

Monetary and macroprudential policies – exploring interactions¹

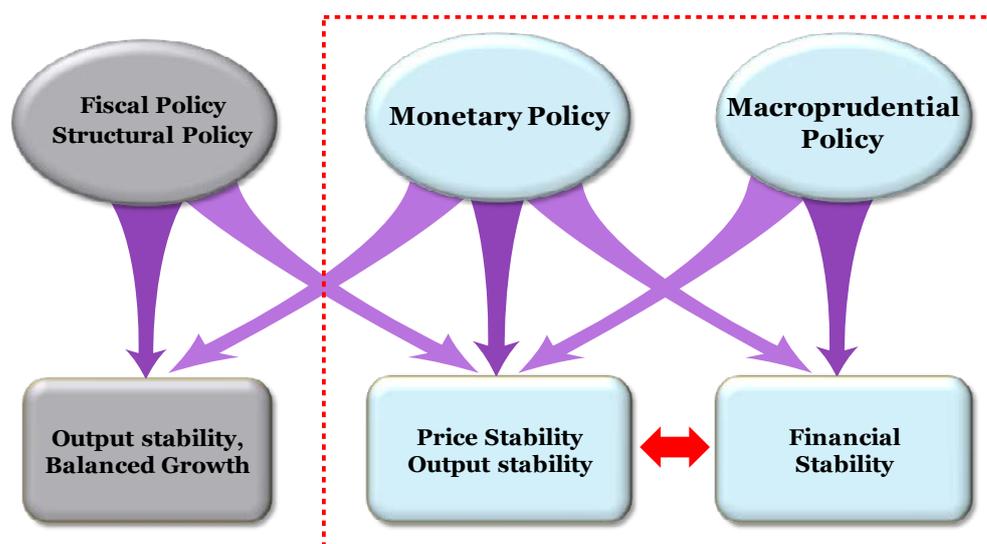
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1. Introduction

This article explores the interactions between monetary policy and macroprudential policy. The starting point is that monetary policy and macroprudential policy pursue different primary objectives – price (and output) stability for monetary policy, and financial stability for macroprudential policy. Nonetheless, the conduct of each policy can have “side effects” on the objectives of the other (Figure 1). We argue that, in the presence of such side effects, effective monetary and macroprudential policies complement each other, yielding superior outcomes to a world where monetary policy – or macroprudential policy – is pursued on its own and in the absence of the other policy. In particular, we explore the following three arguments.

Interactions among policies and objectives

Figure 1



- First, monetary policy can have a range of “side effects” on financial stability. However, macroprudential policy can attenuate these side effects, providing more room for maneuver for monetary policy to pursue its primary objective.

¹ The usual disclaimer applies: this article reflects the views of the authors and should not be represented as stating the views of the International Monetary Fund, its Management or its Executive Board.

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- Second, the tightening of macroprudential policy tools can have dampening “side effects” on output. However, monetary policy can counter these effects, by adding accommodation at the margin, as long as monetary policy is effective.
- Third, macroprudential policy can build buffers that can be relaxed in periods of financial stress. Such a policy can help keep open the transmission of monetary policy, preserving the effectiveness of monetary policy in the event of such stress.

For each of these three “interactions”, we also explore important empirical questions. Can macroprudential policy contain monetary side effects on financial stability effectively? How strong are the side effects of macroprudential policy on output? How effective is a relaxation of macroprudential buffers in periods of stress? This article draws on the results first reported in IMF (2013a) and IMF (2013b), and on further analysis conducted for this article on the effects of macroprudential measures for the sample of 36 countries over the period 2000–11 that was used in IMF (2013b).⁴

2. Side effects of monetary policy for financial stability

It is widely recognised that monetary policy can have side effects on financial stability. Most often, these days commentators focus on the potential for policy rates that are “low for too long” to result in a build-up of financial imbalances. What is sometimes less well recognised is that there can be multiple effects of policy rates on financial stability, with the sign and size of the net effects uncertain and depending on the stage of the financial cycle and capital account openness.

This section therefore starts by offering a brief taxonomy of the side effects that monetary policy can have on financial stability. We then argue that where the effects of monetary policy on financial stability are undesirable, macroprudential policy can attenuate them. Several effects can be identified that work through the behavior of borrowers, the risk-seeking behavior of banks and asset prices and exchange rates (Table 1).

Borrower balance sheets channel. As is well-known, monetary easing stimulates the demand for credit. Since lower interest rates may increase both debt affordability and the prices of assets offered as collateral, low interest rates can induce borrowers to take on more leverage, an effect sometimes termed the “borrower balance sheet channel” of monetary policy. A sizable empirical literature has found that lower interest rates lead borrowers to take on more debt (eg Bernanke, Gertler and Gilchrist, 1996; Jiménez et al, 2012) while a contractionary monetary policy lowers the value of collateral and thus reduces the availability of new loans to borrowers (eg Ciccarelli et al, 2010).

Default channel. A tightening of interest rates can adversely affect borrowers’ credit quality, leading to higher default rates that can precipitate a crisis (Allen and Gale, 2000; Illing, 2007; Goodhart et al, 2009). This “default channel” of tighter monetary policy works through several mechanisms. Tighter interest rate policy increases debt repayment burdens, especially for variable-rate borrowers. By affecting economic activity, rate increases also reduce income flows and loan repayment capacity more generally. Increases in rates can finally lower borrower net worth, thereby curtailing

⁴ A more extensive discussion is forthcoming in an IMF Working Paper by the same authors.

access to short-term credit and increasing the risk of default on existing debt (Gertler and Gilchrist, 1994).

Monetary policy effects on financial stability and tools to address the effects Table 1

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: IMF staff.

Risk-taking channel. Low interest rates can boost banks' capital ratios, leading intermediaries to expand their balance sheets, increase leverage and reduce efforts in screening borrowers (Borio and Zhu, 2008; Dell'Ariccia et al, 2015; Jiménez et al, 2014). Since low interest rates also reduce the likelihood of borrower defaults, this can lead measured risks to go down and risk-weighted capital to go up, in turn creating incentives to take more risk (Adrian and Shin, 2012). These effects are often argued to be worse if monetary policy is (too) accommodative for too long.

Risk-shifting channel. Since banks' funding is short-term but their lending is long-term, increases in policy rates can reduce intermediation margins, and lead lenders, especially poorly capitalised intermediaries, to seek more risk (Bhattacharya, 1982). This channel may be stronger just ahead of a crisis, when intermediary leverage is already high and competition limits the pass-through of policy rates to lending rates (Dell'Ariccia et al, 2015). More generally, where increases in short-term rates lead to a flattening of the yield curve, this can lead banks to seek risk in order to maintain profits (Merrouche and Nier, 2010).

Asset price channel. Low interest rates can increase asset prices, including real estate prices, which can trigger further increases in leverage and asset prices. This exposes the system to financial stress when asset prices fall; an effect known as the "financial accelerator mechanism" (Bernanke and Gertler, 1989). However, evidence is mixed on whether low rates cause asset price booms, and the effects, if any, are often found to be quite small. For instance, Del Negro and Otrok (2007) and Bean et al (2010) find the impact of accommodative monetary policy on house prices to be small relative to the overall increase ahead of the global financial crisis in the United States.

Exchange rate channel. In emerging markets, and small open economies more generally, interest rate increases can lead to policy rate differentials with advanced economies, which can lead to carry trades and attract capital inflows, thereby appreciating the currency (Hahm et al, 2012). An appreciating exchange rate can in turn create incentives for excessive leverage and borrowing in foreign currency and

lay the ground for exchange rate externalities during the depreciation phase (Bruno and Shin 2012; Hahm et al, 2012).⁵

The intensity of these effects can vary with the financial cycle. As financial imbalances build up, low policy rates reduce current defaults, but can induce banks to make riskier loans and increase leverage. When policy rates are increased close to the peak of the financial cycle, this can induce risk-shifting and borrower defaults. The strength of the effects can also depend on financial structure and capital account openness. For instance, in small open economies, domestic monetary policy may have a weaker influence over domestic long-term rates and asset prices when these are driven strongly by capital flows, but exchange rate externalities become more important (Rey, 2013).

Where the effects of monetary policy on financial stability are expected to be undesirable, this can create conflicts between financial and price stability objectives. Appropriate macroprudential policies can attenuate these side effects, thereby reducing policy dilemmas and creating additional “room for maneuver” for monetary policy.

For most of the channels discussed above, a range of specific macroprudential instruments may reduce the effect when brought in ex ante (see Table 1 and also IMF (2013b)). For instance, where loose monetary policy contributes to a build-up of household debt and asset prices, loan-to-value (LTV), loan-to-income (LTI) or debt-service-to-income (DSTI) limits can contain these dynamics, and stressed DSTI limits can reduce the impact of increases in interest rates on household default rates. In open economies where interest differentials lead to borrowing and lending in foreign currency, macroprudential tools such as the macroprudential levy introduced in Korea or constraints on FX lending can aim to contain the resulting risks for systemic stability.

Conceptually, therefore, it appears feasible for macroprudential policy to attenuate the side effects of monetary policy. However, there is an empirical question as to whether macroprudential policy is able to contain side effects successfully when the monetary policy stance gives rise to side effects for financial stability that are very strong. In particular, when monetary policy is very accommodative, this may give rise to incentives to borrow at low rates that are difficult for macroprudential policy to fully contain, since attempts to control credit can be circumvented.

The existing evidence on this issue is still scarce. Aiyar, Calomiris, and Wieladek (2014) find that tightening monetary policy and increasing banks’ capital requirements both have negative effects on bank credit supply, and that there is no interaction between changes in monetary policy and changes in capital requirements. That is, the marginal effect of changes in capital requirements on credit supply is independent of the monetary policy stance. On the other hand, Tressel and Zhang (2016) find that LTV constraints tend to be *more* effective in containing credit growth and house price appreciation when monetary policy is loose.

⁵ Given low policy rates in advanced economies, a number of emerging market economies (eg Brazil, Peru and Turkey) have recently been struggling with this policy dilemma. However, this channel was also relevant ahead of the crisis. In Iceland, high interest rate differentials fuelled capital inflows via the banking sector and led to a sharp appreciation and overheating of the economy. As the inflation targeting central bank raised policy rates in response, it attracted even more capital inflows, generating an adverse feedback loop (Jonsson, 2009). Many central and eastern European economies also faced this dilemma before the crisis (IMF, 2013b).

We examine the issue using a dataset of macroprudential measures that is based on the 2010 IMF survey (Lim et al, 2011) and expanded to include measures taken over the 2000–11 period by 36 countries. We run panel regressions on quarterly data to examine the effect of three types of macroprudential measures (capital buffers, LTV/ DSTI limits and reserve requirements) on credit growth and asset (house) price growth.

We find that a tightening of any of the three macroprudential measures has measurable effects on credit growth, and that capital and LTV constraints in particular have statistically significant effects on house price growth (Table 2). We then interact the variable for macroprudential measures with a dummy variable for the monetary policy stance that indicates whether monetary policy is tight or loose when compared with the country-specific median. We find that the interaction terms are statistically insignificant (Table 2). In other words, the marginal effect of tightening these macroprudential instruments on credit growth or asset prices is unaffected by whether the prevailing monetary policy stance is tight or loose, which is consistent with the results for capital requirements reported by Aiyar, Calomiris and Wieladek (2014).

Effects of macroprudential tools and interaction with monetary policy^{1, 2}

Table 2

Tightening stance	Capital Requirement (CR)	Limits on LTV Ratio (LTV)	Reserve Requirement (RR)	Interaction terms		
				MP*CR	MP*LTV	MP*RR
Credit Growth						
House Price Growth						

¹ The table summarises the results from a panel regression analysis with either credit growth rate (y-o-y) or house price inflation (y-o-y) as a dependent variable and the following variables as independent variables: macroprudential instrument indices, an interaction term between the macroprudential indices and monetary policy stance, and other control variables (ie lagged GDP growth rate and nominal interest rates). Time- and country-fixed effects dummies are included. Quarterly data of 36 economies are used, including 21 emerging market economies and 15 advanced economies. ² Green, orange, and yellow colours in each cell indicate significance at 1%, 5%, and 10% level, respectively.

Source: IMF staff estimates.

In sum, in its transmission, monetary policy can have a range of side effects on financial stability. Several channels may be at work, operating simultaneously and with their strength varying with the stage of the financial cycle and capital account openness. Where these side effects are expected to be undesirably strong, well targeted macroprudential policies can attenuate these effects in principle. While the evidence is still scarce, our preliminary results suggest that the marginal effect of macroprudential policy tools is not affected materially by whether they operate in an environment in which the monetary policy stance is tight, or loose.

3. Effects of macroprudential policies on output – in financial upturns

When macroprudential policies are tightened, the intended effect is to increase the resilience of the financial system and to contain procyclical feedback between asset prices and credit that can result in unsustainable increases in leverage, debt burdens and volatile funding (IMF, 2013c). However, tightening macroprudential policy tools can also have some dampening effects on output. A priori, the strength of the effects should depend on the specific macroprudential tool being used, as well as financial and economic conditions.

Existing research suggests that tools that work on intermediary balance sheets, such as tighter capital and provisioning requirements, increase resilience but will often have only weak effects on loan rates and the volume of credit (IMF, 2013b; BIS, 2010). The effects on credit and output can be greater when an aggressive tightening forces intermediaries to cut lending, or when tightening occurs in periods of financial stress, so that it is more difficult for intermediaries to find equity capital.⁶ For LTV and DSTI constraints, in contrast, the effects on output should be expected to be greater, since these tools are designed to have a more direct effect on the amount of credit received by households.

Evidence first reported in IMF (2013b) confirms that the short-run effects of macroprudential policies depend on the tool considered (Table 3). There is strong evidence that adjustable LTV ratios do affect both the composition of output as well as overall output growth in a measurable way. By contrast, we find that the effects of capital and reserve requirements on output are not statistically significant, suggesting only mild effects on aggregate demand. Overall, this suggests that the effect of a tightening of macroprudential policy tools on output depends on the type of tool considered, with LTV ratios exerting stronger effects than other macroprudential tools.

Effects of macroprudential tools on output^{1, 2}

Table 3

	Capital Requirement	Limits on LTV Ratio	Reserve Requirement
Credit Growth	Orange	Orange	Yellow
House Price Growth	Yellow	Orange	White
Output Growth	White	Yellow	White

Notes: The table summarises the results from panel regression analyses with credit growth rate (y-o-y), house price inflation (y-o-y), and GDP growth rate (y-o-y) as a dependent variable and the following variables as independent variables: macroprudential instrument indices, and lagged terms of GDP growth rate and nominal interest rates. Time- and country-fixed effects dummies are included. Quarterly data of 36 economies are used, including 21 emerging market economies and 15 advanced economies.

Source: IMF staff estimates.

⁶ For reserve requirements, the available existing evidence suggests that their effects on credit can be sizable, but the output effects are still measured to be small, and have been argued to be ambiguous in theory (Glocker and Towbin, 2012).

As long as monetary policy is effective, any undesirable effect on output can be offset by more accommodative monetary policy to reach the price stability objective. Complications may arise, however, when monetary policy is constrained and unable to counter the effects on output. This can happen when capital requirements are tightened in financial downturns – that is, when the imposition of the macroprudential measures is ill-timed – or when monetary policy has already reached its lower bound, and thus may be unable to counter effectively the deleveraging effects set off by increases in capital requirements. Trade-offs can also arise in currency unions and under pegs, where, more generally, monetary policy is unable to respond to the imposition of macroprudential policy tools in a manner that would cushion their effects on output. In these cases of constraints on monetary policy, it will be particularly important for tools such as LTV, LTI and DSTI constraints to be tightened gradually, and in a manner that tries to avoid large effects on output.

4. Effects of macroprudential policy – in financial downturns

Macroprudential policy buffers can be helpful for the conduct of monetary policy in financial downturns. When macroprudential buffers are available in times of financial stress, they can be released in order to maintain the provision of credit to the economy, thereby reducing the effects of financial shocks on output, and complementing monetary easing that would typically occur in such stressed conditions. In particular, macroprudential buffers can help keep monetary transmission open under such conditions, especially when buffers can be relaxed.

For instance, in times of financial stress, monetary easing may not transmit to increased bank lending when banks are weighed down by non-performing loans that deplete voluntary capital buffers over and above the microprudential minimum. Banks may then be reluctant to expand their balance sheets in response to monetary accommodation since this will further reduce capital ratios, potentially leading banks to hit the microprudential minimum ratios that trigger supervisory corrective action. By contrast, where macroprudential capital buffers have been built up, they can be released in periods of stress, and thereby made available to absorb losses from increases in non-performing loans. This makes it less likely that banks will pull back on credit, and can lend greater potency to the transmission of monetary policy accommodation that seeks to stimulate the provision of credit in order to boost output.

Similarly, after a fall in house prices, high-LTV borrowers may be unable to refinance their loans since the principal loan amount exceeds their property value. These borrowers can then not take advantage of lower mortgage rates that an easing of monetary policy may help bring about (Geanakoplos, 2010). A more stringent LTV constraint prior to going into the bust may mitigate this and help strengthen the transmission of monetary policy after prices correct. The transmission of accommodative monetary policy to housing markets can be further enhanced when macroprudential policymakers relax LTV constraints for new loans and refinancing by removing the tightening that occurred ahead of the bust, since this means that a greater share of potential borrowers is able to take advantage of the low mortgage rates that monetary policy easing may bring about.

By helping monetary policy transmission, such active use of macroprudential policy can reduce the need for monetary policy to respond aggressively to adverse financial shocks. It can thereby reduce the risk that monetary policy runs into the lower bound on nominal interest rates and has to resort to unconventional policy measures, such as quantitative easing or negative policy rates.

The benefits of a relaxation of macroprudential policy buffers in stressed times raise the issue as to whether such a relaxation of buffers can be effective. Conceptually, and in general, the effect of a variation of a macroprudential constraint on credit will be the stronger the more its prevailing setting acts as a binding constraint on the provision of credit.

- For capital tools, constraints may be more likely to be binding in bad times, when earnings are subdued and raising new equity is difficult. On the other hand, market discipline may impose a tighter constraint in stressed conditions when buffers are not regarded as sufficient to ensure resilience, thereby reducing the effect on credit of a relaxation of capital tools.
- For LTV and DSTI tools, the effects on mortgage credit from a relaxation will depend on the share of existing borrowers that is constrained by the effect of falling house prices on their ability to refinance at prevailing LTV ratios, and on the new demand for houses that can be unlocked by a relaxation of LTV and DSTI caps. It will also depend on the extent that banks will pass on the relaxation of the regulatory caps to their borrowers.
- In the presence of liquidity stress, liquidity tools are likely to become binding and a relaxation of liquidity tools should then help sustain credit provision and avoid fire sales in such periods. A relaxation of requirements for banks to hold liquid assets can make these assets available to meet withdrawals. Requirements for long-term funding may also become difficult to meet during stressed conditions, and a relaxation can then help avoid fire-sales.

The existing empirical literature on the effect of a relaxation of macroprudential policy tools is scarce, in part due to the fact that instances of the relaxation of macroprudential policy measures are still rare. Jiménez et al (2013) find that episodes of a relaxation of the dynamic provisioning requirements in Spain had a greater effect on credit and output than the tightening of the provisioning regime. Igan and Kang (2011) show that the response of house prices was less visible when LTV and DSTI caps were loosened in Korea, but that a loosening and tightening of DSTI limits had symmetric effects on mortgage loans.

We examine whether the effects of macroprudential policy instruments are symmetric – that is, the strength of effects of tightening on credit growth is similar to that of loosening – or asymmetric – that is, there are differences in the strength of these effects, using our cross-country panel.

We find that the effect of tightening and loosening capital requirements on credit growth and house price growth is largely symmetric (Table 4). The size of the effects on credit from a tightening and a loosening of LTV constraints are similar in magnitude, even though the effect of a tightening of LTV limits on house prices appears somewhat stronger than that of a loosening. Conversely, we find that a loosening of reserve requirements has a stronger effect on credit growth than a tightening of these requirements. Overall, therefore, the evidence is not inconsistent with the assumption of largely symmetric effects of a loosening and a tightening of

macroprudential tools on credit growth, even if the effects are hard to quantify with confidence given the relative scarcity of loosening episodes to date.

Effects of macroprudential tools: symmetric or asymmetric^{1, 2}

Table 4

	Capital Requirement (CR)	Limits on LTV Ratio (LTV)	Reserve Requirement (RR)	Difference: Loosening - Tightening		
				CR	LTV	RR
Credit Growth						
House Price Growth						

¹ The table summarises the results from a panel regression analysis with either credit growth rate (y-o-y) or house price inflation (y-o-y) as a dependent variable and the following variables as independent variables: macroprudential instrument indices, an interaction term between the macroprudential indices and a dummy of macroprudential policy stance (tightening or loosening), and other control variables (ie lagged terms of GDP growth rate and nominal interest rates). Time- and country-fixed effects dummies are included. Quarterly data on thirty six economies are used, including 21 emerging market economies and 15 advanced economies. ² Green, orange, and yellow colors in each cell indicate significance at 1%, 5%, and 10% level, respectively.

Source: IMF staff estimates.

In sum, well-calibrated macroprudential policies can contain systemic risks ex-ante and help buffer shocks, thereby easing the conduct of monetary policy in times of financial stress. A loosening of macroprudential policy constraints is likely to be the more effective, the more binding is their prevailing setting on the provision of credit to the economy. Empirically, we find that the effects of relaxation on credit have been no less strong than the effects of a tightening of tools, supporting the idea that macroprudential policy can be a useful complement to monetary policy easing in times of financial stress. Ultimately, however, when a crisis strikes both monetary and macroprudential policies need to be complemented by lender of last resort policies, to cushion the impact of liquidity shocks, and resolution policy, to ensure the repair of financial sector balance sheets.

5. Conclusions

Overall, we find that there are strong complementarities between monetary and macroprudential policies, such that where both monetary and macroprudential policies are used actively, overall policy effectiveness is enhanced relative to a world in which any one policy acts without the support of the other. Specifically, we argue that three such interaction effects are important in practice.

- First, monetary policy can have a range of “side effects” on financial stability. However, macroprudential policy can attenuate these side effects, providing more room for maneuver for monetary policy to pursue its primary objective.
- Second, the tightening of macroprudential policy tools can have dampening “side effects” on output. However, monetary policy can counter these effects, by adding accommodation at the margin, as long as monetary policy is effective.

- Third, macroprudential policy can build buffers that can be relaxed in periods of financial stress. Such a policy can help keep open the transmission of monetary policy, preserving the effectiveness of monetary policy in the event of such stress.

These interactions strengthen the case for a leading role of central banks in the emerging macroprudential policy frameworks (see eg Nier (2011), IMF (2013a) and IMF (2013c)). In particular, they imply that central banks have strong incentives to ensure macroprudential policy is pursued effectively. However, and as discussed further in IMF (2013a), safeguards are also needed to ensure that each policy function remains focused on its own primary objective.

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