential policies may need to be used, especially when other policies are imperfectly coordinated internationally (e.g., as when foreign lenders are not constrained from lending to the country).<sup>6</sup> Of course, the macroeconomic risks need to be related to financial activities (e.g., a housing boom that is of macroeconomic concern, even when completely financed internationally). And when monetary arrangements are not adequate, strengthening monetary policy’s effectiveness will likely be better than using macroprudential policies as imperfect substitutes.

## **B. Interactions with other policies**

There are, besides monetary policy, many policies that can interact with or condition the use of macroprudential policies. These include fiscal, microprudential, and other structural policies. I review the research in these areas briefly.

*Fiscal policy.* Tax policies can contribute to systemic risk when they encourage leverage, as when interest payments are tax deductible, or affect asset prices (see De Mooij, 2011, Keen and De Mooij, 2012). Macroprudential authorities have therefore an interest in the correction of such biases. Even when not contributing directly to risks, taxes can affect the conduct of macroprudential policies. Real estate taxes (property taxes, stamp duties) can be capitalized into house prices (e.g., Van den Noord, 2005), making (future) tax policies possibly relevant for financial stability. Since various Pigouvian taxes and levies can address systemic externalities (IMF 2010), coordination between macroprudential and fiscal agencies may be needed. Little is known though on the quantitative importance of these aspects. And fiscal policy in the aggregate matters as it can counter (or be a source of) procyclicality.

*Microprudential.* Macroprudential policies presume effective microprudential regulation and supervision. Most often, when conducted properly microprudential objectives will be aligned with macroprudential policies, but there can be conflicts (Osiński, Seal, and Hoogduin, 2013;

---

<sup>6</sup> The need to conduct macroprudential policies at the regional level in currency unions can arise not just from financial frictions, but also due to “incomplete” overall design. It is, for example, generally not thought to be necessary to conduct macroprudential policies at a regional level in the US, even though booms and busts can (and have been) regional. This is, among others, since in the US the financial safety net is nationally organized and funded, fiscal stabilizers operate across regions, and labor and other factors markets are flexible enough to allow for satisfactory reallocation of resources, conditions not present to the same degree in all currency unions, including the euro.

Angelini, Nicoletti-Altimari, and Visco, 2012). This is most clear in bad times when a macroprudential perspective may suggest relaxing regulatory requirements – as they impede the provision of credit to the economy or contribute to fire-sale effects, while the microprudential perspective may seek to retain or tighten requirements – so as to protect the interest of depositors of individual banks or investors. In good times, conflict of interests are less likely, e.g., both authorities will ask banks to build up buffers, but the macroprudential perspective will likely still call for greater prudence. Some of this conflict is institutionally related. For example, accounting indicators, more often used by microprudential authorities, likely give a more positive picture of an institution’s balance sheet in boom time than a system’s view would. While recognized, how to address these issues largely remains an open question. And, as also argued by Jeanne and Korinek (2013), an ex-post strategy of cleaning up after a crisis can be part of an efficient approach to “managing” risks, thus calling for crisis management to coordinate with ex-ante policies.

*Other, structural policies.* Conflicts can also arise in the design of structural policies, as when risks arise from how microprudential policies are conducted. For example, a very high loan to value ratio is likely to increase the incidence of real estate booms. Even when set optimally from a microprudential perspective, capital requirements can increase overall procyclicality (Angelini et al. 2010; Repullo and Suarez, 2013). Or a public safety net, including deposit insurance, while reducing the risk of runs on individual institutions, can give rise to greater system risks (Demirguc-Kunt and Detragiache, 2002; Demirguc-Kunt, Kane and Laeven, 2008). The use of ratings may introduce (more) procyclicality (Amato and Furfine, 2004). And accounting rules aimed at greater transparency and fostering more market discipline can mean more procyclicality as chances of fires-sales increase when institutions mark asset to market (Leuz and Laux, 2010; Ellul et al., 2012,). Also, by affecting incentives for risk-taking, there can be an inverse U-shaped relationship between bank competition and financial stability (Allen and Gale 2004; see further Beck, 2008, Ratnovski, 2013). And house price developments will be importantly affected by land use and construction policies. These examples show that macroprudential policies need to be coordinated with many policy areas, in part as the need for them arises exactly from these other policies.

### **C. International coordination**

*International financial and policy spillovers.* The de-facto international financial integration of most countries affects the desired use of and effectiveness of macroprudential policies. Given financial integration, cross border spillovers may arise as when the financial cycle is in an upswing in one country but in a downswing in another, or because countries are (or are not) using macroprudential policies.<sup>7</sup> As argued by Shin (2012) and shown by Rey (2013) and others, there is much commonality to financial cycles globally, suggesting policies are naturally coordinated. The cycle appears largely driven by conditions in major advanced

---

<sup>7</sup> Obviously, there are many types of international spillovers, e.g., those arising from shocks such as natural disasters, but the focus here is on financial and policy spillovers. Furthermore, many (policy) spillovers can be positive, as when risks are reduced or better diversified when one system becomes more stable due to macroprudential and other policies.

countries, however, and it is thus not obvious that the commonality itself or addressing it from the major countries' perspectives alone is optimal for all countries. Regardless, being financial integrated means countries have less control over their own financial stability.

Policy spillovers can also arise (more likely) when countries vary in policies or calibrations to deal with similar risks, or in policy effectiveness. Aiyar, Calomiris, and Wieladek (2014) show that foreign bank branches increased their lending in the UK in response to tighter measures applied to local banks, a sign of cross-border competition and regulatory arbitrage. Or when policies are not effective at the source country to stem risks related to outflows, recipient countries can be negatively affected if they cannot stop inflows. Spillovers can arise when institutions adjust to local restrictions by decreasing or increasing cross-border activities. Aiyar, Calomiris, Hooley, Korniyenko and Wieladek (2014) show that, as supervisors required UK-based banks and subsidiaries to meet higher capital requirements during the 2000s, local banks lend less abroad which may or not have been optimal. Spillovers can also arise when institutions from country A reduce cross-border flows to country B in response to its rules and increase flows to country C (see Forbes, Fratzscher, Kostka, and Straub, 2012 for the case of capital controls).

Even though the scope for (policy) spillovers is large, the case for international coordination and cooperation depends on the presence of negative externalities. While the welfare gains from coordinating macroprudential policies have not yet been much analyzed (see Jeanne and Korinek, 2014 for some thoughts), analysis on multilateral aspects of CFM tools (e.g., Ostry, Ghosh, and Korinek, 2012) relates. Building on this, Korinek (2014) argues that spillovers can lead to inefficiencies under three circumstances: if policies are “beggar-thy-neighbor;” if policy instruments to deal with externalities operate imperfectly; and if global markets are incomplete or restricted (see also Brunnermeier and Sannikov, 2014). And Jeanne (2014) shows the need to coordinate when some countries are in a liquidity trap as the global real interest rate cannot adjust sufficiently.

While there can be some (limited) scope in principle, policy coordination is hard in practice (see Ostry and Ghosh, 2013). And indeed so far, coordination has been limited, with instruments and mechanisms only defined for the countercyclical and systemic capital surcharges in Basel III. While more progress can be envisioned, (policy) spillovers are likely to remain. For individual countries, CFM tools may then sometimes be part of a useful policy response (IMF 2012c). This raises how to coordinate between CFM tools and macroprudential policies. Here Korinek and Sandri (2014) provide a useful dichotomy: macroprudential policies should address externalities related to domestic credit and CFM tools those related to exchange rate movements. How to make this operational, however, remains to be determined (see further Ostry et al., 2012).

#### IV. POSSIBLE MACROPRUDENTIAL TOOLS AND ACTUAL USES

This section first reviews the toolkit available in principle, and then the actual use of policies.

##### A. The Toolkit Available

Many macroprudential tools have been proposed and some have been used, even before the recent crisis. The toolkit available in principle is quite large and includes existing microprudential and other regulatory tools, taxes and levies, and new instruments. Table 1 categorizes these in a 3-by-5 matrix (for other classifications, see CGFS, 2010, IMF 2011b, and ESRB, 2014). Most tools considered to date apply to the banking system, mainly given the existence of microprudential tools adaptable to macroprudential objectives and related more extensive theory and knowledge. A lack of understanding of possible externalities in other financial market segments is, however, also at play (e.g., as in shadow banking, see Claessens, Pozsar, Ratnovski, and Singh, 2012 for a review; and in insurance, see IAIS, 2013). Note further that many instruments (can) also serve other policy objectives, including, besides microprudential, assuring consumer protection or fostering greater competition, and that other tools can be considered.

The matrix covers along the vertical axis the three goals (as per section 3) and along the horizontal axis five set of tools: a) quantitative restrictions on borrowers, instruments or activities; b) capital and provisioning requirements; c) other quantitative restrictions on financial institutions' balance sheets; d) taxation/levies on activities or balance sheet composition; and e) other, more institutional-oriented measures, such as accounting changes, changes to compensation, etc. Except for a), which aims to affect demand for financing, all can be seen as affecting the supply side of financing. The first four measures are meant to be time-, institution-, or state-varying, while the fifth one is more structural.<sup>8</sup>

Tools under the 15 (3\*5) combinations include those correcting (for factors that can give rise to) externalities and market failures or compensating for policies that can contribute to adverse financial dynamics (such as the pro-cyclicality introduced by microprudential capital requirements). Besides mapping each tool to specific externalities, with some tools possibly mitigating more than one, tools are ideally also mapped to intermediate targets, such as changes in credit, leverage, asset prices, interconnections and the like. Knowledge on what intermediate indicators to use and how to calibrate tools is still limited, however (see further IMF, 2013c, 2013d).

*Use and Calibration of Macroprudential Policies.* The preferred use of policies, in their extensive (whether or not to use a specific tool) and intensive margins (how much to use it), will vary by the degree of amplification in the financial (and real) sector cycles, exposures to systemic shocks and risks, and the effectiveness of (specific) policies. As such, many dimensions come into play, including a country's structural, institutional and financial market characteristics. Models provide some limited guidance for use and calibrations.

---

<sup>8</sup> Other dimensions of relevance include whether tools are meant to be broad based vs. more targeted and rules-based vs. more discretionary.

DSGE-models with financial frictions can suggest an optimal mix of macroprudential and monetary policies (e.g., Kannan, Rabanal, and Scott, 2009; Quint and Rabanal, 2013). Or some historically derived indicators of (excessive) procyclicality and systemic risks, e.g., a notion of a “credit gap,” can suggest specific dynamic provisioning surcharges (Drehmann et al. 2011). And a Pigouvian tax on SIFIs can be made to depend on measures reflecting the size of interconnectedness externalities (Kocherlakota, 2013).

Many questions exist, however, on what measures reliably indicate systemic risk build-up, with both Type I and II errors, and on the time horizon at which risks can be detected. Notably, how to account for country circumstances and characteristics is still unclear. Obviously, some factors are likely relevant: the overall depth of a country’s financial system, which differs vastly; financial structure, e.g., the importance of banks versus capital markets, with institution-based measures likely of greater importance than borrower-based measures when most financing comes from a regulated system;<sup>9</sup> the industrial organization and ownership structure, since a more concentrated system makes the application of tools easier, or because domestic, state-owned and foreign banks react differently to policies.

International financial integration and exchange rate regime matter as well. Openness affects exposures, both directly, as regards to say capital flows risks, and indirectly, given the strong links between behavior of capital flows and banking vulnerabilities (e.g., Hahm, Shin, and Shin, 2013; Cerutti, Claessens, and Ratnovski, 2014). Financial integration also affects how effective policies may be. A very open capital account and large foreign bank presence make circumvention more likely. And with a fixed exchange rate, monetary policy cannot be a possibly complementary tool. These and other considerations will affect which policy is best and whether CFM tools can complement (e.g., Hahm, Mishkin, Shin, and Shin, 2011).

Preferred use could also vary by the availability and effectiveness of fiscal and microprudential policies. High public debt makes countercyclical fiscal policy harder, making macroprudential policies more important. Microprudential supervision may face greater challenges in some markets. Institutional (e.g., lack of data, know-how and skills in supervisory agencies), political economy, and other constraints may lead countries to adopt macroprudential policies in specific ways. Use could also vary with other tools available to mitigate systemic risks. Stress tests could complement macroprudential policies.<sup>10</sup>

---

<sup>9</sup> For instance, reserve requirements are likely more effective when most deposit-like claims are subject to it. Especially in advanced economies, however, many such claims are not directly regulated, or at least not like bank deposits, creating scope for avoidance, while in emerging markets, such claims are less plentiful. Note that also that reserve requirement can fulfill monetary policy functions (see Cordella et al., 2014). Related is the issue of the shadow banking system, by definition less subject to (macroprudential) policies, but using macroprudential policies could increase its size.

<sup>10</sup> Although employed for some time for financial stability assessments, some countries (e.g., US, EU) have recently been using, and making public, stress tests to help identify individual institutions’ and overall vulnerabilities (and remedial actions). Stress tests are more forward-looking than macroprudential policies and can be less coarse in their application (say by having very granular asset categories for risk scenarios). More generally, they can be more tailored to (emerging) vulnerabilities than macroprudential policies may be, especially when the latter are not properly designed and quickly adjusted to (changing) circumstances. Stress tests, however, have some drawbacks. Typically,  
(continued...)

Furthermore, financial reforms are proceeding in various ways, some coordinated (e.g., new liquidity requirements) and some country-specific (e.g., Vickers, Volcker and Liikanen rules), making overall institutional environments in flux and requiring further adaptations.

## **B. Actual Use of Macroprudential Policies**

Information on the actual use of macroprudential policies is limited, in part because (the use of) tools are not always clearly identified (some countries have adopted more explicit frameworks, but most have not yet). Some data have nevertheless been collected for some 65 countries by the IMF (see Lim et al., 2011, and Cerutti et al., forthcoming, for exact coverage and data definitions). The seven specific instruments reviewed here are: caps on loan-to-value (LTV) and debt-to-income (DTI) ratios, limits on credit growth (CG), limits on foreign lending (FC), reserve requirements (RR), dynamic provisioning (DP), and counter-cyclical requirements (CTC). One can organize these measures along the categories of Table 1: those aimed at borrowers (caps on LTV and DTI ratios); those aimed at financial institutions' assets (CG and FC) and liabilities (RR); and those aimed at building buffers (DP, CTC).

*Usage of policies in general.* In the sample, 42 countries – of which 28 are emerging and developing and 14 advanced – implemented at least one instrument once during 2000-2013, while 23 never used any. Most usage is by emerging markets, consistent with their greater needs, being more exposed to external shocks, including from volatile capital flows, and having more “imperfect” and generally less liberalized financial systems with more “market failures.”

Countries use LTV ratios the most (Table 2, column 1): 24 used it at least once. Next are DTI (23), FC (15), RR (10), DP (7), CG (6), and CTC (5). Weighting by the length of time and relative to overall use (column 2), most often used is again LTV, 28% of country-year combinations when a policy was used. Following closely behind is DTI (24%), then RR (15%), FC (14%), CG (9%), DP (8%), and finally CTC (2%).

*Usage of policies by country groupings.* Use varies among countries (columns 3 and 4). In advanced countries, LTV and DTI ratios are used the most, while other policies are rarely used. Differences are starker considering how long policies are used (columns 7 and 8). Emerging markets use more policies and longer than advanced countries do and tend to favor more foreign exchange and liquidity related policies (FC, RR), maybe due to their concerns with large and volatile capital flows and related systemic risks. But they also use CG more often, possibly as their systems are less liberalized. Advanced countries prefer the demand for credit related LTVs (55%) and DTIs (20%), perhaps out of concern with excessive leverage. The increased usage since the late 1990s by more countries reflects the growing recognition of the policies. Overall though policies were used four times more intensively by emerging markets than by advanced countries right before the crisis, with this ratio declining to 3.3 as advanced countries started to use them.

---

they only cover part of financial intermediation (mainly major banks) and thus do not capture fully systemic risks. They are also less geared at ex-ante incentives as their actions to reduce risks follow in more discretionary ways (e.g., need for recapitalization).

## V. RESEARCH AND OTHER EVIDENCE ON EXPERIENCES

This section reviews the literature on the effectiveness of macroprudential policies. Most are cross-country, aggregate analyses, investigating cyclical aspects and notably in credit and housing markets. Some more micro, case studies exist, also largely focused on cyclical aspects, and some work focuses on cross-sectional, systemic risk aspects.

### A. Aggregate, Cross-Sectional Studies, Focusing on Procyclicality

Several papers have analyzed effects of policies on various measures of financial vulnerability and stability (see also ECB, 2012, IMF, 2013a-d; notably IMF 2013d, Table 4 and 5, and ESCB, 2014, for reviews). Lim et al. (2011) document, using cross-country regressions, some policies being effective in reducing the procyclicality of credit and leverage. Specifically, tools such as LTV and DTI, ceilings on credit growth, RR, and dynamic provisioning rules can mitigate procyclicality. IMF (2013b) investigates, also in a cross-country context, how (changes in) policies affect financial vulnerabilities (credit growth, house prices, and portfolio capital inflows) and the real economy (output growth, and sectoral allocation, i.e., the share of residential investment), considering also whether effects are symmetric between tightening and loosening. Overall, both (time-varying) capital requirements and RRs significantly affect credit growth, LTV limits and capital requirements (but not RRs) strongly affect house price appreciation rates, and RRs reduce portfolio inflows in emerging markets with floating exchange rates. They find no significant indication of asymmetric responses. LTVs appear to impact overall output growth, maybe through reducing construction investment, but no other policies do so.

Crowe et al. (2011) find that policies such as maximum LTV have the best chance to curb a real estate boom. They also argue that their narrower focus reduces their overall costs. And, measures aimed at strengthening the banking system (such as dynamic provisioning), even when failing to stop a boom, may still help to cope with the possible bust. IMF (2011a) finds LTV tools to be effective in reducing price shocks and containing feedback between asset prices and credit. Vandebussche, Vogel, and Detragiache (2012) find that capital ratio requirements and non-standard liquidity measures (marginal reserve requirements on foreign funding or linked to credit growth) helped slow down house price inflation in Central, Eastern and Southeastern Europe.

Dell'Ariccia et al. (2012) find that macroprudential policies can reduce the incidence of general credit booms and decrease the probability that booms end up badly. Using specific policies, they find credit and interest controls and open foreign exchange position limits to be significant in most regressions. Consistent with a focus on vulnerabilities, policies reduce the probability of a boom that ends up in a financial crisis or subsequent economic underperformance, i.e., policies reduce the risk of a bust, while simultaneously reducing how the rest of the economy is affected by troubles in the financial system.

Claessens et al. (2013) investigate, using panel GMM regressions, how changes in balance sheets of some 2800 banks in 48 countries over 2000-2010 respond to specific policies. Controlling for endogeneity and country characteristics and macroeconomic policies (by including among others countries' lagged GDP growth and interest rates), they find that

measures aimed at borrowers – LTV and DTI caps, and CG and FC limits – are effective in reducing the growth in bank’s leverage, asset and noncore to core liabilities growth. While countercyclical buffers (such as RR, PRD, and DP) also help mitigate increases in bank leverage and assets, few policies help stop declines in adverse times, consistent with the ex-ante nature of macroprudential tools and the challenges in adjusting policies in times of stress (e.g., how quick and far to allow banks to reduce their capital buffers).

Kuttner and Shim (2013), using data from 57 countries spanning more than three decades, investigate whether nine non-interest rate policy tools, including macroprudential, help in stabilizing house prices and housing credit. Using conventional panel regressions, housing credit growth is significantly affected by changes in the maximum debt-service-to-income (DSTI) ratio, maximum LTVs, limits on exposure to the housing sector, and housing-related taxes. But only the DSTI ratio limit significantly affects housing credit growth when they use mean group and panel event study methods. And, of the policies considered, only a change in housing-related taxes discernible impacts house price appreciation.

Zhang and Zoli (2014) review the use of key macroprudential instruments and capital flow measures in 13 Asian economies and 33 other economies since 2000 and study their effects. Their analysis suggests that measures helped curb housing price growth, equity flows, credit growth, and bank leverage, with loan-to-value ratio caps, housing tax measures, and foreign currency-related measures especially effective.

While suggestive, these studies come with many caveats. Many struggle with identification and endogeneity – e.g., as policies are adopted when the cycle is already up – and other biases, which can only partially be addressed by econometric techniques (such as GMM). Almost all face challenges in controlling for other country characteristics, including the quality of microprudential supervision. Few consider both the use of a policy and its intensity (e.g., the presence of a LTV and its level, whether set high or low) or differentiate by phase of the cycle – e.g., to investigate whether policies help most in mitigating booms or building buffers for busts. Almost all focus on credit and housing developments, and none study risks in capital markets and non-bank financial institutions. And, obviously, not one identifies the specific externalities or market failures policies are supposed to address, but rather mostly analyze manifestations of financial cycles, especially asset prices, that are supposedly of “concern” (e.g., studies are less clear in how LTVs reduce systemic risks, rather than controlling house prices per se).

Nevertheless, both analytical reasoning and existing evidence suggest some basic directions. Higher sectoral capital requirements, such as the CCB and other capital surcharges, by definition can help in increasing resilience by creating additional buffers. Direct measures, such as caps on LTV and DTI ratios, can likely limit mechanisms creating positive feedback between credit growth and asset price inflation. Conversely, such caps can enhance resilience and reduce the risks of fire-sale dynamics.

## **B. Case and Other Studies on Procyclicality and Cross-Sectional Risks**

Country-specific “case” studies investigating the role of macroprudential policies in reducing financial procyclicality often focus on specific risks or market segments, and use micro data.

Jiménez et al. (2012) find for Spain that dynamic provisioning can be useful in taming credit supply cycles, even though it did not suffice to stop the boom (see also Saurina, 2009). More importantly, during bad times, dynamic provisioning helps smooth the downturn, upholding firm credit availability and performance during recessions. Using sectoral data, Igan and Kang (2012) find LTV and DTI limits to moderate mortgage credit growth in Korea. And policies appear to reduce real estate cycles in Hong Kong (Wong, Fong, Li and Choi, 2011).

Some use of macroeconomic tools can be interpreted with a macroprudential perspective. Dassatti Camors and Peydro (2014) investigate the effects of a large and unexpected increase in RR in Uruguay in 2008 using detailed, bank-firm matched data. Their evidence suggests some ambiguous results. On one hand credit growth declines on aggregate, but at the same more risky firms get more credit. They also document that larger and possibly more systemic banks are less affected. There may thus be tradeoffs using RR, since less credit does not necessarily mean less system risks (RR may still be beneficial as macroeconomic tool).

The UK is a case where the use of microprudential tools over the period 1998-2007 has been interpreted with a macroprudential perspective. Aiyar, Calomiris and Wieladek (2013) show that bank-specific higher capital requirements dampened lending by banks, with quite strong aggregate effects: an increase in requirements of 1% reduced bank lending by between 5.7% and 7.6%, a high multiplier.<sup>11</sup> Tighter monetary policy also reduced the supply of lending, but not that of large banks.

A case study analyzing house prices for Israel (IMF, 2014a) shows that macroprudential measures have effects, but only over the six-month period following adoption, with LTVs more effective than DP and CTC. And while policies reduce somewhat transactions, evidence is limited that they contribute to curb house price inflation. Israel also shows that macroprudential policies can create challenges for communication and accountability, even more so when loose monetary policy conditions, proper in their own right, provide opposing forces. And they can have social and political sensitivities, notably when first-time buyers are excluded from the housing markets. Other countries, like Canada and Sweden, have been facing similar challenges, with, in environments of low interest rates, strong increases in house prices and household debt, even though they use some macroprudential policies.

To limit systemic liquidity risks in Korea, a macroprudential stability levy on short-term foreign exchange lending and a core funding ratio were imposed (Shin, 2010). Analysis (IMF, 2012a) suggests that these measures contributed to a shift away from short-term foreign exchange funding, mostly driven by shifts of foreign branches towards longer term

---

<sup>11</sup> This relates to studies on the effects of large shocks to banks on lending (and economic activity). This “credit crunch” literature (see Bernanke and Lown, 1991, for an early review) finds large impact of actual capital shortfalls. The literature on the effects of microprudentially motivated higher capital requirements, including Basel II, however, generally finds limited impacts on lending, essentially only some impact for weaker banks (Claessens 2014 and Thakor 2014 review). The difference in findings likely arises from the nature of the “experiment” – a systemic, adverse shock vs. a (gradual) increase in capital requirements – and that across banks, higher capital ratios are associated with higher lending, liquidity creation, bank values, and probabilities of surviving crises.

funding. This in turn may have made, as Bruno and Shin (2014) show, interbank capital flows less sensitive to global financial conditions compared to other Asian countries. Aregger, Brown and Rossi (2013) find for Switzerland, where taxes vary across cantons, that higher capital gains taxes exacerbate house prices dynamics while transaction taxes have no impact.

Basel III includes a countercyclical buffer, CCB, and BCBS (2010a) has suggested a methodology for setting it, with bodies such as the ESRB (2014) providing further guidance for their regional (EU) jurisdictions. The CCB is loosely calibrated on the probability and cost of systemic crises (see Drehmann and others, 2010). The guidance suggests increasing capital if credit to GDP rises substantially above its trend value, e.g., up to 2.5 percent of risk-weighted assets if the so-called credit-to-GDP gap rise above 10 percentage points, with room for discretion whether and when to invoke (and an ability to impose a higher CCB). Some countries (UK, Switzerland, India, and New Zealand) are implementing the CCB.<sup>12</sup> As its incentive effects are likely limited, its value derives mainly from providing higher buffers in bad times. Questions remain though, notably on what basis to release the CCB when the cycle turns (some favoring adverse developments in asset prices, which are timelier; others in credit markets, which are less subject to interpretation), but also on how to adapt the CCB when credit is a small part of overall financial intermediation (as in the US).

In terms of reducing systemic risk of a *cross-sectional* nature, the BCBS (2013) has agreed on a methodology for the systemic capital surcharges for G-SIBs and D-SIBs and determined (and published) the individual surcharges (from 1% up to 3.5%) for the 29 G-SIFIs identified (FSB, 2013). Some individual countries, such as Austria, Denmark, Singapore, and Sweden, have gone beyond the BIII standards and put in place higher capital requirements for their large domestic banks, and a number of other countries plan to do so as well. And the US has adopted a more stringent leverage requirement for large banks, while Switzerland has additional contingent capital and leverage requirements for its large institutions. No studies exist, however, on the impact and effectiveness of these measures or of the CCB.

Otherwise, work has mostly focused on the identification and measurement of systemic risks due to contagion and other spillovers in interbank and other financial markets (Bisias et al. 2012, and Adrian, Covitz, and Lang, 2013, reviews tools for financial system monitoring, as applied largely to the US; see Arsov et al. 2013 for a more general review). Many central banks, supervisory agencies and international agencies now also supervise their large financial institutions, including insurance corporations, more closely (as the “too big to fail” problem is still prevalent; see further IMF, 2014b, and Laeven, Tong and Ratnovski, 2014). Many also conduct (regular) stress tests, which, inter alia, help to identify those institutions more likely to cause systemic distress.<sup>13</sup> Other relevant efforts underway are new regulations for shadow banking (Adrian and Ashcraft, 2012) and financial infrastructure reforms.

---

<sup>12</sup> Switzerland has set its CCB at 2.5%, but it only applies to mortgage exposures. And the UK has of yet has not invoked it (it is set at 0%).

<sup>13</sup> Experiences with stress tests in identifying such risks have been mixed, with sometimes banks or even whole systems running into subsequent stress. This is in part as financial stability concerns are  
(continued...)

So far, however, these exercises are mainly aimed at supervisory actions – e.g., asking for more capital or winding down of weak institutions – or institutional and structural changes – e.g., greater use of central clearing counterparties. They could though also be linked to the use and intensity of macroprudential tools. Network and interconnection models, and other such cross-sectional tools, for example could help with designing and calibrating tools or infrastructures. So far, however, the mapping between risks and tools (e.g., how to map risk of contagion into preventive measures) seems not clear enough for policy applications. These country case and other studies advance over the cross-country analyses in that they are better at identifying specific channels. At the same time, they come with the caveat that they do not control for, or allow one to explore, the role of different country circumstances and conditions. Being focused on one segment of the financial system, many often do not analyze circumventions and risk transfers to other, possibly less regulated parts. The ideal, analyzing comprehensive micro data for many countries, however, has so far been largely elusive.

### C. Costs and Tradeoffs

By constraining borrowing and hence expenditures in one or more sectors of the economy, macroprudential policies can affect overall output. Conceptually, the transmission of macroprudential policies to financial and real variables could vary across tools (Kashyap, Berner and Goodhart, 2011, provide a model to assess the costs and benefits of various policies). Obvious examples are CTC and RR that may affect overall lending and output, whereas LTV limits have more sectoral impacts. Policies can in principle also affect the overall price setting process (i.e., by making the allocation of resources across sectors less flexible). And these effects may differ not just by tool used but also by the stage of the country's financial or economic cycles.

Actual quantitative effects of policies on the real economy, however, are not well known, in large part because due to a lack of data and experiences. Some papers nevertheless try to assess these impacts. The, necessarily preliminary, empirical analysis finds the short-run effects on overall output to be small, even for broad-based tools, such as capital and liquidity requirements (IMF, 2013b).<sup>14</sup> Moreover, some of the real sector costs can be countered by appropriate variations in monetary policy (unless it itself is constrained). But these findings remain very tentative with work on the relative strength of the effects across tools even more limited (see further CGFS, 2012).

Importantly, as with other “risk”-based policies (e.g., monetary policy which takes actions under uncertainty), macroprudential policies will have to weigh Type I and Type II errors. Analytical frameworks for assessing the associated costs and benefits (as laid out in IMF 2012b, De Nicolò, Gamba and Lucchetta 2012, Blancher et al. 2013; and Arregui and others 2013a, b), while sometimes still basic (e.g., Elliott, 2011), can help to assess tradeoffs of

---

hard to capture in theory and practice – current models and techniques are clearly limited. Of course, in some cases there can also be questions on the governance and the quality of the exercises.

<sup>14</sup> BCBS (2010b) and BCBS-FSB (2011) analyze respectively the structural and transitional costs and benefits of higher capital adequacy requirements and lower risks of systemic crises against foregone growth due to higher financial intermediation costs.

policies in terms of specific parameters (to be estimated or judged) – like the probability of crisis, the loss given a crisis and the cost of a policy decision – and thereby offer some guidance.

## **VI. BROADER LESSONS AND REMAINING ISSUES FOR RESEARCH AND POLICY MAKING**

The recent crisis has led to a reexamination of policies for macroeconomic and financial stability. Part of the evolving thinking involves the adoption of a macroprudential approach, to mitigate boom-bust patterns and systemic risks in financial markets. Many countries, advanced and emerging, have signed on to this new paradigm. Its objectives, conceptual foundations and exact features, however, are still to be determined. I highlight some major knowledge gaps and where practices at times are confused.

On the conceptual side, what the debate, and some of the literature, not always recognizes is that correcting externalities needs to be seen as an intermediate target. Only by adopting policies that control or reduce externalities can one mitigate the market failures that lead to systemic risk. As such, each externality ideally is corrected by a specific tool (of course, tools need not differ by externality and can complement each other; capital surcharges for example may be important in reducing several externalities). Regardless, the start is a clear recognition of the causes for systemic risk. Here much more analytical work on specific externalities arising in financial intermediation is needed. Without this, the danger arises that macroprudential policies are used for general management of business and financial cycles, which introduces distortions, adversely affecting resource allocation, undermines transparency and accountability, and (further) exposes regulators to political pressures.

With actual experiences still limited, evidence on the effectiveness of specific tools is only slowly accumulating and comes with many (economic and econometric) caveats, making it difficult to determine which policies to use and when to tighten or loosen them. Furthermore, while addressing one distortion may reduce some manifestations of risks, it can also worsen overall financial stability. Also tools may not be able to reach some activities that can lead to systemic risks, and tighter regulations create stronger incentives for circumvention, risking vulnerabilities building up outside of the regulatory perimeter and policymakers' sight. Moreover, institutional constraints may impede the optimal deployment of instruments. Cooperation and coordination with microprudential supervisory agencies and international may be legally or institutionally difficult. Furthermore, while more data are being collected (e.g., Financial Soundness Indicators (FSI) and SIFI data by the IMF and BIS respectively),<sup>15</sup> deficiencies in quantity and quality of data can hinder analyses and calibrations (Cerutti, Claessens and McGuire, 2014; Heath, 2013; and Brunnermeier and Krishnamurthy, 2014).

Many of these factors will vary across countries, with developing countries for example likely facing more institutional and data hurdles as well as greater risks of discretionary policy implementations. Overall the best approaches given specific country conditions and characteristics remain thus largely open questions (see Acharya, 2013, and Shin, 2013).

---

<sup>15</sup> The IMF currently collects FSI data from 98 regular reporters (at <http://fsi.imf.org>).

Besides challenges in measuring risks and calibrating tools are political economy pressures and risks. These of course relate in part to limited knowledge – on the effectiveness, costs and distortions of tools, challenge in calibrations, adaptations, perimeter (e.g., shadow banking), interactions among policies and conflict of interests with other goals, and (international) coordination – with rules-based policies thus far off. As such institutional design should allow for sufficient analytical capacity and lessons to be learned. As the recurrence of crises show, however, even with more knowledge (as exists on say microprudential policies), robust policies aimed at financial stability are not easy to implement. Similar to other attempts, macroprudential policies may fall thus short.

This makes an institutional design robust to both ex-ante pressures and ex-post risks all the more important. Design involves the location of the macroprudential policy function, with different models – centralized, inside the central bank or outside it, or using a committee structure – being considered. Each model has various benefits, but also risks (see Nier et al. 2011). Regardless of model, there is a need for transparency and accountability in the conduct of macroprudential policy as well as operational independence. While research has addressed the benefits of independence in the monetary policy function, and identified some modalities for achieving it, sound governance arrangements for the macroprudential policy function (as well as for micro-prudential regulation and supervision) often remain to be adapted (see further IMF, 2013e).

All in all, given these and other limits on current knowledge, one should proceed with some modesty. A “Bayesian” updating approach, where those tools for which impact is well known are used while others are only used as one learns more, may then be attractive, also as it reduces some of the political economy risks (see also Calomiris, 2013). Institutional designs also have to proceed with caution. This more gradual approach does not mean progress. Policy prioritization would help avoid too much discretion, and too little transparency and accountability. And this path could still achieve a key and possible main objective of the new paradigm: a system-wide financial stability view accepted in all aspects of policy making, including microprudential, monetary, fiscal and competition areas. This change in mind-set is needed, and should proceed anyhow. As more data and research come available, one can then further improve the motivations, calibrations, adaptations, and (institutional) designs of macroprudential policies and adopt specific ones.

## References

- Acemoglu, Daron, Asuman Ozdaglar, and Alireza Tahbaz-Salehi, 2013, “Systemic Risk and Stability in Financial Networks,” NBER Working Papers 18727, National Bureau of Economic Research, Inc.
- Acharya, Viral V., 2013. “Adapting Microprudential Regulation for Emerging Markets”, in Otaviano Canuto and Swati R. Ghosh (eds.), *Dealing with the Challenges of Macro Financial Linkages in Emerging Markets*, World Bank, Washington, D.C. pp. 57-89.
- Acharya, Viral V., Marco Pagano and Paolo Volpin, 2013.”Seeking Alpha: Excess Risk Taking and Competition for Managerial Talent,” NBER Working Papers 18891, National Bureau of Economic Research, Inc.
- Acharya, Viral, and Tanju Yorulmazer, 2007, “Too Many to Fail—An Analysis of Time-inconsistency in Bank Closure Policies,” *Journal of Financial Intermediation*, 16(1), pp. 1–31.
- Adam, Klaus and Michael Woodford, 2013, “Housing Prices and Robustly Optimal Monetary Policy,” working paper, June 29, [http://adam.vwl.uni-mannheim.de/fileadmin/user\\_upload/adam/research/AW\\_AssetPrices.pdf](http://adam.vwl.uni-mannheim.de/fileadmin/user_upload/adam/research/AW_AssetPrices.pdf). Adrian,
- Adrian, Tobias and Adam B. Ashcraft, 2012, “Shadow Banking Regulation,” in *Annual Review of Financial Economics*, 4, pp. 99–140 (also FRB of New York Staff Report No. 559).
- Adrian, Tobias and Hyun Song Shin, 2010. “Liquidity and leverage,” *Journal of Financial Intermediation*, Elsevier, 19(3), pp. 418-437.
- \_\_\_\_\_, 2014, “Procyclical Leverage and Value-at-Risk,” *Review of Financial Studies*, 27 (2), pp. 373-403.
- Adrian, Tobias, Daniel Covitz, and Nellie Lang, 2013, “Financial Stability Monitoring,” Staff Reports 601, Federal Reserve Bank of New York, and Finance and Economics Discussion Series 2013-21, Board of Governors of the Federal Reserve System.
- Aiyar, Shekhar, Charles W. Calomiris and Tomasz Wieladek, 2014, “Does Macro-Prudential Regulation Leak? Evidence from a UK Policy Experiment,” *Journal of Money, Credit and Banking*, 46(s1), pp. 181-214, 02.
- \_\_\_\_\_, 2013, “How Does Credit Supply Respond to Monetary Policy and Bank Minimum Capital Requirements?,” mimeo, Columbia University/Bank of England.

- Aiyar, Shekhar, Charles W. Calomiris, John Hooley, Yevgeniya Korniyenko and Tomasz Wieladek, 2014, "The International Transmission of Bank Capital Requirements: Evidence from the UK," *Journal of Financial Economics*, 113, pp.368–382.
- Akerlof, George A., Olivier J. Blanchard, David Romer, and Joseph E. Stiglitz (Editors), 2014, *What Have We Learned?: Macroeconomic Policy after the Crisis*, MIT Press.
- Allen, Franklin, and Elena Carletti, 2011, "Systemic Risk and Macroprudential Regulation," mimeo, University of Pennsylvania.
- Allen, Franklin and Douglas Gale, 1994. "Limited Market Participation and Volatility of Asset Prices," *American Economic Review*, 84(4), pp. 933-55.
- \_\_\_\_\_, 2000, "Financial Contagion," *Journal of Political Economy*, 108 (1), pp. 1-33.
- \_\_\_\_\_, 2004, "Competition and Financial Stability," *Journal of Money, Credit, and Banking*, 36(3) Pt.2, pp. 433-80.
- \_\_\_\_\_, 2007, *Understanding Financial Crises*, Clarendon Lectures in Finance (Oxford, UK: Oxford University Press).
- Allen, Linda and Anthony Saunders, 2003, "A survey of cyclical effects in credit risk measurement models," BIS Working Papers 126, Bank for International Settlements.
- Amato, Jeffery D. and Craig H. Furfine, 2004, "Are credit ratings procyclical?," *Journal of Banking and Finance* 28, pp. 2641- 2677.
- Angelini, Paolo, Andrea Enria, Stefano Neri, Fabio Panetta and Mario Quagliariello, 2010. "Pro-cyclicality of capital regulation: is it a problem? How to fix it?," Occasional Papers 74, Bank of Italy.
- Angelini, Paolo Sergio Nicoletti-Altimari, and Ignazio Visco, 2012, "Macroprudential, Microprudential and Monetary Policies: Conflicts, Complementarities and Trade-Offs," Occasional Papers 140, Bank of Italy.
- Aregger, Nicole, Martin Brown, and Enzo Rossi, 2013, "Transaction Taxes, Capital Gains Taxes and House Prices," Swiss National Bank Working Paper 2013/2.
- Arregui, Nicolas, Jaromir Benes, Ivo Krznar, Srobona Mitra, and Andre Oliveira Santos, 2013a, "Evaluating the Net Benefits of Macroprudential Policy: A Cookbook," IMF Working Paper 13/167.
- Arregui, Nicolas, Jodi Scarlata, Mohamed Norat, and Antonio Pancorbo with Eija Holttinen, Jay Surti, Chris Wilson, Rodolfo Wehrhahn, and Mamoru Yanase, 2013b, "Addressing Risk Concentration and Interconnectedness: Concepts and Experiences," IMF Working Paper 13/199.

Arsov, Ivailo, Elie Canetti, Laura Kodres, and Srobona Mitra, 2013, “Near-Coincident Indicators of Systemic Stress,” IMF Working Paper, 13/115.

Bank of England, 2009, “The Role of Macroprudential Policy,” Discussion Paper, November.

\_\_\_\_\_, 2011, “Instruments of Macroprudential Policy,” Discussion Paper, December

Bank for International Settlements, 2014, 84<sup>th</sup> Annual Report,  
[www.bis.org/publ/arpdf/ar2014e.pdf](http://www.bis.org/publ/arpdf/ar2014e.pdf)

Barberis, N., 2013, “Thirty Years of Prospect Theory in Economics: A Review and Assessment,” *Journal of Economic Perspectives*, 27, pp. 173–96.

Basel Committee on Banking Supervision (BCBS), 2010a, “Countercyclical Capital Buffer Proposal, Consultative Document”, Bank for International Settlements, Basel.

\_\_\_\_\_, 2010b. “An assessment of the long-term economic impact of the new regulatory framework (of stronger capital and liquidity requirements).”  
<http://www.bis.org/publ/bcbs173.pdf>

\_\_\_\_\_, 2010, “Assessing the Macroeconomic Impact of the Transition to Stronger Capital and Liquidity Requirements – Final Report”, December.  
<http://www.bis.org/publ/othp12.pdf>

\_\_\_\_\_, 2011, “Basel III: A Global Regulatory Framework for More Resilient Banks and Banking Systems,” <http://www.bis.org/publ/bcbs189.htm>

Basel Committee on Banking Supervision (BCBS) and Financial Stability Board (FSB), 2013, “Global systemically important banks: updated assessment methodology and the higher loss absorbency requirement,” July, <http://www.bis.org/publ/bcbs255.pdf>

Bean, Charles, Matthias Paustian, Adrian Penalver, and Tim Taylor, 2010, “Monetary Policy after the Fall,” Paper presented at the Federal Reserve Bank of Kansas City Annual Conference, Jackson Hole, Wyoming, August 31–September 1.

Bebchuk, Lucian, and Itay Goldstein, 2011, “Self-Fulfilling Market Freezes,” *Review of Financial Studies*, 24(11), pp. 3519–55.

Beck, Thorsten, 2008, “Bank Competition and Financial Stability: Friends or Foes,” World Bank Policy Research Working Paper 4656.

Benes, Jaromir, Michael Kumhof and Douglas Laxton, 2014a., Financial Crises in DSGE Models: Selected Applications of MAPMOD. IMF Working Paper WP/14/56.

- Benes, Jaromir, Michael Kumhof and Douglas Laxton, 2014b., Financial Crises in DSGE Models: A Prototype Model. IMF Working Paper WP/14/57.
- Bernanke, Ben, and Cara S. Lown, 1991, "The Credit Crunch," *Brookings Papers on Economic Activity*, 1991:2, 205–39.
- Bernanke, Ben, and Mark Gertler, 2001, "Should Central Banks Respond to Movements in Asset Prices?" *American Economic Review*, 91, 253–57.
- Bianchi, Javier, 2010, "Credit Externalities: Macroeconomic Effects and Policy Implications," *American Economic Review*, 100, 2, 398-402.
- Bisias, Dimitrios, Mark D. Flood, Andrew Lo, and Stavros Valavanis, 2012, "A Survey of Systemic Risk Analytics." U.S. Department of Treasury, Office of Financial Research 0001. Also *Annual Review of Financial Economics*, 4: 255-296.
- Blancher, Nicolas, Srobona Mitra, Hanan Morsy, Akira Otani, Tiago Severo, and Laura Valderrama, 2013, "Macroprudential Policy: A Practical Approach to Systemic Risk Monitoring," 13/168.
- Borio, Claudio E.V., 2003, "Towards a Macroprudential Framework for Financial Supervision and Regulation?" BIS Working Paper 128 (Switzerland: Bank of International Settlements).
- Borio, Claudio E.V. and William R. White, 2003. "Whither Monetary and Financial Stability: the Implications of Evolving Policy Regimes?," in *Monetary Policy and Uncertainty: Adapting to a Changing Economy*, Conference Volume, Federal Reserve Bank of Kansas City.
- Brunnermeier, Markus K, Thomas Eisenbach, and Yuliy Sannikov. 2013. "Macroeconomics with Financial Frictions: A Survey". *Advances in Economics and Econometrics*, Tenth World Congress of the Econometric Society. New York: Cambridge University Press.
- Brunnermeier, Markus K., Charles Goodhart, Andrew Crocket, Avinash Persaud, and Hyun Shin, 2009, *The Fundamental Principles of Financial Regulation: 11th Geneva Report on the World Economy*. CEPR/ICMB.
- Brunnermeier, Markus K. and Arvind Krishnamurthy (Editors), 2014, *Systemic Risk and Macro Modeling*, NBER/University of Chicago Press.
- Brunnermeier, Markus K., and Yuliy Sannikov, 2014, "A Macroeconomic Model with a Financial Sector," *American Economic Review*, 104, 379-421.
- Bruno, Valentina, and Hyun Song Shin, 2014, "Assessing Macroprudential Policies: Case of South Korea," *Scandinavian Journal of Economics*, 116 (1), pp. 128-157.

- Caballero, Ricardo, and Arvind Krishnamurthy, 2003, "Excessive Dollar Debt: Financial Development and Underinsurance," *Journal of Finance*, 58(2), pp. 867–94.
- \_\_\_\_\_, 2004, "Smoothing Sudden Stops," *Journal of Economic Theory*, 119(1), pp. 104–27.
- Calomiris, Charles W., 2013. "Managing the risks of the new macro-prudential policy regime," *Borsa Istanbul Review*, Research Department of Borsa Istanbul, 13(4), pp. 65-66.
- Carlstrom, Charles, and Timothy Fuerst, 2010, "Optimal Monetary Policy in a Model with Agency Costs," *Journal of Money, Credit and Banking*, 42, pp. 37–70.
- Cerutti E, Claessens S, Laeven, L. 2014. Macroprudential Policies. IMF Working Paper, forthcoming.
- Cerutti, Eugenio, Stijn Claessens and Patrick McGuire, 2014, "Systemic Risk in Global Banking: What Available Data Can Tell Us and What More Data are Needed?" in *Systemic Risk and Macro Modeling*, Markus K. Brunnermeier and Arvind Krishnamurthy (Editors), NBER/University of Chicago Press
- Cerutti, Eugenio, Stijn Claessens and Lev Ratnovski, 2014, "Global Liquidity and Drivers of Cross-border Bank Flows," IMF working Paper, 14/69.
- Claessens, Stijn, 2014, "Capital and Liquidity Requirements: A Review of the Issues and Literature," Paper for the Yale University Conference September 20 2013, forthcoming in Volume of *Yale Journal on Regulation*.
- Claessens, Stijn, Douglas D. Evanoff, George G. Kaufman, and Laura Kodres, 2011, *Macro-prudential Regulatory Policies: The New Road to Financial Stability*. (Editors.), World Scientific Studies in International Economics, Pte. Ltd, New Jersey.
- Claessens, Stijn, Swati Ghosh, and Roxana Mihet, 2013, "Macro-Prudential Policies to Mitigate Financial System Vulnerabilities," *Journal of International Money and Finance*, 39:153–185.
- Claessens, Stijn and Laura Kodres, 2014, "The Regulatory Responses to the Global Financial Crisis: Some Uncomfortable Questions," IMF working Paper, 14/46, forthcoming in a book edited by Edward Balleisen, Lori Benneer, Kim Krawiec, and Jonathan Wiener.
- Claessens, Stijn, Zoltan Pozsar, Lev Ratnovski, and Manmohan Singh, 2012, "Shadow Banking: Economics and Policy," IMF Staff Discussion Note 12/12.
- Clement, Piet, 2010, "The term "macroprudential:" origins and evolution," BIS Quarterly Review, March, [http://www.bis.org/publ/qtrpdf/r\\_qt1003h.pdf](http://www.bis.org/publ/qtrpdf/r_qt1003h.pdf)

- Committee on the Global Financial System (CGFS), 2010, “Macroprudential Instruments and Frameworks: A Stocktaking of Issues and Experiences,” CGFS Papers 38 (Basel: Bank for International Settlement).
- \_\_\_\_\_, 2012, “Operationalising the Selection and Application of Macroprudential Instruments,” CGFS Papers 48 (Basel: Bank for International Settlement).
- Cordella, Tito, Pablo Federico, Carlos Vegh, and Guillermo Vuletin, 2014, “Reserve Requirements in the Brave New Macroprudential World.” World Bank Policy Research Working Paper No. 6793.
- Crockett, Andrew, 2000, “Marrying the Micro- and Macroprudential Dimensions of Financial Stability,” BIS Speeches, 21 September (Bank of International Settlements).
- Crowe, Christopher W., Deniz Igan, Giovanni Dell’Ariccia, and Pau Rabanal, 2011, “How to Deal with Real Estate Booms,” IMF Staff Discussion Note 11/02.
- Curdia, Vasco, and Michael Woodford, 2009, “Credit Frictions and Optimal Monetary Policy,” Bank for International Settlements Working Paper 278.
- Dassatti Camors, Cecilia and Jose-Luis Peydro, 2014, “Macroprudential and Monetary Policy: Loan-Level Evidence from Reserve Requirements,” mimeo, Universitat Pompeu Fabra, Spain.
- De Nicolò, Gianni, Giovanni Favara, and Lev Ratnovski, 2012, “Externalities and Macroprudential Policy”. IMF Staff Discussion Notes, No.12/05.
- De Nicolò, Gianni, Andrea Gamba and Marcella Lucchetta, 2012, “Capital Regulation, Liquidity Requirements and Taxation in a Dynamic Model of Banking”, IMF Working Paper 12/72.
- Dell’Ariccia, Giovanni, Deniz Igan, Luc Laeven, and Hui Tong, with Bas Bakker and Jerome Vandenbussche, 2012, “Policies for Macrofinancial Stability: How to Deal with Credit Booms,” IMF Staff Discussion Note 12/06.
- Dell’Ariccia, Giovanni, and Robert Marquez, 2006, “Lending Booms and Lending Standards,” *Journal of Finance*, 61(5), pp. 2511-2546.
- Dell’Ariccia, Giovanni, and Robert Marquez, 2013. "Interest Rates and the Bank Risk-Taking Channel," *Annual Review of Financial Economics*, 5(1), pp. 123-141, November.
- Demirgüç-Kunt, Asli, and Enrica Detragiache. 2002, “Does Deposit Insurance Increase Banking System Stability? An Empirical Investigation,” *Journal of Monetary Economics*, 49(7).

- Demirgüç-Kunt, Asli, Ed Kane and Luc Laeven. 2008, *Deposit Insurance around the World: Issues of Design and Implementation*, Cambridge, MA: MIT Press.
- Diamond, Douglas W., and Raghuram G. Rajan, 2011, “Fear of Fire Sales, Illiquidity Seeking, and the Credit Freezes,” *Quarterly Journal of Economics*, 126(2), 557–91.
- Drehmann, Mathias, Claudio Borio, Leonardo Gambacorta, Gabriel Jiménez, and Carlos Trucharte, 2010, “Countercyclical Capital Buffers: Exploring Options,” BIS Working Papers 298.
- Drehmann, Mathias, and Nikola Tarashev, 2011. “Measuring the systemic importance of interconnected banks,” BIS Working Papers 342, Bank for International Settlements.
- Elliott, Douglas J., 2011, “Choosing among Macroprudential Tools,” The Brookings Institution, June 2011.
- Elliott, Douglas J., Greg Feldberg, and Andreas Lehnert, 2013, “The History of Cyclical Macroprudential Policy in the United States,” Office of Financial Research Working Paper No. 8 (Washington: U.S. Department of the Treasury).
- Ellul, Andrew, Chotibhak Jotikasthira, Christian T. Lundblad, and Yihui Wang, 2013, “Mark-to-Market Accounting and Systemic Risk in the Financial Sector,” Fordham University Schools of Business Research Papers, 17 May, available at [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2266247](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2266247)
- European Central Bank, 2012, “Report on the first two years of the macro-prudential research network,” October, [www.ecb.europa.eu/pub/](http://www.ecb.europa.eu/pub/)
- European Systemic Risk Board, Heads of Research, 2014, “Report on The Macro-Prudential Research Network (MARS),” June, at [https://www.ecb.europa.eu/home/html/researcher\\_mars.en.html](https://www.ecb.europa.eu/home/html/researcher_mars.en.html)
- Farhi, Emmanuel, and Jean Tirole, 2012, “Collective Moral Hazard, Maturity Mismatch, and Systemic Bailouts,” *American Economic Review*, 102(1): pp. 60-93.
- Farhi, Emmanuel and Iván Werning, 2013, “A Theory of Macroprudential Policies in the Presence of Nominal Rigidities,” NBER Working Papers 19313, National Bureau of Economic Research, Inc.
- Financial Stability Board (FSB), 2013, “Update of group of global systemically important banks (G-SIBs),” [http://www.financialstabilityboard.org/publications/r\\_131111.htm](http://www.financialstabilityboard.org/publications/r_131111.htm)
- \_\_\_\_\_, 2014, “Report to G20 Leaders on financial regulatory reform progress, and Overview of Progress in the Implementation of the G20 Recommendations for Strengthening Financial Stability,” Basel

- Forbes, Kristin, Marcel Fratzscher, Thomas Kostka and Roland Straub, 2012. “Bubble Thy Neighbor: Portfolio Effects and Externalities from Capital Controls,” NBER Working Papers 18052, National Bureau of Economic Research, Inc.
- Freixas, Xavier, Luc Laeven, and José-Luis Peydró, forthcoming, *Systemic Risk, Crises, And Macroprudential Regulation*, MIT Press.
- Gaia, Prasanna, Andrew Haldane, Sujit Kapadiab, 2011, “Complexity, concentration and contagion,” *Journal of Monetary Economics*, Vol. 58, Issue 5, July, pp. 453–470.
- Galati, Gabriele and Richhild Moessner, 2011, “Macroprudential policy - a literature review,” BIS Working Papers 337, Bank for International Settlements.
- \_\_\_\_\_, 2014, “What do we know about the effects financial macro-prudential policy?,” De Nederlandsche Bank Working Papers 440.
- Gennaioli, Nicola, Andrei Shleifer and Robert W. Vishny, 2013, “A model of shadow banking,” *Journal of Finance*, 68(4), pp. 1331-1363.
- Goldstein, Itay, Emre Ozdenoren and Kathy Yuan, 2013, “Trading Frenzies and Their Impact on Real Investment,” *Journal of Financial Economics*, 109(2), pp. 566-582.
- Gorton, Gary B. and Ping He, 2008. “Bank Credit Cycles,” *Review of Economic Studies*, 75(4), pp. 1181-1214.
- Hahm, Joon-Ho, Frederic S. Mishkin, Hyun Song Shin, and Kwanho Shin, 2011, “Macroprudential Policies in Open Emerging Economies,” *Proceedings*, Federal Reserve Bank of San Francisco, Nov, pp. 63-114.
- Hahm, Joon-Ho, Hyun Song Shin, and Kwanho Shin. 2013, “Noncore Bank Liabilities and Financial Vulnerability,” *Journal of Money, Credit and Banking*, 45(S1), pp. 3-36.
- Hanson, Samuel, Anil Kayshap, and Jeremy Stein, 2011, “A Macroprudential Approach to Financial Regulation,” *Journal of Economic Perspective*, 25(1), pp. 3–28.
- Heath, Robert, 2013, “Why are the G-20 Data Gaps Initiative and the SDDS Plus Relevant for Financial Stability?” IMF Working Paper 13/6.
- Igan, Deniz, and Heedon Kang, 2011, “Do Loan-to-Value and Debt-to-Income Limits Work? Evidence from Korea,” IMF Working paper 11/297.
- International Association of Insurance Supervisors (IAIS), 2013, “Macroprudential Policy and Surveillance in Insurance”, Macroprudential Surveillance and Policy Subcommittee (MPSSC), 18 July (Basel: International Association of Insurance Supervisors), at [http://www.iaisweb.org/view/element\\_href.cfm?src=1/19149.pdf](http://www.iaisweb.org/view/element_href.cfm?src=1/19149.pdf).

- International Monetary Fund, 2010, “A Fair and Substantial Contribution by the Financial Sector: Report to the G20,” <http://www.imf.org/external/np/g20/pdf/062710b.pdf>
- , 2011a, “Housing Finance and Financial Stability—Back to Basics?” <https://www.imf.org/external/pubs/ft/gfsr/2011/01/pdf/chap3.pdf>
- , 2011b, “Macroprudential Policy: An Organizing Framework,” <https://www.imf.org/external/np/pp/eng/2011/031411.pdf>
- , 2012a, “Korea: 2012 Article IV Consultation Staff Report,” September, <http://www.imf.org/external/pubs/ft/scr/2012/cr12275.pdf>
- , 2012b, “Toward Operationalizing Macroprudential Policies: When to Act?” Chapter 3 in *Global Financial Stability Report*, September. <https://www.imf.org/external/pubs/ft/gfsr/2011/02/pdf/ch3.pdf>
- , 2012c, “The Liberalization and Management of Capital Flows—An Institutional View, November. <http://www.imf.org/external/np/pp/eng/2012/111412.pdf>
- , 2013a, “The Interaction of Monetary and Macroprudential Policies,” IMF Policy Paper, January. <http://www.imf.org/external/np/pp/eng/2013/012913.pdf>
- , 2013b, “The Interaction of Monetary and Macroprudential Policies—Background Paper,” IMF Policy Paper, January, <https://www.imf.org/external/np/pp/eng/2013/012713.pdf>
- , 2013c, “Key Aspects of Macroprudential Policy,” IMF Policy Paper, June. <http://www.imf.org/external/np/pp/eng/2013/061013b.pdf>
- , 2013d, “Key Aspects of Macroprudential Policy—Background Paper,” IMF Policy Paper, June. <http://www.imf.org/external/np/pp/eng/2013/061013c.pdf>
- , 2013e, “Implementing Macroprudential Policy—Selected Legal Issues,” <http://www.imf.org/external/np/pp/eng/2013/061713.pdf>
- , 2014a, “Selected Issues paper on Israel,” February. IMF Country Report 14/48.
- , 2014b, “How Big is the Implicit Subsidy for Banks Seen as Too-Important-to-Fail” *Global Financial Stability Report*, Chapter 3, *World Economic and Financial Surveys*, April.
- Jeanne, Olivier, 2014, “Macroprudential Policies in a Global Perspective” NBER Working Paper No. 19967.
- Jeanne, Olivier and Anton Korinek, 2010, “Excessive Volatility in Capital Flows: A Pigouvian Taxation Approach,” *American Economic Review* 100(2), pp. 403-407.

- \_\_\_\_\_, 2013, “Macroprudential Regulation Versus Mopping Up After the Crash,” NBER Working Paper 18675, December.
- \_\_\_\_\_, 2014, “Macroprudential Policy Beyond Banking Regulation,” *Banque de France Financial Stability Review*, 18, pp. 163-172.
- Jiménez, Gabriel, Steven R. G. Ongena, Jose-Luis Peydro, and Jesus Saurina Salas, 2012, “Macroprudential Policy, Countercyclical Bank Capital Buffers and Credit Supply: Evidence from the Spanish Dynamic Provisioning Experiments,” European Banking Center Discussion Paper 2012-011.
- Kannan, Prakash, Pau Rabanal, and Alasdair Scott, 2009, “Monetary and Macroprudential Policy Rules in a Model with House Price Booms,” IMF Working Paper 09/251.
- Kashyap, Anil, Richard Berner and Charles A. E. Goodhart, 2011, “The Macroprudential Toolkit,” *IMF Economic Review* 59(2), pp. 145-161.
- Keen, Michael, and Ruud De Mooij, 2012, “Debt, Taxes and Banks,” IMF Working Paper 12/48.
- Kocherlakota, Narayana, 2013, “Too-Big-to-Fail: The Role of Metrics,” Remarks at the Quantifying the “Too Big to Fail” Subsidy Workshop, Federal Reserve Bank of Minneapolis, Minneapolis, Minnesota, November 18, 2013
- Korinek, Anton, 2011, “Foreign Currency Debt, Risk Premia and Macroeconomic Volatility,” *European Economic Review*, 55, 3. pp. 371–85.
- \_\_\_\_\_, 2014, “Global Coordination or Currency Wars?” (unpublished; Baltimore, Maryland: Johns Hopkins University).
- Korinek, Anton and Damiano Sandri, 2014, “Macroprudential Regulation or Capital Controls?,” mimeo, Johns Hopkins University and International Monetary Fund.
- Korinek, Anton and Alp Simsek, 2014, “Liquidity Trap and Excessive Leverage,” NBER Working Papers 19970, National Bureau of Economic Research, Inc. and IMF Working Paper 14/129.
- Kuttner, Kenneth N. and Ilhyock Shim, 2013, “Can non-interest rate policies stabilise housing markets? Evidence from a panel of 57 economies,” BIS Working Papers No 433.
- Laeven, Luc, Lev Ratnovski and Hui Tong, 2014, “Bank Size and Systemic Risk,” Staff Discussion Notes 14/4, IMF, Washington, D.C.
- Leuz, Christian and Christian Laux, 2010, "Did Fair-Value Accounting Contribute to the Financial Crisis?," *Journal of Economic Perspectives*, 24(1): 93-118.

- Lim, Cheng H., Francesco Columba, Alejo Costa, Piyabha Kongsamut, Akira Otani, Mustafa Saiyid, Torsten Wezel, Xiaoyong Wu, 2011, "Macroprudential Policy: What Instruments and How Are They Used? Lessons from Country Experiences", IMF Working Paper 11/238.
- Lorenzoni, Guido, 2008, "Inefficient Credit Booms," *Review of Economic Studies*, 75(3), 809–33.
- Manconi, Alberto, Massimo Massa, and Ayako Yasuda, 2012, "The Role of Institutional Investors in Propagating the Crisis 2007-2008", *Journal of Financial Economics*, Vol. 104, No. 3, pp. 491-518.
- Merrill, Craig B., Taylor D. Nadauld, René M. Stulz, and Shane Sherland, 2012, "Did Capital Requirements and Fair Value Accounting Spark Fire Sales in Distressed Mortgage-Backed Securities?," NBER Working Paper No. 18270.
- Mooij, Ruud A. de, 2011, "Tax Biases to Debt Finance: Assessing the Problem, Finding Solutions," IMF Staff Discussion Note 11/11.
- Osiński, Jacek, Katharine Seal, and Lex Hoogduin, 2013, "Macroprudential and Microprudential Policies: Towards Cohabitation", IMF Staff Discussion Note 13/05.
- Ostry, Jonathan David, Atish R. Ghosh, Karl Friedrich Habermeier, Luc Laeven, Marcos Chamon, Mahvash Saeed Qureshi, and Annamaria Kokenyne, 2011, "Managing Capital Inflows: What Tools to Use?" IMF Staff Discussion Note 11/06.
- Ostry, Jonathan D., Atish R. Ghosh, and Anton Korinek, 2012, "Multilateral Aspects of Managing the Capital Account," IMF Staff Discussion Note 12/10.
- Ostry, Jonathan D., and Atish R. Gosh, 2013. "Obstacles to International Policy Coordination, and How to Overcome Them," IMF Staff Discussion Note 13/11.
- Perotti, Enrico, and Javier Suarez, 2011, "A Pigouvian Approach to Liquidity Regulation," *International Journal of Central Banking*, 7(4), 3–41.
- Quint, Dominic and Pau Rabanal, 2013, "Monetary and Macroprudential Policy in an Estimated DSGE Model of the Euro Area," IMF Working Paper 13/209.
- Rajan, Raghuram G, 1994, "Why Bank Credit Policies Fluctuate: A Theory and Some Evidence," *The Quarterly Journal of Economics*, 109(2), pp. 399–441.
- Rajan, Raghuram G, and Rodney Ramcharan, 2014, "Financial Fire Sales: Evidence from Bank Failures," Finance and Economics Discussion Series, 2014-67, Federal Reserve Board.

- Ratnovski, Lev, 2009, "Bank Liquidity Regulation and the Lender of Last Resort," *Journal of Financial Intermediation*, 18(4), pp. 541–88.
- \_\_\_\_\_, 2013, "Competition Policy for Modern Banks," IMF Working Paper 13/126.
- Repullo, Rafael, and Javier Suarez, 2013, "The Procyclical Effects of Bank Capital Regulation," *Review of Financial Studies* 26(2): pp. 452-490.
- Rey, Hélène, 2013, "Dilemma not Trilemma: The Global Financial Cycle and Monetary Policy Independence," paper presented at the Jackson Hole Symposium, August.
- Ruckes, Martin, 2004, "Bank Competition and Credit Standards," *Review of Financial Studies*, 17(4), pp. 1073–102.
- Saurina, Jesus, 2009, "Dynamic Provisioning. The Experience of Spain," *Crisis Response*, Note Number 7 (Washington: The World Bank).
- Schmitt-Grohe, Stephanie and Martin Uribe, 2012, "Prudential Policy for Pegggers," NBER Working Papers 18031, National Bureau of Economic Research, Inc.
- Schoenmaker, Dirk, and Peter J. Wierts, 2011, "Macroprudential Policy: The Need for a Coherent Policy Framework," DSF Policy Paper 13 (Amsterdam, The Netherlands: Duisenberg School of Finance).
- Shin, Hyun Song, 2010, "Non-Core Liabilities Tax as a Tool for Prudential Regulation," Mimeo. <http://www.princeton.edu/~hsshin/www/NonCoreLiabilitiesTax.pdf>
- \_\_\_\_\_, 2012, "Global Banking Glut and Loan Risk Premium," *IMF Economic Review*, 60(2), pp. 155-192.
- \_\_\_\_\_, 2013, "Adapting Macroprudential Approaches to Emerging and Developing Economies," in Otaviano Canuto and Swati R. Ghosh (eds.), *Dealing with the Challenges of Macro Financial Linkages in Emerging Markets*, World Bank, Washington, D.C., pp. 17-55.
- Shleifer, Andrei, 2000, *Clarendon Lectures: Inefficient Markets*, Oxford University Press.
- Shleifer, Andrei, and Robert W. Vishny, 1992, "Liquidation Values and Debt Capacity: A Market Equilibrium Approach," *Journal of Finance*, 47:4, pp. 1343–66.
- Stein, Jeremy C., 2012, "Monetary Policy as Financial-Stability Regulation," *Quarterly Journal of Economics*, 127(1), pp. 57–95.
- \_\_\_\_\_, 2013, "Overheating in Credit Markets: Origins, Measurement and Policy Responses," Remarks at a Research Symposium sponsored by the Federal Reserve Bank of St. Louis, February 7.

- Strahan, Philip, 2013, “Too Big To Fail: Causes, Consequences, and Policy Responses,” *Annual Review of Financial Economics*, 5:pp. 43-61.
- Thakor, Anjan V., 2014, “Bank Capital and Financial Stability: An Economic Tradeoff or a Faustian Bargain,” *Annual Review of Financial Economics*, 6, December.
- Ueda, Kenichi, and Beatrice Weder di Mauro, 2012, “Quantifying the Value of the Subsidy for Systemically Important Financial Institutions,” IMF Working Paper 12/128.
- Van den Noord, Peter, 2005, “Tax Incentives and House Price Volatility in the Euro Area: Theory and Evidence,” *Economie Internationale* 101, pp. 29-45.
- Vandenbussche, Jérôme, Ursula Vogel, and Enrica Detragiache, 2012, “Macroprudential Policies and Housing Prices—A New Database and Empirical Evidence for Central, Eastern, and Southeastern Europe,” IMF Working Paper 12/303.
- Wagner, Wolf, 2011, “Systemic Liquidation Risk and the Diversity–Diversification Trade-Off,” *Journal of Finance*, 66(4), pp. 1141–75.
- White, William R., 2006, “Procyclicality in the financial system: do we need a new macrofinancial stabilisation framework?,” BIS Working Papers, no 193, January.
- Wong, Eric, Tom Fong, Ka-fai Li and Henry Choi, 2011, “Loan-to-Value Ratio as a Macroprudential Tools—Hong-Kong’s Experience and Cross-Country Evidence,” HKMA Working Paper, 01/2011 (Hong Kong: Hong Kong Monetary Authority).
- Yellen, Janet, 2014, “Monetary policy and financial stability,” Michel Camdessus Central Banking Lecture at the IMF in Washington, DC, July 2, at [www.federalreserve.gov/newsevents/speech/yellen20140702a.htm](http://www.federalreserve.gov/newsevents/speech/yellen20140702a.htm)
- Zhang, Longmei and Edda Zoli, 2014, “Leaning Against the Wind: Macroprudential Policy in Asia,” IMF Working Paper 14/22.

**Table 1. The Macroprudential Toolkit**

	Policy Tool				
	Restrictions related to borrower, instrument, or activity	Restrictions on financial sector balance sheet (assets, liabilities)	Capital requirements, provisioning, surcharges	Taxation, levies	Other (including institutional infrastructure)
<b>Expansionary phase</b>	Time varying caps/limits/rules on: - DTI, LTI, LTV  - margins, hair-cuts - lending to sectors - credit growth	Time varying caps/limits on: - mismatches (FX, interest rate)  - reserve requirements	Countercyclical capital requirements, leverage restrictions, general (dynamic) provisioning	Levy/tax on specific assets and/or liabilities	- Accounting (e.g., varying rules on mark to market)  - Changes to compensation, market discipline, governance
<b>Contractionary phase: fire-sales, credit crunch</b>	Adjustment to specific loan-loss provisioning, margins or hair-cuts (e.g., through the cycle, dynamic)	Liquidity limits (e.g., Net Stable Funding Ratio, Liquidity Coverage Ratio)	Countercyclical capital requirements, general (dynamic) provisioning	Levy/tax (e.g., on non-core liabilities)	- Standardized products - OTC vs. on exchange - Safety net (Central Bank/Treasury liquidity, fiscal support)
<b>Contagion, or shock propagation from SIFIs or networks</b>	Varying restrictions on asset composition, activities (e.g., Volcker, Vickers)	Institution-specific limits on (bilateral) financial exposures, other balance sheet measures	Capital surcharges linked to systemic risk	Tax/levy varying by externality (size, network)	- Institutional infrastructure (e.g., CCPs)  - Resolution (e.g., living wills)  - Varying information, disclosure
		Enhancing resilience			
		Dampening the cycle			
		Dispelling gestation of cycle			

Source: Claessens, Ghosh and Mihet, 2013.

**Table 2. Overall Use of Macroprudential Instruments**

Type of Instrument	Total Countries	Frequency of Use	Emerging Markets	Advanced Countries	Frequency of EMs-year	Frequency of ACs-year
	(1)	(2)	(3)	(4)	(5)	(6)
LTV	24	28%	13	11	20%	55%
DTI	23	24%	16	7	25%	20%
CG	6	9%	6	0	12%	0%
FC	15	14%	12	3	14%	15%
RR	10	15%	10	0	20%	0%
DP	7	8%	6	1	7%	9%
CTC	5	2%	2	3	2%	2%
<b>Total by classification</b>	<b>42</b>	<b>100%</b>	<b>28</b>	<b>14</b>	<b>100%</b>	<b>100%</b>

Notes: Countries are classified into advanced versus emerging countries (source: IMF World Economic Outlook, April 2014). The frequency of use is the ratio of country-year pairs using a particular instrument to the total number of country-year pairs using a macroprudential policy (e.g., countries used LTV ratio limits 28% of the time during 2000-2013, compared to DTI ceilings 24% of the time).

Source: IMF Survey as reported in Cerutti et al 2014.