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Macroprudential policies: how to mitigate risk in the financial system

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Table of contents

Introduction	2
Abstract	4
1. Major financial and economic crises from 1929	5
1.1. The Great Depression of 1929	5
1.2. The Great Recession of 2007-2008	9
1.3. Impact of monetary policy and policy lessons	13
2. Reducing risk in the financial system	16
2.1. Systemic risk	16
2.2. Policy options to avoid real estate bubbles	19
2.2.1. Fiscal tools	20
2.2.2. Monetary policy	22
2.2.3. Macroprudential regulation	23
2.3. How monetary and macroprudential policies interact	31
2.3.1. How monetary policy can affect financial stability	32
2.3.2. How macroprudential policies can affect output and prices	34
3. Evidence on the effectiveness of macroprudential policies	36
3.1. Who mostly use macroprudential policies?	36
3.2. Empirical evidence	37
3.3. Empirical evidence in Asia	40
3.4. A model with house price booms	42
Conclusion	45
References	46
Appendix	50

Introduction

History has shown how dangerous financial crises can be on the real economy. In particular, the Great Depression of 1929 and the global crisis of 2007-2008 have shown how speculative bubbles can destabilise the financial system and, in turn, the whole economic system. Notwithstanding, the most important elements of such events are often not the events themselves, but rather how and in which context they occur. For instance, financial imbalances are amplified if they arise in economies with a fragile banking system and in which systemic risk is high. The recent global crisis has particularly stressed how fundamental monitoring systemic risk and the financial system as a whole is.

As a result, macroprudential policies have taken hold, even though these policies have firstly been implemented even before the 2007-2008 crisis. The objective of macroprudential policies is reducing systemic risk, making the banking system and the entire financial system more resilient to different shocks and to the consequent build-up of imbalances. This would help to avoid financial crises and externalities to the real economy.

Considering the importance of avoiding financial crises, this work is focussed on how macroprudential policies, which are relatively new compared to other policies, can be used to reduce risk in the financial system. In particular, such policies are presented as ways to avoid real estate bubbles, as historically such bubbles often led to crises. Although, macroprudential policies can have a broad application, not only focused on avoiding housing bubbles.

Most pivotal works on macroprudential policies are published by the International Monetary Fund. Lim et al. (2011a) wrote an interesting paper which not only assesses the effectiveness of macroprudential measures, basing on country experiences but also presents several aspects related to macroprudential policies. For instance, it shows how instruments are applied and for which reasons. Cerutti et al. (2015) made a cross-country study whose objective is to assess the effectiveness of a set of macroprudential tools in a group of countries as broad as possible. Other important studies are those that deal with macroprudential policies along with other sets of policies. For instance, Crowe et al. (2011) showed how to deal with real estate bubbles, presenting macroprudential policies as a potential set of tools. The International Monetary Fund (2013) and Nier and Kang (2016) deeply explained how monetary and macroprudential policies interact.

In the first chapter of this work, there is a brief description of the 1929 and 2007-2008 crises which helps to grasp how macroprudential policies may be useful to avoid such crises. In the second chapter, the concept of systemic risk is introduced. Subsequently, several policies to

reduce systemic risk and avoid real estate bubbles are suggested. Notwithstanding, the focus is on macroprudential tools; thus, the primary objectives of such measures and other aspects are also presented. A description of how monetary and macroprudential policies interact is presented as well. The third chapter reports some empirical evidence on the effectiveness of macroprudential instruments.

Abstract

Come evitare crisi finanziarie è tuttora un argomento molto dibattuto. Storicamente, le crisi finanziarie si sono rivelate essere eventi particolarmente difficili da gestire e scongiurare. La recente crisi finanziaria scoppiata nel 2007-2008 ha sottolineato l'importanza di tenere sotto controllo il rischio sistemico tipico dei mercati finanziari. Inoltre, tale crisi rappresenta un fulgido esempio di quanto possa destabilizzare l'intera economia mondiale lo scoppio di una bolla immobiliare in un sistema finanziario fortemente interconnesso come quello moderno.

È proprio in questo contesto che l'importanza delle cosiddette politiche macroprudenziali sembra non poter far altro che crescere. Tali politiche agiscono su diversi fattori, come ad esempio il rapporto loan-to-value e le riserve di capitale, e il loro scopo è quello di promuovere la stabilità finanziaria riducendo il rischio sistemico sia nella dimensione temporale che in quella trasversale.

Le politiche macroprudenziali possono essere utili proprio per evitare la formazione, o ridurre l'impatto e la pericolosità, di bolle immobiliari, stimolando l'economia nelle fasi di recessione. Le politiche macroprudenziali presentano diversi vantaggi quando messe a confronto con politiche che possono essere considerate più tradizionali come quella fiscale e monetaria. Tuttavia, non ci sono solo vantaggi ma anche potenziali difficoltà nell'effettiva implementazione di queste politiche.

Lo scopo di questo elaborato è quello di presentare le politiche macroprudenziali nel loro insieme, alcune questioni ad esse legate e, focalizzandosi sulle bolle immobiliari, le loro potenzialità. Oltre allo studio delle politiche macroprudenziali, questo elaborato fornisce una breve disamina di come anche la politica fiscale e monetaria possano essere utili per evitare tali eventi. Sempre in questa sede, vengono analizzati i principali canali attraverso cui la politica monetaria e quella macroprudenziale interagiscono tra loro. Il lavoro si conclude con una disamina della letteratura empirica riguardante l'efficacia delle politiche macroprudenziali.

Nell'insieme, i risultati sono incoraggianti e gli strumenti macroprudenziali sembrano essere dei validi complementi alle politiche più tradizionali nel mantenimento della stabilità finanziaria.

1. Major financial and economic crises from 1929

In this section, I will go through two of the most relevant financial and economic crises of the recent economic history. Particularly, I will underline what caused those crises, in order to get an idea of how to prevent banking crises and speculative bubbles in the future. Indeed, such elements have often played a crucial role in economic crises, especially in those highlighted below.

1.1 The Great Depression of 1929

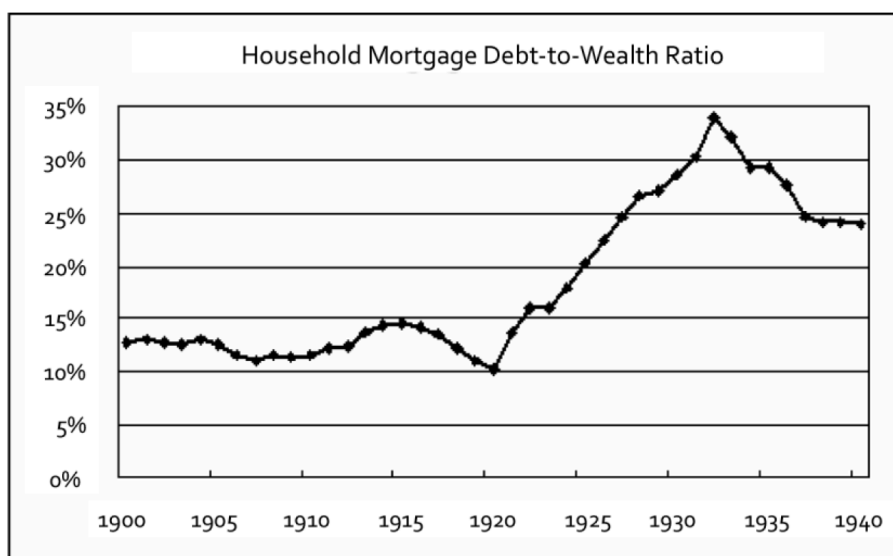
The Great Depression started in the US right after a decade of vigorous economic growth (“the roaring twenties”). Despite some minor economic downturns, the decade of the 1920s was a very healthy period. Industrial production peaked in July 1929, and the development of credit market sustained the consumption of durable goods such as automobiles (Bernanke, 1983). According to Balke and Gordon (1986), the American economy registered an average annual growth of real GNP (Gross National Product) from 1920 to 1929 of 4.6%. However, this period of economic growth turned into an overheated stock market, which finally collapsed and caused the economic crisis.

Many theories try to explain the 1929 crisis, focusing each time on different elements. On the one hand, some scholars argue that a reduction in spending caused a contraction of production and consumption, reducing income and interest rates. This can be theoretically seen as a contractionary shift of the IS curve in the IS-LM model. On the other hand, other accepted theories argue that the Fed (Federal Reserve) allowed the money supply to decrease too rapidly, negatively affecting the real economy with higher interest rates and lower income and production. A contractionary shift of the LM curve can explain this phenomenon. Indeed, after the ‘20s the Fed tightened the monetary policy (Hamilton, 1987).

The background of the “Great Depression” is one of speculation on financial markets, fuelled by credit expansion (especially brokers’ loans) and a mood of optimism that finally gave birth to a financial bubble in the ‘20s. When the bubble finally burst at the end of October 1929, a lot of wealth was wiped out, interacting with a significant structure of private debt, and a severely damaged financial and banking system. The final result was a destabilisation of the real economy, with revised expectations of consumption and investment, high unemployment and difficulties in the real estate sector (Desmedt et al., 2010).

The economic growth of the 1920s created a suitable environment for speculation, which became a widespread activity. In such prosperous period of growth (there were some recessions but they were minor), confidence in the economy and the stock market rose, and people who have never invested before entered the market. The population was buying stocks only in the hope of rising share prices and not on fundamentals. The stock market boom was caused by an element of euphoria (Galbraith, 1973), further stimulated by a shift of money from consumption and production to the call-money market and brokers' loans (Kindleberger and Aliber, 2011). Notwithstanding, not only brokers' loans but also the whole credit sector rose. A significant chunk of credit took the form of instalment debt (for buying durable goods) and real estate mortgages, sharply increasing the household mortgage debt-to-wealth ratio, as shown in Figure 1 (Gjerstad and Smith, 2009; Persons, 1930).

Figure 1



Source: graph retrieved from Gjerstad and Smith (2009).

Especially in the last decades, some scholars tried to find an explanation based on fundamentals for the bull market of the 1920s. However, White (1990) explained that the boom of the stock market was justified by increasing dividends only up to 1927.

Despite Fed's assertions that it would not act as an arbiter of security prices, most researchers agree it took policies to curb speculation and the stock market boom. To deflate the financial bubble, the Fed continued a very tight monetary policy, which initially started in 1928 to stem gold outflows from the US and respect the gold exchange standard (Hamilton, 1987). The policies pursued by the Fed were limited by the gold exchange standard.

During the stock-market boom, Wall Street itself started to get worried about the creditworthiness of its borrowers and asked for more protection against a decline in value of collaterals of brokers' loans. Thus, risk spread and very high demand for brokers' loans led to higher rates in call money and higher margin requirements (Hamilton, 1987).

Overall, a lot of pressure to deflate stock prices was put by Miller, a member of the first Federal Reserve Board, and the neo-elected president Hoover (Cecchetti, 1997): it was only a matter of time before the market was going to crash. It finally occurred on two memorable days: the Black Thursday (24th October 1929) and the Black Tuesday (29th October 1929).

Hamilton (1987) reported that a key element to explain how this financial crisis spread to the real economy is the widespread panic that hit the banking sector. Causing banking failures, financial panic can negatively affect the economy through two channels. First, banking failures have negative effects on liquidity and money supply, determining a further contraction of monetary policies, as suggested by Friedman and Schwartz (1963). Second, financial panic undermines the stability of the banking sector, making banks insolvent and preventing them from sustaining economic activity and worthwhile investments, as argued by Bernanke (1983). Evidence suggests that both illiquidity and insolvency were substantial sources of bank distress during the Great Depression (Richardson, 2007).

Another crucial point to understand how the financial crisis impacted the economic activity is whether the deflation which occurred because of the tight monetary policy was anticipated or not. This has an impact on individuals' expectations, which affect demand and spending. Hamilton (1987) provided a solid basis to argue that much of the overall deflation between 1929 and 1933 was unexpected. Hamilton (1987) argued that if this interpretation is taken, high ex-post rates may have affected the ability of debtors to repay their outstanding debts, resulting in banking bankruptcies and adverse effects on aggregate demand and financial intermediation (as already highlighted above). Lastly, this has seriously impacted the industrial production, as can be seen in Table 1.

To sum up, a stock exchange crisis in October 1929 led to a banking crisis, and almost half of the US banks closed between 1929 and 1933, according to Bernanke (1983). Banking bankruptcies, caused by liquidity and solvency issues, affected the real economy in several ways, with negative effects on industrial production, employment, and real estate sector (Desmedt et al., 2010).

Table 1

Indices of Total Industrial Production, 1927-1935 (1929 = 100).

	1927	1928	1929	1930	1931	1932	1933	1934	1935
Britain	95	94	100	94	86	89	95	105	114
Canada	85	94	100	91	78	68	69	82	90
France	84	94	100	99	85	74	83	79	77
Germany	95	100	100	86	72	59	68	83	96
Italy	87	99	100	93	84	77	83	85	99
Netherlands	87	94	100	109	101	90	90	93	95
Sweden	85	88	100	102	97	89	93	111	125
U.S.	85	90	100	83	69	55	63	69	79

Source: Organisation for European Economic Co-operation (1958).

In 1933, F. D. Roosevelt became the new US president. According to Eggertsson (2008), Roosevelt took several policies which caused a fundamental shift in expectations, putting the US economy on the right path to recover. On the monetary side, Roosevelt abolished the gold standard and announced his willingness to inflate price level to pre-Depression levels. On the fiscal side, he expanded the public deficit, eliminating a balanced budget. Doing this, Roosevelt made clear that his policies were going to follow a path completely different from those pursued by the former president Hoover, making his declarations credible.

1.2 The Great Recession of 2007-2008

The most recent and notorious economic crisis is undoubtedly the so-called “Great Recession”: an economic crisis caused by the real estate bubble and financial crisis of 2007-2008.

This crisis shares some aspects with the Great Depression of 1929. The 1929 crisis occurred as a stock-market bubble burst, while the 2007 crisis was caused by the burst of a housing bubble and the collapse of the subprime mortgage market in the US.

The pop of the real estate bubble seriously hampered liquidity and solvency of the banking sector.

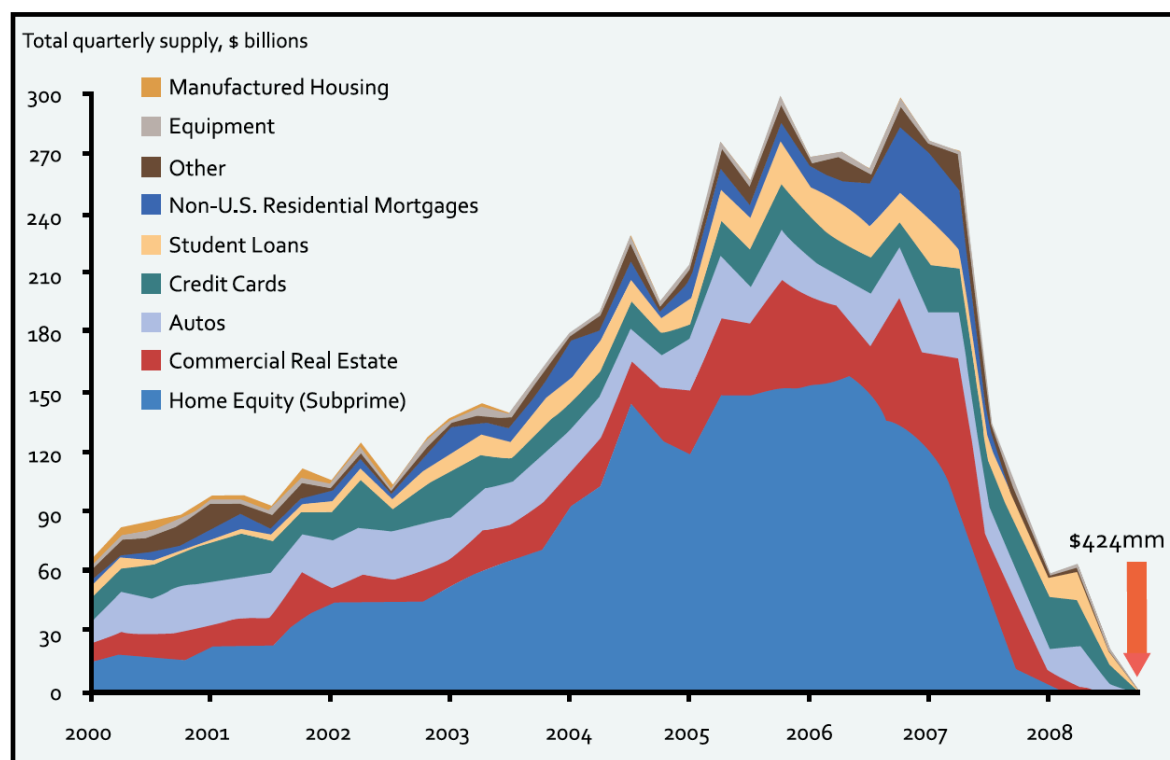
House prices started to inflate in 2001 when lax oversight, major changes in regulation, and abnormally low interest rates were pursued in response to a previous period of recession. Lending standards were relaxed, causing a credit expansion towards less creditworthy borrowers (Bordo, 2008). Evidence was found that the credit boom that occurred in those years was due to a reduction in lending standards (Dell’Ariccia et al., 2012). In a five-year span of time, from 2002 to 2007, the national debt-to-income ratio increased from 3.75 to 4.75 and house prices grew at about 11% per year (Acharya and Richardson, 2009). Lending institutions were heavily exposed to home mortgages.

When the housing bubble burst, financial institutions faced significant losses on mortgages, with a negative impact on financial markets and the real economy. Defaults on mortgages spread to both investment and commercial banks, not only in the US but all over the world, through a complex network of securitised mortgage derivatives into which subprime mortgages were bundled. The real economy was affected by the financial crisis in a similar way to that in 1929: a credit contraction caused by damages of the banking sector (Bordo, 2008). Moreover, declining equities exacerbated the downturn, fostering the people’s perception of losing purchasing power and contributing to lower expenses and production.

According to Acharya and Richardson (2009), what made this crisis so deep was the behaviour taken by many financial institutions. Banks are asked to hold a certain level of capital, proportional to the level of their assets, as a “buffer” against losses and for daily activities. To avoid meeting such capital requirements, financial institutions used “securitisation” in a distorted way. The logic behind securitisation is “spreading risk”, and it works by removing large concentration of risk from the balance sheets of financial institutions and spreading small “chunks” of it among numerous investors. However, from 2003 to 2007, securitisation was mostly used to circumvent capital regulations instead of diluting risk among investors (Acharya and Richardson, 2009). To achieve this object, usually asset-backed securities were conveyed

into off-balance-sheet entities purposely created. These vehicles used to fund collateralised securities through short-term asset-backed commercial paper (ABCP) bonds. Placing loans in conduits permitted banks not to maintain capital against them. Most of these securities were made of subprime mortgages (loans given to less creditworthy people) pooled together and then sold into the capital market. These securities were structured in tranches, based on risk. AAA-tranches attracted a big number of speculators and investors for their high return relative to the perceived low risk. The entire process is explained in detail by Acharya and Richardson (2009), but I will go no further. To give an idea of how much the securitised market grew between 2000 and 2008, Figure 2 shows how rapidly the supply of asset-backed securities increased in those years.

Figure 2
Asset-backed securities issuance, 2000-2008.



Source: graph retrieved from Acharya and Richardson (2009).
Data source: J.P. Morgan Securities Inc. Data as of 31/10/2008.

For our purpose, this is the main point: financial regulation was not keeping the pace with financial innovation and banks. Brunnermeier (2009) wrote that a trend from a traditional banking model of “issue and maintain loans” to a more dynamic model of “originate and distribute loans” was in place. This radical change finally led to a degradation in lending standards and an astonishing increase in the level of debt, both for individuals and banks. Bankers’ willingness to take high leverage can be explained by the incentive system in force at

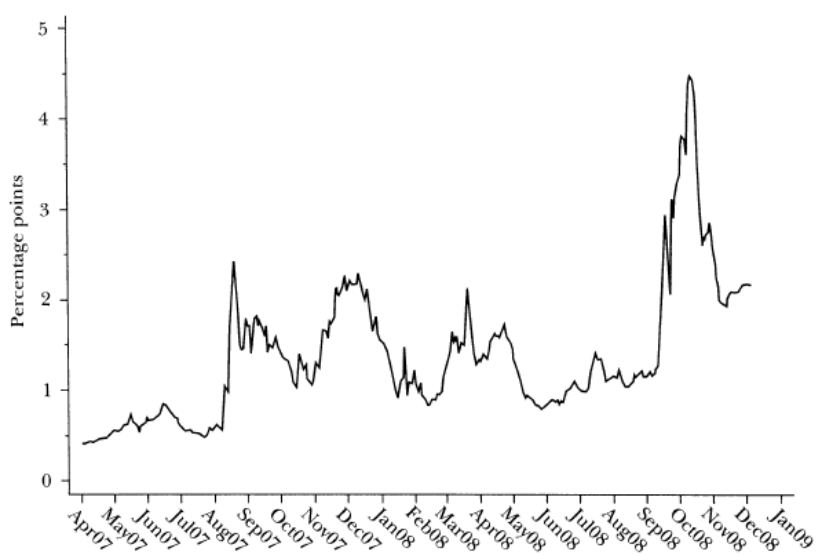
the time. Bankers were paid through short-term bonuses based on volume, rather than on long-term profitability measures (Acharya and Richardson, 2009).

The combination of excessive leverage, securitisation, credit risk transfer, myopic incentives, loose monetary policies, and tax incentives introduced in 1997 (housing assets up to \$500'000 were exempt from capital gain tax), along with a general assumption that house prices were going to increase, determined cheap credit and fed a massive bubble in the real estate market (Gjerstad and Smith, 2009).

House prices started to decline in 2006 and subsequently plummeted in 2007 (Gjerstad and Smith, 2009). In February 2007, subprime mortgage defaults increased, triggering a liquidity crisis. Fear started to spread within the financial industry, which was heavily leveraged and invested in securities made of subprime mortgages. Capital-market participants became cautious in lending money to each other, as signalled by an increase in the LIBOR (London Interbank Offered Rate) rate after the collapse of the German bank IKB (Brunnermeier, 2009). Not only the US was exposed to subprime mortgage but almost every industrialised country through the circulation of collateralised derivatives based on subprime loans. Thus, a liquidity crisis finally turned into a global credit crunch. Borrowers with no equity to repay their mortgages were forced to leave their houses (through foreclosure) and the downtrend in housing prices self-reinforced itself. As houses worth less than the loans on them, losses are transmitted to financial institutions (Gjerstad and Smith, 2009).

The TED spread, calculated as the difference between the LIBOR and the US Treasury bill rate, has historically been used as a measure of credit market deterioration and banking stress (Brunnermeier, 2009). Thus, Figure 3 is helpful to understand how deteriorated credit market was in 2008. The acronym "TED" comes from "T-Bill" and "ED", which is the ticker of the Eurodollar futures contract.

Figure 3
The TED spread.



Source: graph retrieved from Brunnermeier (2009).
Data source: Bloomberg.

Because of low liquidity, credit shocks and losses registered in subprime mortgages, several investment banks became unsustainable. The most known are Bear Sterns, Merrill Lynch, and Lehman Brothers. Bear Sterns was bailed out, and JPMorgan Chase acquired it for \$236 million in March 2008. Merrill Lynch was acquired by Bank of America for \$50 billion. Lehman Brothers was let to go bankrupt in September 2008, with negative externalities for all its counterparts across the globe (Brunnermeier, 2009).

The banking and subprime market crisis had adverse effects on financial markets, which ruinously collapsed in 2008, and on the real economy. Credit tightened, infecting the global economy and making hard not only to buy houses and durable goods but also to invest (impacting long-term productivity and efficiency). All these channels caused the spread of the crisis from the housing sector to the broader financial sector and finally to the real economy.

1.3 Impact of monetary policy and policy lessons

Many similarities can be found between the 1929 and 2007-2008 crises. Those crises are structurally similar: both occurred after a period of growing credit and expansive monetary policy, and both occurred when a speculative bubble burst. Desmedt et al. (2010, p. 4) argued: “the popping of the speculative bubble fuels a debt-deflation type of crisis that spreads to the whole of the economy”. Notwithstanding, they highlighted a significant difference between those crises. During the Great Depression, the stock market crashed, damaging the banking system (causing a credit crunch) and then the real estate sector (and the whole real economy), whereas in the 2007-2008 crisis the burst of the real estate bubble hit the banking system and then the stock market (and the whole economy): the two processes are opposite.

An extensive growth of credit can be dangerous if not appropriately managed. A speculative bubble may arise, wiping out wealth as it bursts. However, why did other large bubbles, such as the dot-com bubble in the early 2000s, do no serious damage to financial institutions and overall economy as the 2007-2008 crisis did? The difference is that in 2007-2008 the house market collapse was conveyed into financial institutions through mortgages (Gjerstad and Smith, 2009). The banking sector was heavily exposed to mortgages, and subprime lending fuelled in large part the real estate boom (Rose and Spiegel, 2012).

Jordà et al. (2011) argued that credit growth is the best predictive signal of financial instability. Therefore, the monetary policy pursued by the central bank and the level of interest rate are fundamental elements to monitor. On the one hand, an expansionary monetary policy fosters credit because borrowing becomes cheaper. On the other hand, a contractionary policy has the opposite effect and can be used to stop inflationary pressures and curb asset price bubbles. Monetary policy affects cost of financing and has a broad impact on the whole economic system, at least in the short-run. Therefore, if it is not used appropriately, it may also lead to a period of recession, as occurred in 1929: the contractionary policy was maintained by the Fed during the first years of the economic crisis (Aiginger, 2010), with a negative impact on the economy, according to Friedman and Schwartz (1963). They argued that once the crash occurred, the Fed should have expanded the money supply to sustain the economic recovery and avoid the deflationary spiral that finally damaged the financial system. Notwithstanding, it seems that the Fed learned the lesson because in the 2007-2008 crisis it aggressively expanded the money supply and lowered interest rate even before the financial crash had fully occurred (Gjerstad and Smith, 2009).

In both crises, credit expansion resulted in high leverage of both individuals and financial institutions, making them fragile and less resilient to external shocks. This was also fostered by accommodative regulation. For instance, in 2004 the limit on the leverage ratios of the brokerage units of investment banks raised from 15:1 to 33:1 (Duca et al., 2010). A lower debt ratio would have helped individuals to suffer to a lower extent of negative equity when house prices dropped in 2007. During the roaring '20s, margin requirements required by brokerage firms were typically very low and not uniformly set till 1933 (Rappoport and White, 1994). If margin requirements were established to a prudent level, investors would have less suffered from margin calls when the stock market crashed in October 1929.

A parallel between those crises seems to be a certain inertia of financial regulation, unable to keep the pace with financial innovation. For instance, as just highlighted, in 1929 the call-money market lacked some regulation on margin requirements. Moreover, the US banking system was primarily a network of small and independent banks, making the US banking network very vulnerable to financial panic (Bernanke, 1983).

Whereas, in the recent financial crisis many elements regarding mortgages, derivatives and securitisation were not appropriately regulated. On private nonprime mortgages, there were lax limits on loan-to-value ratio (Duca et al., 2010). Loans were primarily packed into Collateralised Debt Obligations (CDOs): products that were complex and difficult to assess due to their non-transparency, making difficult to evaluate counterparties' exposition (Duca et al., 2010). CDOs are structured financial products in which asset-backed loans are pooled: commercial banks sold loans to investment banks, which in turn repackaged them into CDOs and sold them to investors such as pension and hedge funds. This mechanism allowed banks to shift risk, encouraging them to lend money to less creditworthy borrowers who pay higher interest rates. Even Basel I regulation may have been harmful, encouraging "procyclicality" in lending as securitised assets required lower capital requirements (Rose and Spiegel, 2012). As already seen, in 2007-2008 structure of bankers' compensation was flawed as well. All these aspects enacted a vicious circle which resulted in declining lending standards.

Considering these aspects, I would suggest three main elements that must be kept in mind, along with monetary policy, to avoid speculative bubbles' negative externalities on the banking sector:

- i. Macroprudential policy tools;
- ii. financial regulation;
- iii. incentives.

First, macroprudential policy tools act directly on those factors that make possible a speculative bubble and make its pop dangerous for the financial system and in turn for the whole economic system. For instance, limits on credit growth, loan-to-value ratio, debt-to-income ratio, and countercyclical requirements help to monitor leverage, control speculative bubbles, and make the banking system resilient. Those tools seem to be noteworthy and valuable. Their focus is narrower than that of monetary policy: this may make these instruments less risky and with fewer side effects. For instance, an increase in interest rate affects all borrowers, with no regard for creditworthiness. Instead, higher requirements like those cited above may help to screen worthwhile projects and creditworthy borrowers, with positive impacts on long-term economic efficiency. Furthermore, it must be kept in mind that monetary policy is not always completely available to regulators. For instance, currency unions put constraints on monetary policy. Monetary policy also has its own limits: the economy may fall into the so-called “liquidity trap”, making monetary policy useless. In those circumstances, macroprudential tools can be extremely helpful.

Second, another fundamental issue is keeping the pace with financial innovation. If this is not done, over-complexity and opaque transactions might make fragile the whole economic system. Thus, either financial products must be kept simple or financial regulation must consider more and more elements to regulate the financial system adequately, becoming potentially complex. Finally, a balance between short-term and long-term incentives must be maintained. Incentives must consider the impact of what they stimulate and carefully evaluate potential distortions that they may create.

Many problems have been encountered in defining a model to predict future crises (Rose and Spiegel, 2012). Therefore, monitoring at the root what historically has led to financial crises may be an appropriate approach. Thus, it is fundamental that credit expansion and systemic risk are monitored.

2. Reducing risk in the financial system

2.1 Systemic risk

The financial crisis of the 2007-2008 is likely to be the most important event in the recent economic history. It showed how dangerous a real estate bubble could be as it bursts, how the banking system can act as a channel for spreading crises from the financial to the real side of an economy, and how important monitoring the financial system as a whole is. Relations among financial institutions and interbank exposure highlight the importance of a dimension of risk that must be holistically assessed: systemic risk.

Allen and Carletti (2013) wrote how the concept of risk in the financial system has evolved in the last decade. In their analysis, the 2007-2008 crisis plays a pivotal role and represents a watershed in the conception of risk in the financial system. The authors argued that before the crisis banking regulation and prudential policies mainly looked at microeconomic aspects, focusing on balance sheets, solvency, and liquidity of single financial institutions. The underlying rationale was that if each bank did not take any large risk, the overall system did not risk any financial crisis. In other words, it was like an equation in which the overall risk of the financial system came out as the addition of single institutions' risk, without considering potential interaction effects. Each element of the financial system was singularly examined, without a comprehensive view of the system. Even though systemic risk was considered also before the recent financial crisis, such event stressed its importance as systemic risk played a fundamental role in the spread of the crisis (especially after the collapse of Lehman Brothers). Opposed to the microprudential approach there is the macroprudential one, which adopts a holistic view of the financial system, striving to limit risk and potential losses across the whole system while considering the risk that interactions among different entities produce. Macroprudential policies address systemic risk, while the focus of microprudential policies is on single institutions.

Allen and Carletti (2013) suggested four main causes of systemic risk:

- i. Panic;
- ii. asset price falls;
- iii. contagion;
- iv. foreign exchange mismatches.

For each of these causes, Allen and Carletti (2013) highlighted some points.

First, during economic downturns, widespread panic can cause liquidity problems to banks if many people (more than what could be reasonably expected) run to banks for withdrawing. Indeed, the main banks' activity is profiting by turning short-term liabilities (typically deposits) into long-term assets (typically loans and other form of investments). However, this process involves risk and exposes banking institutions to potential liquidity and solvency problems. Liquidity issues may force banks to sell out some of their less-liquid assets at a discount price, deteriorating their net worth. Panic events are self-fulfilling events: if depositors believe that other depositors are going to heavily withdraw money prematurely, they will run to the bank to withdraw their funds as well, stimulating this process even more. To avoid such events, deposits have been insured (completely or up to a certain amount). Although, it must be borne in mind that this may encourage banks to engage in riskier activities (moral hazard).

Second, sudden asset price falls are destabilising for the economy and the financial sector, especially if they occur after a period of speculative bubbles fed by credit (Crowe et al., 2011). Bubble busts are more costly and dangerous when the boom in prices is funded through credit and highly-leveraged transactions, as leverage operates as a financial accelerator. The most relevant aspect of bubbles is not the boom itself but how it is funded (Crowe et al., 2011).

The third source of systemic risk suggested by Allen and Carletti (2013) is the risk of contagion. Since financial institutions are interrelated, difficulties of specific individual institutions can spill over the financial system and impact balance sheets of other institutions, with sometimes a dreadful systemic impact. A straightforward example of contagion is represented by the losses that an entity faces when one of its debtors go bankrupt and cannot repay the full debt. These events may start a sort of "chain reaction" in which balance-sheet deterioration of an institution negatively impacts the balance sheet of another institution, which may suffer illiquidity and/or solvency issues and in turn provoke a loss for its creditors, and so forth. Preventing these events and chain reactions (which are not limited to financial institutions, but may also impact retail investors and other economic agents) is the rationale behind most bailouts of financial institutions, especially those that are "too big to fail".

The last source of systemic risk given by Allen and Carletti (2013) is currency mismatches in the banking system. Currency mismatches played a pivotal role in the Asian financial crisis in the late '90s. Asian countries principally borrowed money in foreign currencies, especially US dollars, while they were recipients of high capital inflows caused by carry-trade activities (i.e. borrowing at a low interest rate in one country and lending at a higher interest rate in another country - investors borrowed money in yen and US dollars at low rates and lent at higher rates in Asian economies). As Asian currencies collapsed, Asian economies found themselves unable to sustain their deep structure of dollar-denominated debt. Trust in Asian countries collapsed,

which became unable to borrow money in the international market. Finally, an intervention of the IMF was necessary.

Claessens (2014), along with others researchers before him, highlighted the distinction between the “time” dimension and the “cross-sectional” dimension of systemic risk. Instruments that address the “time dimension” must monitor systemic risk dynamics over time, while instruments that deal with the “cross-sectional” dimension are those that control the level of systemic risk across the financial system at a certain point in time.

Time dimension: The time dimension of risk refers to the cyclicity of risk, and to how it develops over time. To address such risk in the financial system is necessary monitoring how financial variables (e.g. credit growth, banking and individuals’ leverage) change over time and how the financial cycle develops. To limit the time dimension of risk, policies aim at reducing the volatility of the financial cycle. Thus, for instance, higher capital and reserve requirements may be enforced during upward phases of the financial cycle, while more loose requirements can be implemented during downward phases of the cycle. Another example is requiring to build resource buffers during economic expansions that will be released during recessions. Overall, countercyclical policies are implemented to smooth the financial cycle.

Cross-sectional dimension: The cross-sectional dimension of risk refers to the systemic risk existing in the financial system at a certain point in time. For the cross-sectional dimension, the focus is mainly on interdependencies among financial institutions. Thus, those institutions whose liquidity and/or solvency problems cause most damages are subjected to greater attention. An instance of measure which looks at cross-sectional risk is higher capital requirements required to Systematically Important Financial Institutions (SIFIs). Reducing cross-sectional systemic risk often involves structural reforms, such as changes in accounting and compensation schemes (Cerutti et al., 2015).

Considering the recent trends in the global economy, macroprudential policies may become more and more important in the future. Financial innovation has led to a higher rate of interaction among financial institutions, a greater number of transactions, and an increasing capital mobility among different countries. These changes are likely to increase the relevance of systemic risk in the future, increasing the number of circumstances in which macroprudential tools may be useful in preventing financial instability.

2.2 Policy options to avoid real estate bubbles

Severe declines in asset prices are ones of the main sources of systemic risk. Substantial declines in prices typically occur as speculative bubbles burst.

Historically, real estate bubbles have been very dangerous and played a major role in past financial crises. Crowe et al. (2011) reported that among 46 systemic banking crises, more than 60% occurred after a boom-bust pattern in housing prices. They also said that almost all the countries that experienced the so-called “twin booms” in real estate and credit markets finally suffered either a serious decline in GDP growth or a financial crisis. The recent financial crisis is a clear example of what real estate bubbles fed by excessive availability of credit can provoke. How bubbles are funded is fundamental to analyse the impact of potential busts. High levels of leverage act as a magnifier when bubble burst. Bubbles financed through credit are likely to be more dangerous than others. Real estate transactions often involve borrowing, and homebuyers are usually allowed higher leverage ratios than those allowed in other markets (Crowe et al., 2011).

Crowe et al. (2011) also highlighted other hallmarks that make the real estate market a relevant source of shocks. First, real estate is likely the most important “storage of wealth” in several economies. Most households hold a significant part of their wealth in their homes rather than in equities. This is true both in the US and in Europe, where this is even more accentuated. Thus, whether similar shocks occur in the housing market and other markets, the wealth effect produced by the change in house prices is larger than that in other asset prices.

Second, the construction sector is a significant contributor to the national value added. Moreover, property prices are used as signals to adjust production accordingly. Therefore, reduction in house prices produces a downturn of one of the most important sector and indicates to reduce construction of houses.

Third, the real estate market is characterised by a lag between demand and supply and it is relatively illiquid because of several factors (e.g. high transaction costs, impossibility of short sales). This makes the housing market slow in reacting to shocks and stabilising to its equilibrium point.

Fourth, network effects may also foster boom-busts cycles. For instance, foreclosures and fire sales tend to lower the value of nearby property.

Policies aimed at avoiding real estate bubbles mainly target three objectives: i) preventing the boom in real estate prices, ii) containing the level of leverage among householders, and iii) increasing the resilience of the financial system (Crowe et al., 2011).

All measures involve costs and distortions, and effectiveness is limited by loopholes and circumvention. Broad measures are typically harder to circumvent, thus potentially more efficient. However, they also implicate more costs and distortions, impacting the whole economic system. Instances of broad measures are monetary and fiscal policies such as changes in interest rates and tax incentives, respectively. More targeted measures are typically macroprudential tools. On the one hand they are more cost-effective, but on the other hand their effect is potentially jeopardized by circumvention. To address real estate bubbles, macroprudential tools mainly look at containing credit growth, leverage, and procyclicality.

Crowe et al.'s (2011) work is pivotal and analyses all the major tools that may be useful to deal with real estate booms:

- i. Fiscal tools;
- ii. monetary policy;
- iii. macroprudential regulation.

2.2.1 Fiscal tools

Crowe et al. (2011) argued that tax treatment of homeownership and housing-related debt can be modelled to curb housing appreciation. For instance, changes in transaction taxes, property taxes, and mortgage interest tax deductibility can limit the favourable tax treatment in favour of home ownership that exists in many countries.

Using taxes to either foster or hamper house prices growth may be politically difficult. For instance, increasing the level of taxes can create unrest among voters, making policymakers less prone to do it even though necessary. Moreover, government entities often face a sort of “procyclical pressure” on tax determination: when markets are booming, tax revenues are high and economic agents ask for a tax reduction as they see a large tax bill.

Overall, Crowe et al. (2011) reported that evidence on the effect of tax treatment on real estate cycles is inconclusive. The relationship between fiscal policy and real estate cycles is ambiguous, especially at a cross-country level. Fiscal tools may be helpful in a one-off setting, but a long-term application is hampered by political issues. Furthermore, it is fundamental to remember that taxes and incentives introduce distortions in the economic system, limiting the “signal role” that prices have on the economy. Crowe et al. (2011) focussed their analysis on three different fiscal policies.

Transaction taxes: Theoretically, higher transaction taxes may reduce the size of the real estate market by limiting speculative activity. This should be even more promising whether taxes and subsidies are countercyclical, for instance with higher stamp duties during booming markets. However, empirically there is not a clear relationship between house prices and transaction taxes. Modelling transaction taxes helped to stabilise the housing market in the US and in the UK. In China and Hong Kong, transaction volume reacted more than prices to changes in transaction taxes and the impact was temporary. Both Belgium and Japan used transaction taxes with no significant positive results.

Property taxes: Theoretically, the same logic applied for transaction taxes can be applied for property taxes, with high property taxes potentially curbing a real estate boom. Empirically, using US data, a negative relation has been found between property tax rates and both average annual housing price growth and price volatility. Therefore, higher property taxes can help to keep housing booms and volatility controlled.

However, deriving implications using only US data presents some flaws. Indeed, such results may be specific to the US market, which differs from other markets. Furthermore, property taxes did not prevent real estate bubbles in the US.

Mortgage interest tax deductibility: Removing interest tax deductibility on mortgages may also help to curb real estate booms. Such measure is estimated to cause an immediate decline of about 10% in house prices. However, this change is only one-off and is not sustainable in the long period.

2.2.2 Monetary policy

Tightening monetary measures makes borrowing more expensive. For instance, a rising interest rate, which represents the “cost of money”, put downward pressure on credit demand. Thus, tight monetary policies may help to contain or avoid real estate bubbles through its effect on the cost of money, considering that real estate transactions are often funded through credit.

Monetary measures are far-reaching and blunt. This makes monetary policy very hard to circumvent and easier to implement from a political perspective. However, there are several potential limits and side effects, as shown by Crowe et al. (2011).

First monetary policy’s wide approach affects the entire economy, impacting on the cost of financing to which all economic agents are subjected. This may have a cost in terms of employment and output and has a negative impact on inflation (which can be either a desired result or not). Moreover, monetary measures affect financial stability through several channels. These concerns are minimized if the bubble occurs in a context of macroeconomic overheating. Second, during housing booms the expected returns on the inflated asset may be so high that are virtually no impacted by any increase in the policy rate. In this case, an increasing interest rate may even cause some distortions: borrowers that would have qualified for standard loans move towards more dangerous forms of loans because of the higher cost of financing (e.g. variable-rate loans, and foreign-currency loans - exposing themselves to exchange rate risk). Third, free capital mobility may hamper the attempt to reduce housing prices by increasing interest rates. Indeed, higher interest rates may stimulate and attract carry-trade activities. Significant capital inflows are likely to inflate housing prices.

Finally, the effectiveness of monetary policy is also affected by the structure of the mortgage market. Indeed, if mortgages rates are primarily derived from long-term interest rates, an increase in short-term interest rates might not cause the desired result (it depends on the peculiar relation between long and short-term rates).

Empirical evidence supports all these concerns: tight monetary measures can stop booms but at a very high cost. According to Crowe et al.’s (2011) study, a 100-basis-point hike in the policy rate reduces house appreciation only by 1%, through a five-year span of time. Although, it also provokes a 0.3% drop in GDP growth. Moreover, some evidence supports that the speculative segment of the mortgage market is little affected by changes in policy rates.

2.2.3 Macroprudential regulation

Macroprudential measures, such as higher capital requirements or limits on leverage can be helpful to directly tackle the risks associated with real estate booms. Macroprudential instruments are not only less blunt than monetary policy, but they are also more flexible; moreover, they need a shorter span of time than that required by fiscal policies to get positive results (Lim et al., 2011a). Having a narrow focus and targeting specific risks, macroprudential measures often allow to avoid and/or limit real estate bubbles with less costs than those involved when monetary and fiscal policies are used (Crowe et al., 2011).

Crowe et al. (2011) highlighted also some downsides of the narrow and direct approach of macroprudential measures. First, as a specific type of contracts or group of people is targeted, circumventing macroprudential policies may be easier than circumventing monetary and fiscal ones.

Second, since macroprudential measures have a very direct impact, implementing these measures may be politically difficult. Indeed, as new macroprudential tools are implemented, “winners” and “losers” are clearly identifiable and there is the chance that losers join their forces and put pressure on regulators to hamper the implementation of the new rules.

Finally, measures which are now considered as macroprudential tools have been considered as microprudential tools so far; thus, using them to achieve systemic and macroeconomic results may be perceived as an unnecessary intrusion into the market.

Different authors classify macroprudential tools in different ways. For instance, Lim et al. (2011) distinguished three types of tools per the type of issues they look at:

- i. Credit-related tools (e.g. caps on loan-to-value ratio, caps on debt-to income ratio, credit growth limit);
- ii. liquidity-related tools (e.g. reserve requirements, limits on currency mismatches);
- iii. capital-related tools (e.g. countercyclical capital requirements, dynamic provisioning).

Other authors adopt a classification based on which phase of the financial cycle macroprudential tools are adopted. For instance, Claessens et al. (2013) distinguished tools that must be used during:

- i. Expansionary phase;
- ii. contractionary phase;
- iii. contagion/shock propagation.

The first two categories essentially address the portion of systemic risk that arises with financial cycles, the so-called time dimension. Instead, tools used during the contagion phase aim at

dealing with the cross-sectional dimension of risk. However, Claessens et al.'s (2013) classification is deeper than this and even states the major objective of those tools that deal with cyclicity (i.e. increasing resilience of the financial system, dampening the cycle, or preventing the growth of the cycle). For sake of clarity, Appendix A shows the table made by Claessens et al. (2013) that depicts such classification.

Macroprudential tools are still in their infancy. However, especially after the recent global financial crisis, the interest on this subject has greatly increased and an increasing number of countries is implementing such measures.

Why using macroprudential tools: main objectives

In a broad sense, macroprudential tools aim at financial stability. The importance of financial stability arose especially after the recent financial crisis, when microprudential policies revealed inadequate in limiting financial instability and systemic risk. The crisis clarified that achieving price stability through a correct monetary policy is not enough to maximise welfare if there is financial instability (International Monetary Fund, 2013). Macroprudential policies' objective is improving financial stability by reducing systemic risk, either over time or across markets and institutions at a certain point in time, as argued by Lim et al. (2011a). As suggested before, to reduce systemic risk over time macroprudential regulation imposes tighter requirements during upward phases of the financial cycles and looser requirements during downward phases. This is helpful to reduce excessive expansion of credit and to build resource buffers that will be released during recessions. Instead, to reduce the cross-sectional dimension of systemic risk, more prudent requirements (e.g. higher capital requirements) are imposed to SIFIs, which may also be monitored more closely. To encourage long-term funding and reduce cross-sectional risk arising from illiquidity, Brunnermeier et al. (2009) proposed capital surcharges against illiquidity.

Cerutti et al. (2015) argued that macroprudential policies deal with externalities and market failures that cause excessive procyclicality, increasing systemic risk and the likelihood of severe financial crises. Per them, most analyses classify these externalities in three main groups. First, there are externalities that arise from strategic interactions among financial institutions, banks, and economic agents. They cause an increase in vulnerability during expansive phases of financial cycles. Historical evidence sustains that financial intermediaries are used to assume an extensive exposure to credit and liquidity risk during upswings, fostering asset price volatility (Claessens, 2014).

Second, there are externalities related to fire sales and credit crunches. These events often cause a decline in asset prices because investors are forced to sell assets during downturns. Usually fire sales not only decrease the value of sold assets but also that of similar assets held by other investors and/or financial intermediaries, spreading the damage in the financial sector (Claessens, 2014). For example, fire sales may occur during events of financial panic. Indeed, banks may be compelled to liquidate their less-liquid assets whether they are not able to fulfil all withdrawal requests. When banks suffer substantial losses, a credit crunch often follows, with negative effects on the real economy. These externalities usually arise during the downside of a financial cycle.

Third, there are externalities related to interconnection within the economic system. Claessens (2014) argued that on the one hand interconnection among financial institutions helps to handle with small financial shocks by spreading them across the system, but on the other hand it amplifies the biggest shocks as failure of one specific institution affects many counterparties. Moreover, individuals are often unable to internalise in their behaviours the potential damages caused by high levels of interaction. Thus, individual institutions may be fragile and act as a channel to spread shocks throughout networks and financial markets.

Per Claessens (2014), these three kinds of externalities can in turn be classified between “time-series externalities” and “cross-sectional externalities”. The first and second kind of externalities (i.e. those related to strategic interactions and those concerning fire sales and credit crunches) are “time-series” and foster the time dimension of systemic risk. Instead, the last kind of externalities (i.e. those due to interconnectedness) increases the cross-sectional dimension of systemic risk.

Another argument that sustains the necessity of macroprudential tools is the so-called Tinbergen rule. Galati and Moessner (2013) reminded that the Tinbergen rule supports the need for at least one independent instrument for each policy objective. Monetary and fiscal tools are already focused on achieving price stability and managing aggregate demand, respectively. Thus, Galati and Moessner (2013) argued that at least another type of instruments besides monetary and fiscal ones is necessary to achieve financial stability.

What affects the choice of instruments?

Which macroprudential instrument is implemented depends on the issues faced by a country. Lim et al. (2011b) reported six different objectives that can be targeted with various macroprudential instruments. For each objective, they identified which tools were used and which were the most common. First, to address risks associated with complexity and

interconnectedness, higher capital requirements are usually imposed to SIFIs. Second, procyclicality is addressed by countercyclical provisioning and, to a lower extent, by higher capital requirements imposed to SIFIs. Third, the most common instruments to control credit growth and increase in asset prices are caps on loan-to-value ratio. Other instruments used for the same purpose are countercyclical provisioning and reserve requirements for non-resident. Fourth, limits on maturity mismatches are usually used to reduce liquidity risks and leverage. Fifth, currency risk is addressed with limits on open currency positions. Finally, reserve requirements for non-resident are the most common tool used for capital controlling and avoiding potential risks associated with capital flows, according to this research.

According to Lim et al. (2011b), macroprudential instruments mainly aim at limiting credit growth (39% of the cases). In 23% of the cases examined, macroprudential policies were implemented to address currency risk, in 15% to address leverage, and in 13% to deal with procyclicality. These objectives are followed by control of capital flows and risks associated with complexity and interconnectedness, with 4% and 6% respectively.

In another work, Lim et al. (2011a) highlighted some relations between few characteristics of countries that have implemented macroprudential policies and the kind of policies implemented.

First, the stage of economic and financial development seems to influence what kind of macroprudential tools are implemented. Emerging economies use macroprudential instruments more than advanced ones. The authors suggested this may reflect a substantial need to address market failures where financial markets are not as developed as those in advanced economies. Second, the exchange rate regime is relevant in the choice of instruments as well. Countries with fixed exchange rate regimes tend to use more intensively all types of macroprudential policies, averagely. This is due to the limits that a pegged exchange rate regime poses on monetary policy. In these countries, credit-related measures are often used to manage credit growth while liquidity tools are used to manage funding risk.

Third, also the type of shock is relevant in the choice of macroprudential instruments. For instance, if a large capital inflow (large relatively to the size of the economy) occurs, countries often undertake credit and liquidity-related policies to address the impact of the shock. A big inflow of capital represents a substantial shock that may destabilise the economy of a country through appreciation of a specific category of assets.

The impact of a financial shock is also affected by the size of the financial sector, with smaller financial sectors more vulnerable to liquidity issues. Thus, it is no coincidence that a negative

relation between the size of the financial sector and the use of macroprudential policies has been found.

Rules vs discretion

When it comes to calibrating macroprudential tools, an issue is whether policies should be rule-based or discretion-based. On the one hand, Borio and Shim (2007) argued that discretionary policies could be better designed to solve the relative imbalance, in principle. Moreover, discretionary tools may be crucial as it is likely that the next crises will be different from previous ones (Galati and Moessner, 2013); thus, it is difficult that the causes of the future crises will be internalised in rules. On the other hand, Borio and Shim (2007) argued that rule-based stabilisers leave less room for policy errors and are politically easier to be implemented. As rule-based stabilisers do not require any justification to be activated, such measures are likely to be implemented quicker than discretionary ones.

Finally, Borio and Shim (2007) sustained that rule-based policies are superior. Nevertheless, they also supported the complementarity of built-in stabilisers and discretionary measures, in particular whether effective rules are too hard to be outlined.

Although, Lim et al. (2011a) reported that most of the macroprudential instruments used so far are discretionary. This is mainly due to the lack of conclusive studies on the effects of macroprudential policies. Thus, calibration of macroprudential tools has been based on a trial and error process so far.

Some macroprudential policies

Countercyclical capital requirements, reserve requirements, and dynamic provisioning

Capital regulation has a procyclical effect. During booms fundamentals improve, reducing the riskiness of a loan portfolio, which in turn make banks' capital requirements less tight and subsequently increase the supply of credit (Crowe et al., 2011).

Crowe et al. (2011) argued that forcing banks to hold more capital during housing booms would oppose such distortion, building resource buffers that will be available to offset losses when busts occur and capital requirements get looser. These buffers make the financial system more resilient and solid, helping banks to not fire sale assets to meet capital requirements and avoiding banking crises. They also argue that capital requirements could be directly linked to the dynamics of house prices in order to hamper real estate booms. Countercyclical capital requirements are not only useful to avoid real estate bubbles but also to enhance overall financial stability, smoothing cyclicity and avoiding overheated economies.

A similar logic relies behind the implementation of countercyclical reserve requirements and dynamic provisioning.

Reserve requirements are the minimum amount of cash that a bank must own against the total amount of deposits of its customers. Imposing higher reserve requirements during periods of growth protect against liquidity risk, while reducing procyclicality of credit as well because higher reserves reduce the amount of money available to be lent. Nevertheless, the main objective of reserve requirements is protecting against liquidity issues.

Dynamic provisioning (i.e. dynamic loan-loss provisioning) essentially means requiring to set aside a higher amount of money against potentially uncollected loans during periods of economic growth. This helps to limit credit expansion (Crowe et al., 2011), which is often a root of financial instability and dangerous speculative bubbles, especially in the real estate sector. However, the main objective of dynamic provisioning is strengthening the banking system by building resource buffers to cover future loan losses. Thus, it is better to implement such policy at the beginning of credit cycles, in order to build a sufficiently large amount of resources to cover those losses (Lim et al., 2011a). As with capital requirements, dynamic provisioning may directly aim at avoiding real estate bubbles if the provision is linked to dynamics of house prices (i.e. increasing loan-loss provision when house prices increase) (Crowe et al., 2011).

Caps on loan-to-value (LTV) and debt-to-income (DTI) ratios

The definition of loan-to-value ratio is quite straightforward to understand: it is the ratio between the amount of borrowed money and the value of the collateral used to get the loan. Crowe et al. (2011) argued that limiting this ratio helps to reduce borrowers' financial vulnerability. Indeed, reducing leverage of debt make borrowers more resilient to external shocks. For instance, considering a drop in housing prices, Crowe et al. (2011, p.21) argued: "the lower the leverage, the greater the drop in prices needed to put a borrower into negative equity". Limiting loans reduces the effect of "financial accelerator" that leverage has and the impact of real estate busts, subsequently reducing defaults and thus losses transmitted to the banking system. Caps on LTV ratio not only make borrowers, and in turn lenders, more resilient, but also reduce credit growth and property prices by reducing credit demand (Lim et al., 2011a). Since real estate properties are used as collateral to get loans, during housing booms, the amount of credit that borrowers are entitled to get increases. Therefore, modelling caps on LTV ratio countercyclically would help to cool down the credit market and avoid speculative bubbles (Lim et al., 2011a). Such adjustment would particularly reduce the time dimension of systemic risk. The sooner such caps are implemented, the greater will be their pre-emptive effect, preventing credit from becoming too large (Lim et al., 2011a).

Most countries impose caps on LTV ratio along with caps on DTI ratio and/or reserve requirements. Caps on DTI ratio, which is the ratio between the debt and the income of a specific individual, act similarly to caps on LTV ratio: they reduce credit demand, which in turn reduces pressure on real estate prices. According to Crowe et al. (2011), caps on DTI ratio are particularly effective in limiting speculative demand. Like caps on LTV ratio, caps on DTI ratio would also make borrowers less fragile to external shocks. Moreover, they reduce the time dimension of systemic risk if adjusted countercyclically, along with caps on LTV ratio. Screening creditworthy borrowers, caps on the DTI ratio ensure the quality of banks' assets and make the banking system stronger (Lim et al., 2011a).

Policies targeted at foreign currency-denominated debt

Banks which are highly committed in foreign currency-denominated transactions are vulnerable to exchange-rate risk. Individuals who earn money in local currency and borrow money in foreign currency may not be able to repay their debt in case of a sharp depreciation (Lim et al., 2011a). Such concerns are particularly relevant for those emerging economies that adopt a pegged exchange rate in order to attract investors, and subsequently find themselves forced to devalue their currency. For instance, the Thai economy had a deep structure of dollar-

denominated debt in the late '90s. As Thailand had to leave the fixed exchange rate regime due to speculative pressure and declining exports, the baht (Thai currency) sank and the dollar-denominated debt became far more onerous to repay, shocking the economy.

According to Lim et al. (2011a), to mitigate this risk many countries decide to limit exposure to foreign currency through measures such as caps on DTI ratio by currency or other targeted restriction on foreign-denominated transactions and capital inflows. Imposing some constraints on foreign currency-denominated lending may encourage lending in local currency, posing less risk on the financial system. Other policies that aim at reducing risk relative to foreign currency are higher risk weights and higher capital requirements for foreign-denominated lending (Lim et al., 2011a).

Considering the objectives of these measures, implementing them as soon as possible is fundamental to limit exposure and build buffers of resources.

Policies targeted at cross-sectional systemic risk

Caruana (2010) highlighted six group of policies that should be useful in reducing systemic risk at a certain point in time (cross-sectional dimension of risk).

First, capital and liquidity requirements should not only be managed countercyclically, as seen before, but should also be set at a higher level overall to limit externalities from the financial sector to the real economy. Specifically, SIFIs should be subjected to tighter prudential requirements.

Second, failures of SIFIs should be managed accurately; thus, an adequate resolution regime is necessary.

Third, incentives and governance should be revised to guarantee that there are no perverse effects which cause market failures in the financial industry.

Fourth, the financial sector should be made structurally more resilient. This may be done by using robust central counterparties in bilateral relations and trading derivatives in organised exchanges instead of over-the-counter.

Fifth, to internalise externalities produced by interconnectedness, taxation may also be used (which is the classic way to deal with externalities, e.g. Pigouvian taxes).

Finally, Caruana (2010) argued that systemic institutions should be supervised more proactively.

2.3 How monetary and macroprudential policies interact

Before the recent global financial crisis, prudential policies were mainly applied with a microprudential approach, focusing on the specific risk of single financial institutions (idiosyncratic risk). Whereas, macroeconomic policies (e.g. monetary and fiscal policy) had the scope to achieve price stability and to manage the pace of economic activity. These two frameworks of policies were conceived as completely independent. Instead, after the crisis, this clear distinction was abandoned and systemic risk arose as a fundamental issue that must be directly addressed and monitored. Thus, prudential policies began to be adopted with a macroprudential approach, aiming at financial stability and reducing systemic risk. Macroeconomic and prudential policies overlapped each other, giving birth to a framework in which macroprudential policies are in the middle and objectives are not influenced by only one set of policies. This idea was explained by the International Monetary Fund (2013) and can be grasped in the following picture.

Figure 4
Interactions among policies.



Source: graph retrieved from International Monetary Fund (2013).

According to the IMF's report, macroprudential policies should focus on financial stability, as they are less appropriate to manage aggregate demand and economic activity, creating distortions and avoidable costs. The same logic applies to macroeconomic policies, with the necessary changes. Thus, even though monetary policy can influence financial stability, its main objective is price and output stability and it should be focused on them.

As both macroprudential and monetary policies impact on each other's sphere of influence, these policies should be implemented while considering the side effects that they have on other policies' objective. Recent researches advise monetary and macroprudential policies should be used as complements, and not as substitutes (International Monetary Fund, 2013). The researches that sustain this "complementarity" between these two sets of instruments are based on Dynamic Stochastic General Equilibrium (DSGE) models. From those researches come out that a financial shock should be mainly addressed with macroprudential policies. Instead, to address productivity shocks, using monetary policy may be enough.

To sum up, the IMF argued that monetary and macroprudential policies can be effectively implemented together, enhancing each other. However, the precise effect that one set of policies has on the other depends on country-specific circumstances. Moreover, there is not enough empirical knowledge about the use of both monetary and macroprudential policies. Nonetheless, it is not possible to achieve financial stability only with monetary policy, as sometimes financial stability is affected by elements out of monetary policy's sphere of influence (Claessens, 2014).

The following paragraphs will show some channels through which monetary and macroprudential policies influence each other.

2.3.1 How monetary policy can affect financial stability

An International Monetary Fund's (2013) report highlights five specific channels through which monetary policy can influence financial stability. All these arguments are indicated by the IMF through the support of selected empirical evidence.

First, monetary policy influences financial stability through its effects on borrowers' balance sheet. Increases in interest rates raise the cost of debt, reduce loan repayment capacity, and lead to drop in asset prices. All these effects curb credit access and deteriorate borrowers' balance sheet. As assets are used as collateral to get a loan, a potential fall in asset prices may lead to foreclosures and fire sales, contributing to transfer losses to the banking system and amplifying the initial fall. Thus, high interest rates may increase default rates; however, they also incentivise borrowers to take less debt and reduce leverage.

Second, a low interest rate may incentivise high risk-taking behaviours. When monetary policy is expansive, economic activity is boosted, banks' capital and collateral values rise, and borrowers' debt burden decreases. All these elements foster financial institutions to increase leverage and loosen lending prudential criteria.

Third, there is a risk-shifting channel. As monetary policy gets tighter, financial intermediaries' margins get tighter too. When margin get smaller, banks may be incentivised to invest in riskier assets, in order to maintain a certain level of return on equity.

Fourth, an expansive monetary policy may result in booming asset prices, potentially destabilising the economy as the boom turn into a bust. Indeed, as interest rates decrease, borrowers' net worth and lenders' asset value rise. This increases the supply of and demand for loans, increasing borrowers' leverage and asset prices.

Fifth, an increase in policy rates may destabilise the economy as it affects capital flows and exchange rate. For instance, in emerging markets, when policy rates are high, there are significant activities of international carry-trade, especially in the current scenario in which most developed economies have particularly low interest rates. This fosters the build-up of debt (which is likely to be in foreign currency as international interest rates are lower, exposing borrowers to exchange rate risk as well), increasing the fragility of the domestic economic system, which may overheat as foreign capital is invested. Increasing exchange rate, caused by noteworthy inflows of capital, may hamper economic growth especially in those emerging countries where it is based on cheap exports. The destabilising effect of significant capital inflow (combined with a fixed exchange rate regime) played a pivotal role in the Thai financial crisis in late '90s, which finally became an Asian financial crisis.

Most of these undesired effects may be reduced with well-targeted macroprudential policies. For instance, caps on debt ratios help to hamper speculative bubbles, risky behaviours and the relative build-up of leverage (Nier and Kang, 2016). Appendix B shows the key macroprudential tools to address such side effects and sum up monetary policy effects on financial stability through a table reported by Nier and Kang (2016).

2.3.2 How macroprudential policies can affect output and prices

Nier and Kang (2016) wrote a paper in which they examined macroprudential policies effects on output and prices, which are elements typically monitored by monetary policy as it aims at output and prices stability.

On the one hand, during financial upturns, macroprudential policies are tight to address procyclicality, increase the resilience of the financial system, and hamper the build-up of speculative bubbles. Tight macroprudential criteria, such as low LTV ratios and high capital and reserve requirements, by affecting credit growth finally impact asset prices (especially housing prices as the housing market often involves borrowing) and output (by limiting investment). This downturn pressure on output and prices is greater if it forces financial intermediaries to shrink lending to meet capital and debt ratio requirements. Therefore, if such tightening occurs in a period of stress for the financial industry, the consequent lending contraction is likely to be greater. According to Nier and Kang (2016), LTV ratios have stronger effects than other macroprudential tools on asset prices.

If monetary policy is effective (and available), undesired effects on output provoked by tight macroprudential criteria can be offset through a more accommodative monetary policy.

On the other hand, during financial downturns macroprudential criteria should be loose, and buffer of resources should be available. Thus, relaxed requirements and the release of macroprudential buffers can be helpful to transmit the monetary policy and achieve the desired results. For instance, during downturns banking institutions may be reluctant to react to expansive monetary policies and expand their assets, as doing this might result in triggering the minimum capital ratios and the subsequent external supervision. In such scenario, macroprudential buffers can offset losses, and lower capital requirements should incentivise banks to expand their lending activities, even though the perceived risk is greater as borrowers' net worth deteriorate during downturns. Similarly, higher caps on LTV ratios may open lending to those borrowers whose collateral value declined after a fall in asset prices. By sustaining the transmission of monetary policy, the need for monetary measures themselves may reduce as they are implemented more effectively. Thus, it would be less likely to fall into a liquidity trap.

To conclude, Nier and Kang (2016) sustained that complementarities between monetary and macroprudential policies are important and strong. Since interactions are strong, the authors argued it is appropriate to make central banks leaders of the emerging framework of macroprudential tools. This would make easier to coordinate the different sets of policies.

If central banks control both monetary and macroprudential policies, I would argue that a potential issue is the “lack of credibility” whether those two sets of policies are in contrast with each other. For instance, if the president of the Fed announces a future interest rate hike while macroprudential policies are loose, individuals and markets may perceive the announcement as implausible. Thus, as expectations greatly influence economic agents’ behaviour, in such scenario monetary policy may lose some power.

3. Evidence on the effectiveness of macroprudential policies

Even though macroprudential tools are still quite new, several countries have introduced macroprudential measures in the last years, especially after the recent global financial crisis (often such measures were already in place but with microprudential objectives).

Several empirical studies on the effectiveness of macroprudential policies have been made. However, the overall evidence on the effectiveness of macroprudential tools is still quite opaque.

In this chapter, some of these empirical studies will be presented.

3.1 Who mostly use macroprudential policies?

According to Claessens (2014), most usage of macroprudential tools comes from emerging markets. According to him, this matches expectations, as emerging economies are more fragile to external shocks (e.g. capital inflow). Indeed, less-advanced economies have less-developed financial systems, which are often less-liberalised than those of advanced economies. In other words, emerging countries usually have worse economic fundamentals than developed countries, making them more fragile to external shocks. Claessens (2014) reported that emerging economies use more policies for a longer span of time than advanced ones. Moreover, they are usually most worried about liquidity issues and use mostly foreign exchange and liquidity-related macroprudential tools (e.g. caps on foreign lending and reserve requirements, respectively), while advanced economies tend to prefer credit-related measures (e.g. caps on LTV and DTI ratios). Cerutti et al. (2015) argued that advanced countries prefer credit-related measures because the potential impact of a housing bust is typically very large in these markets as the mortgage market is greatly developed. Cerutti et al.'s (2015) findings agree with the negative relation between the countries' level of income and the use of macroprudential policies suggested by Claessens (2014).

Before the 2007-2008 crisis, emerging economies used macroprudential tools four times more intensely than advanced ones. However, this ratio has been declining as the crisis triggered the need for macroprudential measures (Claessens, 2014). Moreover, there is an overall increase in the use of macroprudential tools from all countries (Cerutti et al., 2015).

3.2 Empirical evidence

A recent work made by Cerutti et al. (2015) reports a wide cross-country study based on regressions which describes how twelve macroprudential policies were used by a heterogeneous group of 119 countries and the relative impact these measures had on credit and housing market, over a period which spans from 2000 to 2013. The authors' objective was to analyse a set of countries and instruments as broad as possible. Among the 119 countries, 31 were advanced economies, 64 emerging economies, while the remaining 24 were developing countries (the full list of countries, with the relative classification, is available in the source at p. 22).

The twelve macroprudential policies on which the study is focussed are reported in Table 2.

Table 2
Macroprudential tools considered in Cerutti et al. (2015).

Macroprudential tools	Definition
Caps on loan-to-value ratio	Limiting the level of debt that is possible to take in a mortgage to increase the resilience of borrowers and subsequently lenders. Usually, these limits are countercyclically adjusted.
Caps on debt-to-income ratio	Restricting households' leverage. Usually, these limits are countercyclically adjusted.
Dynamic loan-loss provisioning	Requiring banks to hold more provisioning towards loan losses during upward phases of the economy.
Countercyclical capital buffers/requirements	Requiring banks to hold more capital during upward phases of the economy.
Limits on leverage ratio	Requiring banks to meet a maximum on leverage ratio to reduce banking fragility.
Capital surcharges on SIFIs	Requiring SIFIs to hold a higher level of capital as solvency/liquidity problems of these institutions are more likely to cause contagion and systemic problems in the financial system.

Limits on interbank exposures	Restricting the amount of money that banks borrow and lend each other to limit risk of contagion.
Concentration limits	Limiting the assets held by individual borrowers to make them less exposed to external shocks.
Limits on foreign-currency loans	Restricting the level of debt denominated in foreign currency that individuals can take. This reduces risk caused by exchange rate volatility.
Reserve requirements	Increasing reserve requirements that banks must meet. This is aimed at limiting credit growth and may be focused on riskier classes of loans (e.g. foreign-currency loans).
Limits on domestic currency loans	Limiting credit growth through a direct channel.
Levy/tax on financial institutions	Influencing financial institutions activity with taxes to meet the desired level and composition of credit.

Source: Cerutti et al. (2015).

The most used policy was limiting asset concentration, used by about 75% of the countries. In order, this was followed by: limits on interbank exposures (29%), countercyclical reserve requirements (21%), caps on LTV ratio (21%), caps on DTI ratio (15%), limits on leverage ratio (15%), taxes on financial institutions (14%), limits on foreign-currency loans (14%), limits on credit growth (12%), dynamic loan-loss provisioning (9%), countercyclical capital requirements (2%), and capital surcharges on SIFIs (1%).

Cerutti et al. (2015) looked at the effectiveness of macroprudential policies in controlling credit growth. The main results are the following.

First, they found that, on average, macroprudential policies were more powerful than monetary policy in influencing credit growth. However, it must be kept in mind that there may be some flaws in these results. For instance, policy rate may be an imperfect proxy of monetary policy. Other potential flaws are endogeneity and the fact that monetary policy is mainly designed to aim at other objectives.

Second, the authors not only found that macroprudential policies are more used by not-advanced countries, but also that their effectiveness is higher in emerging and developing countries. This may be a consequence of advanced countries' developed financial systems, which present more possibilities of avoidance. Cerutti et al. (2015) used an index called MPI, whose range is from 0 to 12, to measure the extent to which macroprudential policies were used in each country (0 if no policy was used and 12 if all the 12 policies were used). In advanced countries, an increase of one standard deviation in MPI is related to a reduction in credit growth of about 2%. This effect increases when dealing with emerging and developing economies, respectively to 9 and 8 percent. The authors also found that in relatively closed economies macroprudential policies are about twice as effective as in open economies. This may be due to relatively higher circumvention and difficulty to apply macroprudential policies in open economies. Considering both these aspects, it can be argued that macroprudential tools are more effective in emerging and relatively closed economies.

The study continues by analysing the relation between individual macroprudential policies and credit growth, household credit growth, house price growth, and corporate sector credit growth. Regarding overall credit, the only additional result is the lack of complementarities between caps on LTV ratios and limits on DTI ratios. Considering both the results relative to households and the corporate sector, it emerges a negative relation between credit growth and macroprudential policies in both cases, but it is stronger for households. If borrower-based policies (caps on LTV and DTI ratios) and financial institution-based policies are distinguished, borrower-based policies seem more effective, even though the statistical significance of financial institution-based policies is higher. When it comes to analyse the effect that macroprudential policies have on house price growth, a negative relation still exists, but it is statistically not significant. This suggests that is hard to curb real estate bubbles with only macroprudential policies. However, Crowe et al. (2011) showed that the most disruptive real estate bubbles are those associated with high leverage. Thus, as the negative relation between macroprudential tools and credit growth is significant, macroprudential policies can be considered useful in curbing real estate prices. This is especially true for borrower-based policies in advanced countries, and Cerutti et al. (2015) reported that also other papers sustained this argument.

According to Cerutti et al. (2015), caps on LTV and DTI ratios are potentially very effective in reducing credit growth. This is mainly due to their strong effect on household credit, which is a significant share of overall credit. Foreign-currency limits reduce credit growth especially in emerging and developing countries. If corporate credit growth and household credit growth are

separately considered, foreign-currency restrictions are respectively most effective in emerging and advanced countries. The importance of reserve requirements particularly comes out in reducing corporate credit growth in emerging economies. However, Cerutti et al. (2015) could not analyse the effectiveness of reserve requirements in advanced economies as no advanced country in the sample used them. Dynamic provisioning is negatively related to overall credit growth (although such measure has been used almost only in emerging markets), and both leverage and countercyclical capital requirements reduce overall credit in developing countries. Both limits on interconnection among financial institutions and limits on concentration reduces overall credit. Limits on interconnectedness effectively worked in particular in emerging and developing economies.

In conclusion, Cerutti et al. (2015) argued that borrower-based policies have some effectiveness in most countries, while foreign currency-related tools are more effective in emerging economies.

3.3 Empirical evidence in Asia

By looking at Asia, where countries have extensively used macroprudential measures, we may be interested in assessing the effectiveness of macroprudential regulation. Zhang and Zoli (2014) did a regression-based study focussed on Asian countries and both macroprudential policies and capital flow management measures. They considered all major macroprudential and capital flow measures used by 13 Asian countries and 33 other countries across the world since 2000.

Zhang and Zoli (2014) suggested that tightening macroprudential policies, especially those housing-related (e.g. caps on LTV and DTI ratios, loan-loss provisioning, and risk weights requirements), has reduced overall credit growth in Asia. However, this reduction was not very significant: credit growth decreased only by 2% below the peak after six quarters, on average. Tightening macroprudential measures reported some impact also on reducing real estate prices in Asia. Particularly, housing-related tools reduced housing prices by 5% in five quarters. If macroprudential measures in general are considered, this effect is reduced by half.

In Asia, most of the effects caused by capital flow management measures are related to non-resident equity and debt inflows as percentage of GDP. In particular, tightening such measures usually reduced equity inflows, averagely. However, such relation was statistically insignificant. No clear relationship was found between capital flow policies and debt inflows. Capital flows measures also reduced Asian housing prices; notwithstanding, the major effects on the real estate sector are those related to macroprudential tools. The absence of a relation

between Asian credit growth and capital flow tools may be due to the low rate of use of these measures in such countries. Indeed, a relation between capital flow tightening and credit growth has been found for the full sample.

By comparing the effectiveness of policies in Asia with the full sample, some interesting considerations can be derived. In the full sample, housing-related measures were found to reduce by about 2.6% overall credit growth in one year. Instead, in Asia, the same figure is lower (1.5%). However, macroprudential policies revealed as very effective in reducing procyclicality in Asia compared to the other regions. In particular, if procyclicality is measured as the elasticity of credit growth to GDP growth, macroprudential policies reduced procyclicality by 27% in Asia and only by 13% in the other countries of the sample. While in Asia only housing-related measures have been effective in hampering credit growth, in the full sample capital flow measures have been effective as well. No other macroprudential tool has effectively reduced credit growth, both in Asia and in the full country.

A surprising result obtained by Zhang and Zoli (2014) has to do with housing prices. As highlighted above, housing-related measures revealed effective in curbing real estate prices in Asia. However, such relation was not valid in the full sample. This is surprising as other studies (e.g. Cerutti et al. (2015)) found that this relation is valid in other regions as well.

Through a model based on previous literature, Zhang and Zoli (2014) also found that the impact of macroprudential policies on Asian banks' leverage was significant. However, only housing-related policies had a statistically significant impact, whose estimated magnitude is quite small.

Overall, based on Zhang and Zoli's (2014) findings, it may be argued that especially housing-related measures have been effective in reducing credit growth, housing inflation, and banking leverage in Asia. Notwithstanding, such measures contributed to reduce credit growth not only in Asia but also in the full country sample. However, housing-related policies did not have a significant effect on housing prices in the full sample, and other macroprudential policies had no significant effects both in and outside Asia. Thus, the authors sustained that macroprudential instruments are potentially effective in mitigating financial risk to some extent.

Considering that Zhang and Zoli (2014) and Cerutti et al. (2015) found that macroprudential policies have different effects in countries with different characteristics, it is likely that country specificity influences effectiveness of macroprudential policies.

As the feedback received in different countries is heterogeneous but overall the results are encouraging, it is clear how important researches on macroprudential policies are.

3.4 A model with house price booms

Conducting cross-country studies based on regressions is not the only way to assess macroprudential policies. Another approach is using macroeconomic models and simulating various shocks. In particular, there is a growing literature which use Dynamic Stochastic General Equilibrium (DSGE) models to assess the effectiveness of a combination of monetary and macroprudential policies.

Since real estate bubbles are relevant source of shocks, some studies are focused on these events. Kannan et al. (2009) used a DSGE model to assess how monetary and macroprudential policies react to productivity and financial shocks during a real estate boom. Their model is made of several elements. There are households who borrow, save, and decide how much to spend in housing and nondurable goods. There are financial intermediaries that take deposits and lend money to borrowers, charging a spread calculated according to borrowers' net worth. The charged lending rate is a function of the policy rate, LTV ratios, the mark-up charged, and macroprudential instruments. The conditions of the credit market are not fixed. In both sectors (durable and nondurable goods), prices are sticky in the short run. Moreover, other forms of inertia caused by habits and switching costs are assumed in consumption and housing investment. There are costs also for workers willing to shift from producing consumable goods to building houses. All these conditions introduce frictions and adjustment costs in the model, making it more realistic. However, for simplicity, the economy is assumed to be closed and there is no capital involved in the production of houses and nondurable goods. The model constructed grasps some features of contemporary economies but it does not fit to any specific one.

In this model, the authors introduced two policies available to policymakers: i) monetary policy, and ii) macroprudential policy.

After calibrating the model, Kannan et al. (2009) examined how the modelled economy reacted to different shocks under different policy regimes. In particular, the four policy regimes were: i) a basic Taylor rule, which requires higher policy rates as the output gap and the difference between inflation rate and target inflation rate rise, ii) a Taylor rule in which policy rate also directly reacts to nominal credit growth, iii) a regime that is like the second one but combined with a macroprudential tool which reacts to nominal credit growth, and lastly iv) a policy regime which is like the third one but with optimised weights on each factor.

Financial shock: First, a financial shock is simulated by Kannan et al. (2009). Such shock consists of a relaxation in lending standards which causes a reduction in lending rates by 25

basis points in the first policy regime. In the basic scenario, this change activates a mechanism summarised in the following steps:

- i. Reduction in lending rates;
- ii. lower lending rates foster housing investments;
- iii. increasing residential investments foster housing demand, which in turn leads to rising housing prices;
- iv. as house prices increase, collateral values increase as well, leading banks to lower lending rates. Thus, the shock feeds itself and loans increase;
- v. as higher level of credit fosters demand for both durable and nondurable goods, CPI (Consumer Price Index) inflation increases;
- vi. higher CPI inflation rates push Central Banks to set higher lending rates;
- vii. higher lending rates put a downward pressure on inflation, bringing back financial conditions to normality.

The second policy regime, reacting directly to credit growth, responded better than the standard Taylor rule to the financial shock, leading to less volatility in output and inflation. The standard Taylor rule's reaction was too weak and did not hamper enough housing investment. Nonetheless, the third regime, which includes a macroprudential tool, reacted even better.

Productivity shock: Another shock tested by Kannan et al. (2009) is a productivity one. This shock was designed as an increase in productivity of nondurable goods. In the case of the standard Taylor rule, this is the process started by such shock:

- i. Increase in productivity in the nondurable goods sector, which causes an increase in output that fosters demand in both durable and nondurable good sectors because of higher income expectations;
- ii. housing boom: housing investment, house prices, and credit demand increase;
- iii. increase in consumption and low CPI inflation lead to lower deposit and lending rates, fostering again credit growth;
- iv. as inflation gets higher (because of higher credit), lending rates increase, bringing back the economy to the steady-state level.

The results are quite surprising. According to the model, the standard Taylor rule was the most appropriate regime. When policies that directly react to credit growth are introduced, the reaction becomes too intense and produces higher volatility of inflation and output gap, destabilising the economy.

These results highlight how important is understanding which shock is impacting the economy. Moreover, they show that policymakers may need some discretion before applying macroprudential tools, especially because in the first phases of both shocks the real estate and the credit market behave similarly (Kannan et al., 2009).

To sum up, the study sustains that macroprudential tools are potentially helpful to reduce volatility caused by financial shocks but not by productivity ones.

Conclusion

History has shown that financial stability is fundamental to avoid financial and economic crises, which can be very dangerous for the well-being of every person. Empirically, macroprudential policies reported encouraging results in sustaining financial stability. Particularly, such tools are useful in reducing systemic risk, both over time (time dimension) and across the system at a certain point in time (cross-sectional dimension).

Macroprudential tools can be useful in reducing procyclicality in the financial system. During periods of economic upturns, lending institutions may loosen lending criteria, giving money to less creditworthy borrowers and building-up systemic risk. Instead, during downward phases of the economy financial institutions are usually less prone to lend money as economic activity faces obstacles and borrowers suffer losses. However, this hampers the economy from recovering. Macroprudential policies may reduce such issues by imposing tighter lending and prudential criteria during upward phases of the financial cycle and looser criteria during downward phases. This not only aims at reducing the volatility of the financial cycle over time but also helps in building resource buffers that will be available to be released during crashes, mitigating the impact.

Macroprudential policies have several pros when compared to fiscal and monetary policies. For instance, macroprudential tools are more direct and focused, better targeting the source of financial instability without impacting other elements in the economy with no real need. This may result in lower costs when policies are implemented.

I retain that macroprudential tools may be particularly useful in the Euro-zone. Macroprudential measures tailored to the characteristics of each country may help to sustain the economy, contrasting the rigidity introduced by the common currency. However, considering that macroprudential tools interact with other policies, such tools must consider how they interact with the monetary policy of the European Central Bank and follow some supranational guidelines.¹

Macroprudential measures have not only pros but also cons when compared to other policies (e.g. potential circumvention) and interact with other policies as well. Thus, macroprudential policies can be more effective in reducing systemic risk if implemented while bearing in mind not only their effect on financial stability but also all the other effects on the economy and the interaction with other policies.

¹ A system of financial supervision which combines supranational and national authorities is already in place in Europe (Angelini, 2015).

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Appendix

Appendix A

Macroprudential tools and relative classification.

Policy Tool			
Restrictions related to borrower, instrument, or activity	Restrictions on financial sector balance sheet (assets, liabilities)	Taxation, levies	Other (including institutional infrastructure)
Expansionary phase Time varying caps/limits/rules on: - DTI, LTI, LTV - margins, hair-cuts - lending to sectors - credit growth	Countercyclical capital requirements, leverage restrictions, general (dynamic) provisioning - mismatches (FX, interest - reserve requirements	Levy/tax on specific assets and/or liabilities	- Accounting (e.g., varying rules on mark to market) - Changes to compensation, market discipline,
Contractionary phase: fire-sales, credit crunch Adjustment to specific loan-loss provisioning, margins or hair-cuts (e.g., through the cycle, dynamic)	Countercyclical capital requirements, general (dynamic) provisioning Liquidity limits (e.g., Net Stable Funding Ratio, Liquidity Coverage Ratio)	Levy/tax (e.g., on non-core liabilities)	- Standardized products - OTC vs. on exchange - Safety net (Central Bank/Treasury liquidity, fiscal support)
Contagion, or shock propagation from SIFIs or networks Varying restrictions on asset composition, activities (e.g., Volcker, Vickers)	Capital surcharges linked to systemic risk Institution-specific limits on (bilateral) financial exposures, other balance sheet measures	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: table retrieved from Claessens et al. (2013).

Appendix B

Monetary policy effects on financial stability and macroprudential tools to contain side effects.

Source of financial instability	Channel	Predicted effect when $\uparrow r$ (\uparrow improves stability)	Tools to contain side effects
Borrowing constraints	Balance sheet	\uparrow	Caps on LTI or DSTI ratio
	Default	\downarrow	
Risky behaviour of financial institutions	Risk-taking	\uparrow	Capital buffers, leverage ratio
	Risk-shifting	\downarrow	Net stable funding ratio, capital buffers
Externalities through aggregate prices	Asset price	\uparrow	Limits on LTV ratio
	Exchange rate	\downarrow	FX reserve requirements, limits on FX lending, Levy on FX non-core liabilities

Source: table retrieved from Nier and Kang (2016).