

# What Can We Learn from the Implementation of Monetary and Macroprudential Policies: A Systematic Literature Review

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## Abstract

*The emergence of macroprudential policies, implemented by central banks as a means of promoting financial stability, has raised many questions regarding the interaction between monetary and macroprudential policies. Given the limited number of studies available, this paper sheds light on this issue by providing a critical and systematic review of the literature. To this end, we divide the theoretical and empirical studies into two broad channels of borrowers - consisting of the cost of funds and the collateral constraint - and financial intermediaries - consisting of risk-taking and payment systems. In spite of the existing ambiguity surrounding coordination issues between monetary and macroprudential policies, it is argued that monetary policy alone is not sufficient to maintain macroeconomic and financial stability. Hence, macroprudential policies are needed to supplement monetary. Additionally, we find that the role of the exchange rate is critical in the implementation of monetary and macroprudential policies in emerging markets, whilst volatile capital flows pose another challenge. In so far as how the arrangement of monetary and macroprudential policies varies across countries, key theoretical and policy implications have been identified.*

Keywords: monetary policy, macroprudential policy, capital flows, payment system, exchange rate, systematic literature review

JEL Classification: E42, E44, E52, E58, G18

## 1 Introduction

The prolonged effect of the recent global financial crisis has taught policymakers a valuable lesson, particularly central banks around the world, in their efforts to find a way to stabilise the economy and prevent the crisis from reoccurring. The emerging economic environment is believed to be subject to surges of financial imbalances that can potentially lead to economic stagnation and disinflation. A relatively new approach has been adopted, which is to implement both monetary and macroprudential policies to stabilise the economy. In this context, monetary policy is used as a means of achieving price stability; macroprudential policies predominantly focus on financial stability, whereas microprudential policy targets the safety and soundness of individual financial institutions.

The introduction of the new stabilisation policies raises a number of questions relating to their effectiveness when interacting with monetary policy. For instance, it would be interesting to examine how macroprudential and monetary policies respond to technological/financial shocks, or to identify the transmission channels through which these policies interact to withstand such shocks. It would also

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be interesting to establish the extent to which monetary and macroprudential policies need to be coordinated.

In spite of the growing number of studies in this area, there is very little support for the macroprudential policy framework. In a broader sense, we lack a conceptual mechanism relating the implementation of monetary and macroprudential policies to the real economy, and to the financial system (International Monetary Fund, 2013). A comprehensive framework of monetary and macroprudential policy is required in order to provide some guidance to policymakers as to how they might achieve their objectives and enhance the transparency and accountability of the central bank.

Moreover, in this context, it is argued that the payment system plays a significant role in promoting financial stability. The importance of payment system to the financial stability can be observed from how the central banks define the financial stability. Taking the definition of financial stability from the Bank of England as an example, which states financial stability is “the consistent supply of the vital services that the real economy demands from the financial system (which comprises financial institutions, markets and market infrastructures). Those services are: providing the main mechanism for paying; for goods, services and financial assets; intermediating between savers and borrowers, and channelling savings into investment, via debt and equity instruments; and insuring against and dispersing risk” (Bank of England, 2017, p. 32). In other words, the payment system is part of the financial system that needs to be preserved in order to enhance the efficiency of the financial markets and the financial system as a whole, hence boosting consumer confidence as well as enhancing economic interaction and trade in goods and services (Hasan *et al.*, 2013). It is therefore important that we incorporate into our discussion on monetary and macroprudential policies the payment system as well.

The right policy mix between monetary and macroprudential policies varies across countries. In the case of emerging markets, any external shocks - coupled with domestic shocks - affecting the financial system may disrupt the monetary transmission mechanism. In this context, capital flow volatility, which may be transmitted to the credit or exchange rate markets or both, needs to be taken into account.

These premises raise fundamental questions about how a central bank promotes stability in the macroeconomy, specifically, how monetary and macroprudential policies interact, how the payment system relates to monetary and macroprudential policies, and what the impact of capital flows on monetary and macroprudential policies is.

To address the aforementioned questions, this paper provides a critical systematic review of the literature on the interaction of monetary and macroprudential policies. Our objective is to identify the current policy debate in order to assist researchers as well as policymakers in identifying the relevant research questions to support policy design and implementation for the interaction of monetary and macroprudential policies.

Based on the results of the systematic search, 125 articles are assessed to tackle the initial review question<sup>3</sup>. After obtaining the relevant data and identifying the emergent themes and sub-themes, the articles reviewed in this section are classified into three broad categories. The first category discusses the mechanisms in which monetary and macroprudential interact. The second category includes papers which discuss the open-economy setting, which incorporates the role of the exchange rate and the impact of capital flows. The final category includes papers which discuss a framework of capital control measure following the current experience of the emerging markets. Although some aspects of these categories may not be distinct but partially overlap, each represents the conceptual framework of how monetary policy connects to macroprudential policies, where financial intermediation has been identified as one of the critical elements in this framework of the policy mix (Bernanke et al., 1999; Goodfriend and McCallum, 2007).

This review makes three specific contributions. First, to the best of our knowledge, this is the first paper that utilises a systematic literature review approach in this area; secondly, it provides a comprehensive analysis of the theoretical foundations of the interaction of monetary and macroprudential policies; and thirdly it offers a comprehensive analysis of how monetary and macroprudential policies have been implemented in both advanced economies and emerging markets.

The rest of the paper is organised as follows: section 2 touches on the elements linking monetary and macroprudential policies. Section 3 highlights the role of the exchange rate in the framework of monetary and macroprudential policies whilst section 4 assesses the implications of capital flow. Finally, section 5 provides some concluding remarks and ideas for future research.

## **2 Interlink between Monetary and Macroprudential Policies**

Broadly speaking, all the reviewed studies build their explanation of the interaction of monetary and macroprudential policies through the role of the financial sector in amplifying shocks to the economy. Previously, the financial sector was abandoned by mainstream business cycle models (see Christiano *et al.* (2005) and Smets and Wouters (2007) for example). However, the recent global financial crisis has delivered a very blunt message regarding how financial shocks may have implications for the economy. What we observe from all the reviewed studies is that the financial shocks affect the borrowers' side by limiting their credit eligibility, which in turn reduces credit demand. At the same time, financial shocks also affect the financial intermediaries, particularly through their balance sheet, which in turn affects their credit supply.

These two entities (borrowers, lenders/financial intermediaries) form the conduit through which the interlinking mechanism between monetary and macroprudential is explored. By virtue of the latter, we classify the studies we have reviewed accordingly, i.e. borrowers' cost of funds and collateral constraint mechanism on the borrowers' side, and balance sheet, risk appetite and payment system on

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<sup>3</sup> Details of the systematic literature review methodology can be found in Appendix A.



Study	Main Questions	Channel/Mechanism	Main Conclusion
Iacoviello (2005)	How can financial frictions explain the aggregate time-series evidence and be used for monetary policy analysis?	Collateral constraint	The collateral constraint amplifies demand shocks but stabilises supply shocks to the economy. Monetary policy which reacts to asset prices does not give any significant welfare gain.
Rubio and Carrasco-Gallego (2014)	What are the implications of a macroprudential loan-to-value tool for business cycles, financial stability, and welfare, and what are those of its interaction with monetary policy?	Collateral constraint	The combination of macroprudential and monetary policies achieves a more stable financial situation and macroeconomy. Welfare is improving in the case of a non-cooperating situation between monetary and macroprudential policies.
Brzoza-Brzezina et al. (2015)	What is the impact of the introduction of occasionally binding constraints (OBC) into models with financial frictions and macroprudential policy?	Collateral constraint	A large macroprudential tightening can have a much stronger impact on the economy than a loosening of the same size.
Quint and Rabanal (2014)	What is the optimal mix of monetary and macroprudential policies in an estimated two-country model of the euro area	Collateral constraint	Macroprudential rule would help macroeconomic stability, enhance welfare, and partially substitute for the lack of national monetary policy. Macroprudential policy effects on borrowers depend on the shock that hits the economy.
Borio and Zhu (2012)	What is the interaction between capital regulation, the business cycle and the transmission mechanism?	Risk-taking	Insufficient attention has so far been paid to the link between monetary policy and the perception and pricing of risk by economic agents—termed the “risk-taking channel” of monetary policy.
Angelini et al. (2014)	What are the consequences of introducing a time-varying capital requirement, on macroeconomic performance and stability, and what is its interaction with monetary policy?	Risk-taking	In the presence of supply shocks, time-varying capital requirements help to stabilise the fluctuation of the loan-to-output ratio. Lack of cooperation between monetary and macroprudential policies may cause excessive volatility in the policy instruments. In the presence of financial shocks, a time-varying capital requirement helps to stabilise the output and the loans-to-output ratio, regardless of their coordination.
Barnea et al. (2015)	To understand the connections between monetary and macroprudential policies.	Risk-taking	Monetary policy can be used to address financial stability, and macroprudential policy can also be employed to stimulate the economy, particularly in the situation where the interest rate reaches zero. There is a trade-off in the policy tools that needs to be understood by the policymaker.
Gerali et al. (2010)	To understand the role of financial frictions and banking intermediation in shaping the business cycle in the euro area.	Risk-taking	Balance-sheet constraints establish a link between the business cycle, which affects bank profits and thus capital, and the supply and cost of loans. The banking sector and sticky rates diminish the effects of monetary policy shocks. Financial intermediation increases the propagation of supply shocks. A significant reduction in bank capital may have a significant effect on the economy.
Agénor and Aynaoui (2010)	What are the implications of excess bank liquidity for the effectiveness of monetary policy?	Risk-taking	Excess liquidity conveys greater stickiness to the deposit rate in response to a monetary contraction and induces an easing of collateral requirements on borrowers – which in turn may translate into a lower risk premium and lower lending rates.
Angeloni and Faia (2013)	How do bank regulation and monetary policy interact in a macroeconomy that includes a fragile banking system?	Risk-taking	Risk-based capital requirements amplify the cycle and reduce welfare. The best combination includes anticyclical capital ratios (Basel III) and the response of monetary policy to asset prices or bank leverage.
Angelini et al. (2014)	What are the consequences of introducing a time-varying capital requirement on macroeconomic performance and stability?	Risk-taking	During the presence of a technology shock, the capital requirements may not be beneficial for stabilising the economy compared to monetary policy. In the presence of financial shocks, the capital requirement helps to stabilise the target variables. However, a lack of coordination between these two policies may cause

Study	Main Questions	Channel/Mechanism	Main Conclusion
			excessive volatility in both the monetary policy and the capital requirement.
Agénor et al. (2013)	What are the roles of bank capital regulation and monetary policy in mitigating procyclicality and promoting macroeconomic and financial stability?	Risk-taking	A combination of a credit-augmented interest rate rule and a Basel III-type countercyclical capital regulatory rule may be optimal for promoting overall economic stability.
Benes and Kumhof (2015)	Developing theoretical models of banks and macroprudential policies such as the Basel III regime.	Risk-taking	A countercyclical capital buffer leads to a significant increase in welfare. It also reduces the need for countercyclical adjustments in policy interest rates.
Valencia (2014)	What is the link between monetary policy and banks' risk-taking incentives in a dynamic bank model and under what conditions can risk-taking be excessive?	Risk-taking	Lower monetary policy rates can worsen or reduce these incentives depending on the size of the shock when equity financing is ruled out. Capital requirements are closer to the source of the distortion and thus work better than loan-to-value caps in reducing excessive risk-taking.
Piazzesi and Schneider (2018)	How to model the determination of securities prices and inflation in an economy with a layered payment system that supports trade in both goods and securities.	Payment system	Securities markets matters for both the supply and the demand of inside money. Securities are held by banks to back inside money, which is in turn used by other investors to pay for securities. As a result, securities prices, inflation, and policy transmission depend on the institutional details of the payment system.
Williamson (2003)	To study the role of the central bank in a model which permits alternative types of payment arrangements.	Payment system	A private clearing house arrangement improves efficiency but produces a real indeterminacy. The pricing of daylight overdrafts is irrelevant for the equilibrium allocation.

**Table 2 Interaction of monetary and macroprudential policies: selected empirical studies**

Study	Main Questions	Channel/Mechanism	Methodology	Data	Main Conclusion
Chang and Dasgupta (2007)	How shocks to some business segments affect investment in a firm's non-shock segments.	Collateral constraint	Multivariate regressions	Multi-segment firms (1979 to 1997)	A fall in the collateral value of assets contributes to the increase in financial constraints faced by these firms and the decline in investment in the non-shock segments.
Cecchetti <i>et al.</i> (2017)	Does prolonged monetary policy easing increase the vulnerability of the domestic and off-shore financial system?	Risk-taking	Panel regression	22 countries (1998 Q1 to 2014 Q4)	The leverage ratio and other measures of firm-level vulnerability increase for banks and non-banks as domestic monetary policy easing persists. The increasing vulnerability is also found in the financial sector firms outside of the U.S. as the result of monetary easing in the U.S.
Aiyar <i>et al.</i> (2016)	How does the credit supply respond to monetary policy and bank minimum capital requirements?	Risk-taking	Least square, panel Vector Auto Regression (VAR)	UK banks' minimum capital requirements (1999 Q1 to 2006 Q4)	There is little evidence of interaction between these two policy instruments. The findings do not confirm theoretical models that raise concerns about complex interactions between monetary policy and macroprudential variation in capital requirements.
Greenwood-Nimmo and Tarassow (2016)	What are the effects of both monetary shocks and macroprudential shocks on aggregate financial fragility in the US over the period?	Risk-taking	A sign-restricted VAR	US (1960 Q1 to 2007 Q4)	Contractionary monetary policy aggravates financial fragility whereas credit-constraining macroprudential shocks may be able to reduce the credit-to-GDP ratio in the short run when interest rates are fixed. However, when the interest rate is free to accommodate the

Study	Main Questions	Channel/Mechanism	Methodology	Data	Main Conclusion
					macroprudential shock, this reduces financial fragility and suggests there may be gains from a coordinated approach to macroeconomic management.
Merrouche and Nier (2012)	Are efficiency of interbank payment systems and credit creation linked?	Payment system	Regression, seemingly unrelated least squares (SURE)	Eastern European countries (1995 to 2005)	Payment reforms were an important precondition for the credit expansion in the sample countries. Payment system reforms also led to a shift away from cash (outside money) and towards demand deposits (inside money) as a medium of exchange, and this, in turn, enabled an expansion of credit in the sample countries.

## 2.1 Borrower Channel

Within the borrower channel, we identify from the surveyed literature two main mechanisms by which monetary policy interacts with macroprudential: the borrowers' cost of funds mechanism and the collateral constraint mechanism.

### 2.1.1 Cost of Funds Mechanism

Bernanke *et al.* (1999) offer an insight into how endogenous development in the credit market escalates and proliferates shocks to the macroeconomy – termed as the financial accelerator. This amplifying effect of credit markets can be explained by the relationship between the external finance premium (the difference between the cost of funds acquired externally and the opportunity cost of funds internally) and the net worth of potential borrowers (the difference between borrowers' liquid assets and the collateral value of illiquid asset excluding outstanding obligations). This financial accelerator may explain the output contraction in 2008 in the U.S., as well as the broadening in the spread between the central bank's policy rate and the cost of funds faced by entrepreneurs, and why financial conditions have amplified the U.S. business cycle and the intensity of the recession (Merola, 2015).

Using Bernanke *et al.*'s (1999) approach, Bailliu *et al.* (2015) examine the interaction of monetary and macroprudential policy. They assume that the financial shock affects the firms' cost of funds. Asymmetric information between the borrower and the lender causes the development of a financial market imperfection due to the inability of the lender to spot the idiosyncratic shock for the entrepreneur. Both monetary and macroprudential policy are activated by signs of developing financial imbalances, for which deviations of credit growth from its steady-state value are used as a proxy. Monetary policy uses Taylor's rule, which lets the policy interest rate also respond to deviations of credit growth from its steady-state value. The macroprudential policy is modelled as the exogenous component of the external finance premium and assumed to have a direct influence on the funding costs of firms (via the external finance premium).

Bailliu *et al.* (2015) report that the interaction between monetary and macroprudential policies improve welfare gains. Furthermore, macroprudential policy is a better tool with which to stabilise the macroeconomy than monetary policy in the presence of financial shocks. However, macroprudential

policy neutralises the effect of monetary policy in episodes of technology shocks. Therefore, monetary policy needs to respond more than it would without the presence of macroprudential policy.

In addition, De Paoli and Paustian (2013) argue that the insertion of macroprudential policy into the policy toolkit to manage the macroeconomy enhances the outcome regardless of shocks. However, they suggest that policymakers need to be cautious in selecting their monetary and macroprudential instruments. Choosing monetary and macroprudential tools that work in a similar way may lead to a significant welfare loss. They argue that the loan-to-value ratio is analogous with a time-varying tax on borrowing, which in turn increases/decreases the cost of funds. This characteristic works in a similar way to the interest rate, which can lead to a conflict between monetary and macroprudential policies and contribute to significant welfare losses.

### **2.1.2 Collateral Constraint Mechanism**

Another strand of the literature dealing with the non-financial borrowers' channel focuses on the collateral restraint that borrowers must face (Kiyotaki and Moore, 1997). In this model, fixed assets – such as land – act not only as an input to production but also as collateral. Lenders require collateral to reduce the risk of non-payment. Borrowers receive loans equal to the present value of their collateral. Thus, borrowers have to deal with the collateral constraint if they want to expand their projects, since their assets may be limited. Changes in borrowers' collateral values amplify the impact of monetary shocks on prices and the supply side. An increase in the lending rate increases the monitoring effort and increases the collateral-loan ratio. Chang and Dasgupta (2007) present empirical evidence of this collateral constraint channel. They find that a decrease in the collateral value exacerbates financial constraints faced by firms and reduces investment.

This constraint may cause an alteration in the composition of investment from long-term to short-term, while, in turn, decreasing the growth and amplifying the shock (Aghion *et al.*, 2010). In addition, financial innovation<sup>4</sup> allows the value of the collateral to increase while at the same time exposing the risk arising from volatility of collateral requirements or the loan-to-value ratio (Bianchi *et al.*, 2012). A negative shock to asset liquidity or firms' collateral constraint can cause aggregate investment, employment and consumption to collapse with output (Shi, 2015). In addition, Abo-Zaid (2015) concludes, using U.S. data in a New Keynesian model with collateral constraint, that long-run inflation is around 1.5% when the economy faces a total factor productivity (TFP) shock and about 2.5% when the economy is hit by mark-up shocks.

In the presence of a collateral constraint in the Euro Area, Quint and Rabanal (2014) demonstrate that macroprudential measures enhance welfare by reducing macroeconomic volatility; macroprudential measures help to reduce the leverage of both borrowers and banks. As a result, the real variables, such as output and consumption, are less volatile and generate cheaper lending rates and increased welfare.

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<sup>4</sup> Bianchi *et al.* (2012) define financial innovation as “the introduction of a truly new financial regime”.



Iacoviello (2005) connects the collateral constraint to the housing market, by using real estate as collateral for loans. He argues that, under a positive demand shock, the upswing in housing prices increases the borrowers' capacity to ask for higher loans so as to spend and invest more. However, Iacoviello (2005) only observes monetary policy, without the presence of macroprudential policy. He argues that monetary policy that responds to asset prices does not result in any significant advantages in terms of output or inflation stabilisation. Rubio and Carrasco-Gallego (2014) then take the Iacoviello (2005) approach further by combining monetary and macroprudential policy. They include the loan to values requirement, as a macroprudential instrument, in the context of the conventional Taylor rule of monetary policy. The loan-to-value requirement is a constraint on the value of a loan relative to the underlying collateral, which in this case is residential property. This macroprudential instrument acts as a rule that reduces the loan-to-value ratios, thereby discouraging credit expansion. Rubio and Carrasco-Gallego (2014) find that the interaction of monetary and macroprudential policy enhances welfare.

The collateral constraint is assumed by Brzoza-Brzezina *et al.* (2015) to be occasionally binding, which means that it does not play a significant role near to the steady state, but becomes binding in the presence of large negative shocks in the economy. Brzoza-Brzezina *et al.* (2015) demonstrate asymmetric effects of financial frictions and find that significant tightening of the loan-to-value ratio can have a much stronger impact on the economy than a loosening of the same size. In contrast, small policy innovations, whether expansionary or contractionary, have effects of almost equal magnitude. The introduction of loan-to-value ratios along with monetary policy mildly decreases the volatilities of most variables, including house prices, while at the same time substantially reducing fluctuations in household debt.

## **2.2 Financial Intermediaries Channel**

In this strand of the literature, the banking sector is found to play a major role in amplifying shocks to the macroeconomy. We identify two mechanisms in our surveyed literature through which financial intermediaries (such as banks) play a role in the interaction of monetary and macroprudential policy: banks' risk-taking (balance sheet) and payment systems.

### **2.2.1 Banks' Risk-Taking (Balance Sheet) Mechanism**

The surveyed papers focus on how monetary and macroprudential policy affect the risk-taking behaviour of financial intermediaries which operate under restrained liability and asymmetric information. According to Borio and Zhu (2012), banks' risk perception and tolerance are influenced by changes in the policy rates. An easing of monetary policy leads banks to increase their leverage and lower their monitoring (Cecchetti *et al.*, 2017; Dell'Ariccia *et al.*, 2014).

Borio and Zhu (2012) argue that the capital position is the nexus of the banks' risk-taking attitude in terms of their lending and their leverage position. Given the capital position of the bank, a capital requirement influences bank behaviour through the capital threshold effect and the capital framework

effect (Borio and Zhu, 2012)<sup>5</sup>. The capital threshold effect occurs due to the high cost banks have to pay, including the costs of restraining supervisory action, damage to reputation and negative market reaction, when a bank breaks the minimum capital requirement. The capital framework effect works on the basis that banks have to adjust their portfolios in response to changes in the capital requirement, given their attitude towards risk and their assessment of risks.

In order to provide further insights into the interaction between capital requirements and monetary policy, Angeloni and Faia (2013) point out that the risk-based capital requirement – a microprudential-based approach<sup>6</sup> – augments the cycle and causes an attenuation of welfare in its interplay with monetary policy during an economic downturn. Under a low-interest-rate environment, where risk-taking behaviour by banks can be excessive, a capital requirement constraint also works better than a loan-to-value ratio constraint (Valencia, 2014). The loan-to-value ratio regulates the leverage of borrowers, while a capital requirement regulates the banks' leverage. Forcing banks to use their internal funding to finance the borrowers may restrain the excessive risk-taking behaviour of banks.

In the case of banks facing monopolistic competition, Gerali *et al.* (2010) argue that loan margins are determined by the banks' capital-to-asset ratios and by the degree of interest rate stickiness. Banks receive funding in return for issuing deposits, provide collateralised loans to both households and firms, and build up their capital from retained earnings. Excess liquidity may also convey greater stickiness on the deposit rate in response to a monetary contraction, and generate an easing of collateral requirements for borrowers – which in turn may transform into a lower risk premium and lower lending rates (Agénor and Aynaoui, 2010).

Banks may support a stable business cycle because their monopolistic position promotes the ability of financial intermediation to shield economic agents from fluctuations in market rates by moderating the impact of non-financial shocks. However, a bank may also introduce additional volatility into the business cycle due to the shocks that come from the credit market vis-à-vis collateral constraints and the relationship between the loan margin and capital-to-asset ratios (Gerali *et al.*, 2010). In addition, Mimir (2016) finds that financial shocks to the banking sector contribute significantly, not only to financial variables such as bank credit and deposits, but also to the observed dynamics of macroeconomic variables such as output and consumption. In order to moderate the banks' tendency to amplify the cycle, a countercyclical capital requirement should be considered, and coordinated with the monetary policy (Agénor *et al.*, 2013). Agénor *et al.* (2013) argue that a standard Taylor's rule interest rate policy, enhanced with credit growth and countercyclical capital requirements, may be an optimal option for achieving macroeconomic stability.

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<sup>5</sup> Borio and Zhu (2012) provide an extensive survey of the interaction of monetary policy and the capital requirement.

<sup>6</sup> The risk-based capital adequacy ratio as suggested in the Basel II accord.

In more detail, the central bank is confronted with a policy trade-off when it uses either the policy interest rate or the capital requirements, but not both, in order to diminish the effect of the shock – either a shock to expected inflation or financial stability. The effectiveness of the monetary transmission mechanism from the policy rate to the bank lending and deposit rates is influenced by financial stability policy tools, such as reserve requirements and capital ratio requirements (Barnea *et al.*, 2015). During the ‘normal’ period – when the dynamics of the economy are dominated by supply-side shocks – the active use of capital requirements has an insignificant impact on the output volatility and inflation, despite generating a smaller loan-to-output ratio fluctuation (Angelini *et al.*, 2014). During a period of financial shocks, countercyclical capital requirements provide beneficial support to monetary policy. Therefore, countercyclical capital requirements reduce the volatility of the policy rate (Benes and Kumhof, 2015).

A different view is taken, however, by Cao and Chollete (2017). More specifically, using the game-theory approach, they observe a reduction in the central bank’s welfare due to the trade-off between maintaining price stability and financial stability. This approach links the bank’s leverage to the financial and real shock. A positive real economy shock increases marginal productivity and moves the production function upward. The increasing marginal productivity drives the marginal return on capital and makes banks increase their credit supply. In a similar vein, a negative financial shock cuts the credit supply. Monetary policy contraction may reduce the financial imbalance, but monetary policy expansion may lower the probability of insolvency. Therefore, Cao and Chollete (2017) argue that the larger the correlation between real and financial shocks, the more likely it is that the central bank has to face the trade-off between maintaining price and financial stability.

### **2.2.2 Payment System Mechanism**

An alternative approach to analysing the role of the financial sector is offered by Goodfriend and McCallum (2007), an approach labelled as the banking accelerator. In contrast to the financial accelerator, the banking accelerator integrates the liabilities side of the banking sector to amplify shocks to the macroeconomy. The credit mechanism in this model is connected to the deposit side of the banking system. Given a negative shock in the macroeconomy which increases the external finance premium, a customer may have to liquidate his deposits in the banking sector. This reduction in the deposit side may cause the banking sector to increase the external finance premium even further.

Furthermore, this deposit side of banking liabilities is used as a payment medium (inside money) for customers, along with cash (outside money). Piazzesi and Schneider (2018) argue that banks will face a liquidity management problem due to their inability to protect themselves against liquidity shocks caused by payment instructions from the customer. Different types of payment systems, such as real-time gross settlement (RTGS) or net settlement, may require different types of liquidity management. Banks’ issuance of inside money determines the value of collateral held by banks, and the nominal price level required to cover the liquidity shocks. A loosening monetary policy may increase the asset price,

which is the collateral the banking sector requires to engage in the payment system. Paying an interest rate on banks' reserves in the central bank offsets this effect, and increases welfare, but only when transaction costs are small (Bencivenga and Camera, 2011).

Merrouche and Nier (2012) argue that the efficiency of interbank payment systems relates to credit creation. Such efficiency may affect the creation of credit through at least one of the following two channels. First, innovations in the interbank payments technology enhance the reliability of inside money (holdings of deposits) as a payment medium for customers, and deposits are intermediated by the banking system. An increase in the supply of deposits to the banking system can, in turn, lead to a shift in the supply of credit to the economy. Second, innovations in interbank payment systems help to establish well-functioning interbank markets for end-of-day funds by reducing unsettled payments (Williamson, 2003). In addition, Hasan *et al.* (2013) find that moving to electronic retail payments has stimulated consumption and trade across the European Union.

Concerns about the risk associated with payment systems are increasing in tandem with the increased fragility of the banking industry following the recent global financial crisis. Freixas and Parigi (1998) demonstrate that the capital requirements of banks will provide a buffer in both RTGS and net settlement in terms of the necessary reserves and contagion risk<sup>7</sup>. To tackle the liquidity problem and avoid systemic risk, many central banks provide intraday overdrafts as collateral. Allowing banks to take out free intraday loans from the central bank relieves the credit constraints in the payment system. In combination with monetary policy, a central bank can explore the trade-off effects of liquidity constraints against the increases in priority afforded by collateralization (Kahn and Roberds, 2001; Lacker, 1997). In addition, a surge in the implicit intraday interest rate suggests an increased opportunity cost of pledging collateral intraday, and can be used as an indicator to measure the pressure **in** the payment system (Jurgilas and Žikeš, 2014).

### **2.3 Coordination between Monetary and Macroprudential Policy**

One crucial factor that needs to be considered is the coordination between monetary policy and macroprudential policy. There is an increasing amount of discussion exploring this coordination (Smets, 2014). The current institutional arrangement of these two policies varies across countries. In advanced countries, such as the UK, the central bank is in charge of macroprudential policy. Meanwhile, the Financial Supervisory Authority takes this role in Sweden and Australia. Concern over the introduction of macroprudential policy may lead to a coordination problem, not only in countries where different institutions would be responsible for setting up monetary and macroprudential policy, but also in those with a single institution responsible for both. In addition, Tinbergen dogma states that only one policy is needed for one objective.

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<sup>7</sup> Gross settlement means all payments are settled directly (real time) according to incoming/outgoing transactions, whereas net settlement means all payments are settled at the end of the day by deducting the outgoing from the incoming payments.

However, the abandonment of this Tinbergen rule has been called for by the Committee on International Economic and Policy Reform (2011). Close coordination between monetary and macroprudential policies needs to be ensured to enhance macroeconomic stability. During the presence of a cost-push shock, close coordination between them is needed to enhance welfare (De Paoli and Paustian, 2013). Even when these policies are set by two different institutions, there is a need for the leaders of these institutions to enhance welfare. A lack of coordination between macroprudential and monetary policy may generate unnecessary volatility of the policy instruments (Angelini *et al.*, 2014). This unnecessary volatility occurs because these policy instruments work on the same channel with different objectives, and try to influence targeted variables such as bank rates and credit in conflicting directions. Therefore, the effect of one policy may cancel out the other's action.

This view is supported empirically by Greenwood-Nimmo and Tarassow (2016), who call for coordination between monetary and macroprudential policy. They argue that, in the absence of monetary policy, macroprudential policy may only be able to reduce one component of financial fragility in the short run. However, when used alongside monetary policy, macroprudential policy may diminish financial fragility.

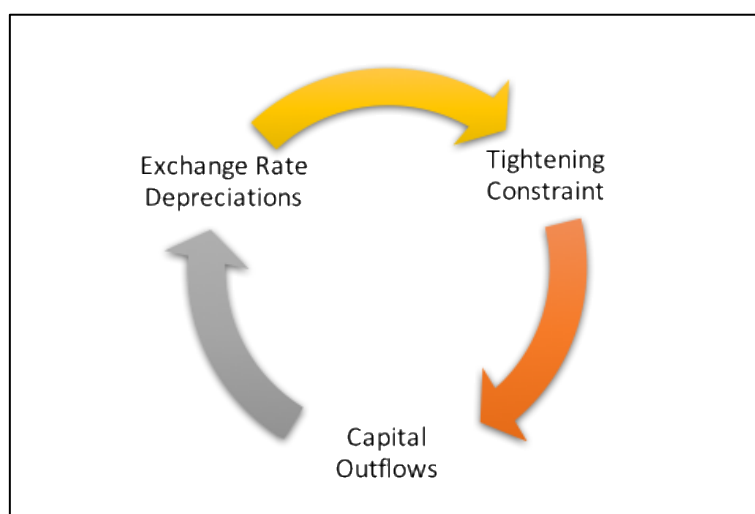
However, this view is challenged by Rubio and Carrasco-Gallego (2014). They argue that monetary and macroprudential policy operated in a non-coordinated fashion improve welfare more than if they are coordinated. Moreover, allowing each policymaker to concentrate on their own objective leads to more effective results in terms of achieving stability. In addition, Aiyar *et al.* (2016) do not find any complex relationship between monetary and macroprudential policy.

### **3 The Role of the Exchange Rate in a Monetary and Macroprudential Framework**

One of the distinct characteristics of emerging markets is exchange rate volatility, especially for those countries that have substantial debt in foreign currency. Exchange rate volatility is less relevant for financial stability in advanced economies, but asset price volatility remains a threat (Korinek and Sandri, 2016). The exchange rate amplifies the shocks through both its volatility and level. The volatility of exchange rates poses a challenge to financial stability through three main channels (Agénor, Alper and Pereira da Silva, 2014). First, large currency movements can disrupt exchange rate expectations which, in turn, lead to sudden changes in capital flows and generate high fluctuations in local-currency debt and equity markets. Second, currency depreciation can aggravate the currency mismatches of domestic borrowers with large foreign-currency debt exposures, which may undermine their creditworthiness. Third, large depreciation can be related to deterioration in external funding conditions during a crisis. The level of the exchange rate can amplify the shocks because it influences how much foreign lenders value domestic collateral (Korinek and Sandri, 2016). A depreciation of the exchange

rate reduces the value of collateral and initiates a feedback loop of tightening constraints and further exchange rate depreciation. This feedback loop is pictured in Figure 2.

**Figure 2 Feedback loop of financial crises with exchange rate depreciation**



Source: Korinek and Sandri (2016)

In order to respond to the question of whether a country should abandon a floating exchange rate regime in the case of large capital reversals, Fornaro (2015) introduces a theoretical framework that demonstrates that domestic agents borrow from the international markets using fixed assets as collateral. In the case of a sudden stop – significant capital outflows from the country – the value of this collateral shrinks. As a collateral constraint takes place, the economy falls into recession. Fornaro (2015) finds that monetary policy that responds to development in the financial system and spreads between domestic and foreign bonds delivers a better result for welfare compared to strict inflation targeting. In addition, there is a tendency for a central bank to deviate from its strict framework, allowing free exchange rate movement and engineering exchange rate depreciation, to maintain the value of collateral used to gain access to credit. Furthermore, a fixed exchange rate regime leads to substantially higher welfare losses during a financial crisis episode (Gertler *et al.*, 2007).

Foreign exchange intervention has been actively used as a policy tool in many economies in Asia and elsewhere. Nevertheless, countries that employ foreign exchange intervention may still implement an inflation-targeting framework. The intervention itself can be communicated as restraining the exchange rate volatility or even targeting a certain level. However, it is found that intervention tends to be a discretionary action rather than a policy rule (Jun, 2008). A managed exchange rate regime relaxes the constraint on the degree of response to inflation, and alleviates problems of indeterminacy and expected instability (Llosa and Tuesta, 2008). Cavoli and Rajan (2015) state that, while sterilisation weakens the capital inflow effect on interest rates, it may even strengthen the foreign interest rate effect. Small open economies that implement either a fixed exchange rate regime or strict inflation targeting manage to stabilize the real exchange rate and inflation at the expense of significant instability in the real economy (Alba *et al.*, 2011).

Turning to the empirical evidence, on the basis of Norwegian data Akram and Eitrheim (2008) suggest that output stability and financial stability can be improved simultaneously. However, monetary policy faces a trade-off between inflation and output stability. Consistent with the theoretical approach, an interest rate response to excessive inflation of house prices, equity prices and credit will also increase stability in consumer price inflation and output. However, when interest rates react to a misalignment in the nominal exchange rate, the stabilising effect of the exchange rate on inflation and output is counteracted by the destabilising impact of increased interest rate volatility.

#### **4 Capital Flows Volatility – A Challenge for Monetary and Macprudential Policies**

The massive volatility of capital flows, following the unconventional monetary policy applied in advanced countries, has provided challenges for policymakers, in terms of restraining capital flows from aggravating overheating pressures and consequent inflation, and mitigating the risk that protracted periods of easy financing conditions will threaten financial stability (Unsal, 2013). Under a restriction in foreign banking operations, international banking flows to the foreign non-bank private sector fall when the bank entry barriers increase, and interbank lending rises. After the liberalisation of capital inflows, domestic banks have to face fierce competition from foreign funds. Agents have to take on excessively risky forms of finance, and expose the economy to extreme systemic risk (Korinek, 2010). Domestic banks reallocate their lending to non-financial business, or they may take on riskier projects, and a few unlucky banks may become insolvent due to asymmetric information. If investors fail to appreciate the quality of bank assets, banks may accumulate losses even if investors expect a banking crisis. A few banks accumulating losses may, therefore, disrupt the credit market and even disrupt solvent projects. This disruption is likely to lead to an output loss, even if there are no illiquidity problems (Giannetti, 2007). This capital inflow is subject to a ‘sudden stop’, which can be portrayed as reversals of international capital flows reflected in sudden increases in net exports and the current account. The reversal of capital inflows may precipitate a decline in production and absorption, and lead to corrections in asset prices (Mendoza, 2010).

In the case of volatile capital flows, monetary and macroprudential policies can supplement each other, and these policies are not perfect substitutes (Unsal, 2013). Broad macroprudential measures – such as the loan-to-value ratio – are more effective than macroprudential measures that target capital flow. In addition, financial shocks have a more significant impact on inflation and output under a fixed exchange rate regime *vis-à-vis* a flexible exchange rate where appreciation of the nominal exchange rate facilitates a restraint on the overheating and inflationary pressures. In addition, macroprudential measures in the form of capital flow management contribute to a reduction in the elements that make up financial vulnerability, such as bank leverage, inflation expectations, bank credit growth, and exposure to portfolio liabilities (Forbes *et al.*, 2015).

In seeking further insights into the international transmission of asymmetric shocks, Dedola and Lombardo (2012) build a two-country model with financial frictions along the same lines as Bernanke *et al.* (1999). They highlight that foreign exposure in interconnected balance sheets can, indeed, act as a powerful mechanism propagating asymmetric shocks across countries. Integration of asset markets will magnify the financial and real interdependence, even with minimal balance sheet exposure to illiquid foreign assets for financially constrained agents, provided that asset markets are integrated. A high degree of integration in the relevant asset classes stimulates a tendency towards the cross-border equalisation of external finance premia faced by financially constrained investors due to the no-arbitrage conditions it imposes, thus exposing a tight connection between leverage and macroeconomic dynamics across countries.

A somewhat different perspective is taken by Medina and Roldós (2014). In addition to the banking accelerator, they address a shock stemming from an extended period of zero-bound interest rates by introducing a simulation model. The simulation illustrates a long period of inflows – representing low interest rates – succeeded by capital outflows which reflect the normalisation of unconventional monetary policy in advanced economies. They argue that a countercyclical reserve requirement enhances the effectiveness of monetary policy in reducing asset price volatility and, hence, improves welfare.

Looking at a different transmission channel, Agénor *et al.* (2014) develop a dynamic stochastic model of a small open economy. This model describes firms that are allowed to borrow from a domestic bank, while the bank borrows from the rest of the world, with a two-level banking intermediation structure, a risk-sensitive regulatory capital regime, and imperfect capital mobility. Countercyclical capital regulation is effective at promoting macro stability and financial stability. However, a countercyclical regulatory capital rule may need to be complemented by other, more targeted macroprudential instruments when shocks are large and persistent, because the advantage in terms of reduced economic volatility displays diminishing returns.

Glocker and Towbin (2012) advocate the use of a reserve requirement as an important policy instrument in many emerging economies. The interest rate complemented by the reserve requirement can be useful in stabilising economic activity in the context of a small open economy which is subject to sticky prices. The use of a reserve requirement becomes more effective when the banking sector is subject to legal reserve requirements – more specifically, when financial frictions, foreign currency debt and an objective of the authority to stabilise credit are all present. However, the presence of capital controls reduces the effectiveness of reserve requirements. This finding differs from those reported in earlier studies by De Gregorio *et al.* (2000), who argue that the effect of reserve requirements in terms of restraining capital inflows is limited, although they may alter the composition of capital inflows, from short-term to long-term.

Samarina and Bezemer (2016) argue that capital flow controls can be implemented to tame massive capital inflows. However, such measures need to consider the effect of capital inflows on

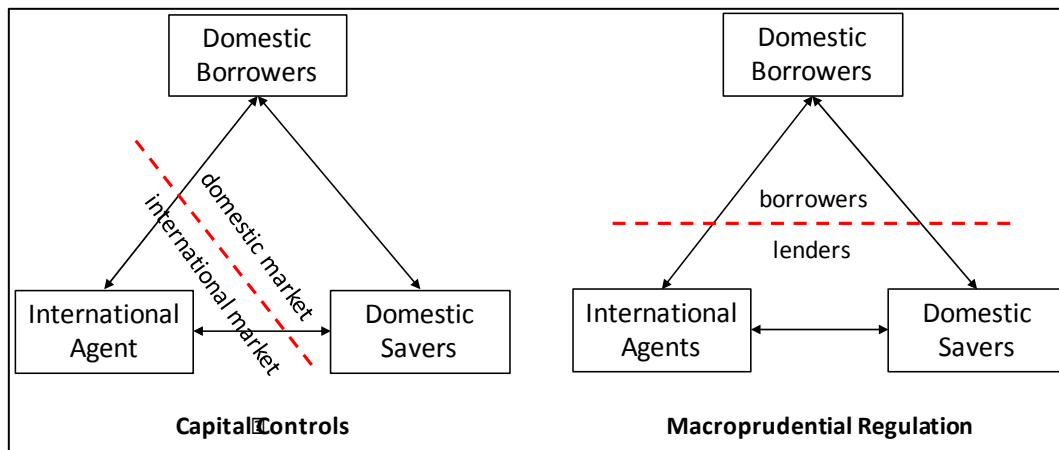


growth and financial system stability, and the importance of sectoral destination in determining the effects of capital flows. Foreign capital flows into economies with few investment opportunities may substitute for domestic bank lending to non-financial businesses, so that bank balance sheets become more dominated by household lending. In particular, greater dependence on domestic investment before crisis exacerbates the credit crunch that occurs during crisis, while exposure to foreign direct investment alleviates the liquidity constraint (Tong and Wei, 2011).

As noted above, Forbes *et al.* (2015) argue that macroprudential measures in the form of capital flow management may reduce financial vulnerabilities stemming from bank leverage, inflation expectations, bank credit growth, and exposure to portfolio liabilities. However, they also report that this reduction only lasts for six months and then reverses. In addition, such capital flow management measures have a limited effect on most other macroeconomic variables and financial market volatilities over the short and medium term, including equity indices, inflation, interest-rate differentials, and the volatility of exchange rates and portfolio flows. Based on data from India, Patnaik and Shah (2012) argue that the introduction of capital controls can reduce debt flows when price, quantitative and administrative controls are imposed, in the framework of a financial regulatory regime where all financial transactions are illegal unless explicitly permitted. There is a trade-off between lower unhedged foreign currency borrowing by households and firms, and a lower regulatory burden on financial markets.

Korinek and Sandri (2016) focus on the difference in impact between capital control and macroprudential policies. Capital controls are applied exclusively to financial transactions between residents and non-residents, whereas macroprudential regulation limits domestic agents to borrowing from either domestic or foreign lenders. The difference is shown in Figure 3. Korinek and Sandri (2016) argue that utilising both capital controls and macroprudential policies to complement monetary policy may moderate contractionary exchange rate depreciation. The macroprudential regulation aims to reduce the amount and riskiness of all financial liabilities, and capital controls aim to increase the aggregate net worth of the economy by restraining net inflows. These measures generate an interest differential between the domestic and international credit markets, and encourage domestic saving.

**Figure 3 Capital control versus macroprudential regulation**



Source: Korinek and Sandri (2016)

Empirical testing of the impact of capital controls has yielded mixed results for different periods of observation. On the one hand, Edison and Reinhart (2001) observe that capital controls in Brazil and the Philippines, during the 1999 crisis and 1997-1998 Asian financial crisis respectively, did not succeed in restricting capital flow volatility. Furthermore, countries with capital controls have a high probability of experiencing a financial crisis (Glick and Hutchison, 2005). On the other hand, Chamon and Garcia (2016) find that capital controls in Brazil may have helped to tame a bubble in the economy. Restricting the access to foreign financing, however, may have contributed to the low investment and growth performance during that period, given the low domestic saving rate of the Brazilian economy. One of the characteristics of capital controls is that they tend to be kept in place for an extended period. Authorities seldom use this instrument to tackle short-term fluctuations in output, the terms of trade, or financial-stability considerations.

Ostry *et al.* (2012) investigate whether macroprudential policies and capital controls can enhance financial stability in the face of the risks typically associated with large capital inflows. In order to analyse this, they compose new indices of foreign-currency-related prudential measures, domestic prudential measures, and financial-sector-specific capital controls for 51 emerging market economies over the period 1995–2008. They point out that both capital controls and foreign-currency-related prudential measures are related to a decline in the proportion of foreign exchange lending within total domestic bank credit and in the proportion of portfolio debt within total external liabilities. Other prudential policies provide support in terms of limiting the intensity of aggregate credit booms.

The increasing number of central banks that employ capital flow management measures – in the form of either macroprudential measures or capital controls – need to take into account the adequacy of their international reserves (Jeanne, 2016). Massive capital inflows into emerging market countries are subject to reversal. Thus, the authorities must preserve the possibility of fire-sales, which can be caused by the Value-at-Risk constraint in the global banking system. Sudden stops in capital inflows are typically related to large contractions in real activity. Jeanne (2016) argues that the best policy for

tackling this problem is to manage international reserves by absorbing the capital inflows and supplying the market during the outflow episode.

In order to implement macroprudential policy in an environment where the financial sector has been connected globally, international macroprudential policy coordination is critical (Agénor and Pereira, 2018). Shocks are not only transmitted from advanced countries to emerging countries and the rest of the world, but also originate from emerging countries and affect advanced countries and the rest of the world. These shocks may also have a spillback that provides the policy originators with the motivation to consider the effect of their policy to the rest of the world in their decision making process. Agénor and Pereira (2018) highlight that cross-border arbitrage and leakages are other factors that should be considered for strengthening international policy coordination. In addition, implementing different types of policies in different countries to increase global welfare requires global coordination.

## **5 Conclusions and Future Research Directions**

In view of the preceding discussion, it becomes apparent that the extant body of literature on monetary and macroprudential policies is still in its infancy. An extensive debate between scholars is still ongoing as to whether financial friction affects the macroeconomy, and also how to factor financial stability into a framework of macroeconomic stability. The studies reviewed in this paper suggest that monetary policy alone is not sufficient to maintain the stability of the macroeconomy, given the complexity of the current economic environment.

As demonstrated above, financial intermediation appears to be playing a significant role in the achievement of financial system stability as well as macroeconomic stability. Despite the fact that macroprudential policies have, in many countries, played a major role since the global financial crisis, there is as yet limited experience of the practice of such policies (Galati and Moessner, 2013). A substantial range of macroprudential instruments has been discussed without a primary instrument having been recognised. Macroprudential instruments tend to be customised according to the challenges a particular country has to face (Claessens, 2015).

The systematic review of the literature performed in this study points to several promising avenues for future research: (a) The inclusion of several macroprudential instruments, such as the loan-to-value ratio and the multiple versions of reserve requirements which are implemented in several countries, will improve our knowledge of the framework of monetary and macroprudential policies. (b) As the systematic literature review highlights the importance of maintaining the exchange rate – both its level and volatility – along with the stability of the economy, it is recommended that foreign exchange intervention is incorporated in the framework of monetary and macroprudential policies. As the review findings point out, such intervention is mainly performed on a discretionary basis. Central banks, particularly in emerging markets, need to factor foreign exchange operation into the framework of monetary and macroprudential policies. (c) Given the importance of the payment system for providing the foundation for settlement and credit supply, there is little evidence on the role of the

payment system in the context of a monetary and macroprudential framework of analysis. It may be interesting to explore whether a policy regarding the payment system, such as electronic transfer fees or limitations on the nominal value to be settled in the large payment system in the central bank, would have an impact on either macroeconomic or financial stability, or both. (d) It is also envisaged that a review paper on the implementation of monetary and macroprudential policies in an open-economy setting and the international aspect of macroprudential policy would be of great interest to both academics and policymakers.

Finally, a question that still begs an answer revolves around the effectiveness of monetary and macroprudential policies in producing desired economic outcomes, namely, price and financial stability.

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## **Appendix A. Methodology**

To assess the interaction of monetary and macroprudential policy, the Systematic Literature Review (SLR) approach was adopted. SLR is a methodology that pinpoints current studies, chooses and assesses analyses, contributions and data syntheses, and reaches clear conclusions about what is known and unknown (Denyer and Tranfield, 2009). Unlike narrative reviews, the SLR offers a more rigorous and clear review process by following procedures that incorporate comprehensive searches for all possible significant studies (Thomé *et al.*, 2016), and an audit trail of all research stages in a scientific and transparent manner (Tranfield *et al.*, 2003).

SLR has been used in psychology, medical and social science research to deliver in-depth answers to specific research questions and thereby support policymaking and implementation (Thomé *et al.*, 2016). Given the complexity of the assessment area and the need to deliver a comprehensive result to scholars, practitioners and policymakers, it was believed that the SLR approach would be a suitable approach for responding to these challenges.

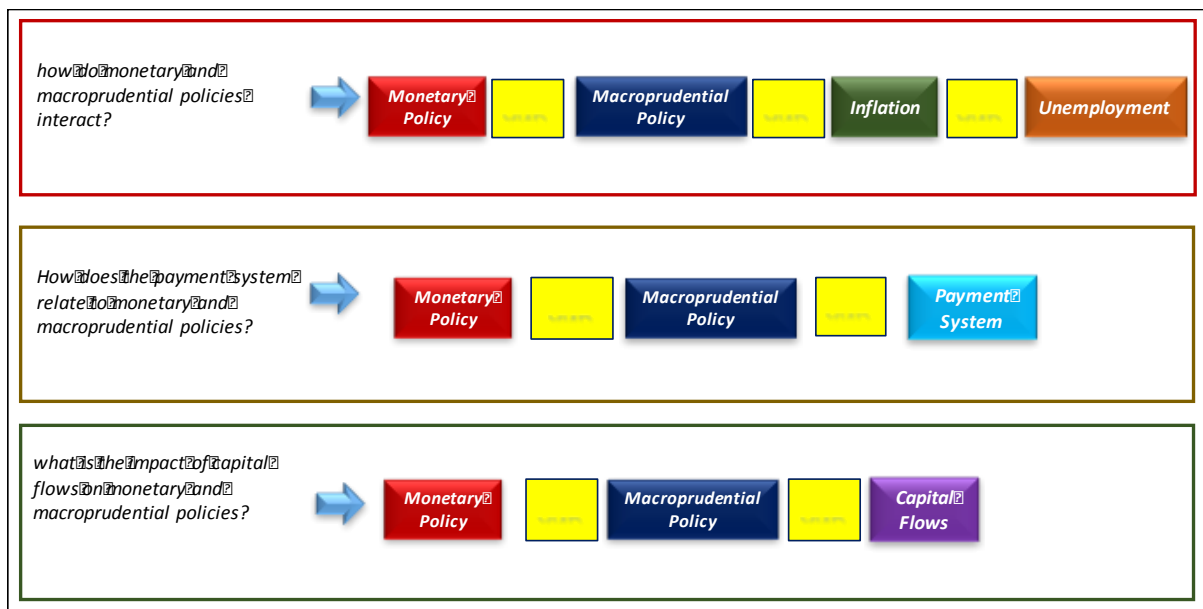
### **A.1. Review Strategy**

This paper focuses on tackling the review question of how monetary and macroprudential policies interact to achieve price stability and financial stability in the economy. In line with the general principle supporting the SLR methodology, the above question was formulated into a review protocol (Tranfield *et al.*, 2003). This protocol covers information relating to the steps we followed to conduct our reviews, which were performed in two stages. First, inclusion and exclusion criteria regarding the literature for the survey were developed. Pursuing the review question and sub-questions, the literature needed to include an assessment of both monetary and macroprudential policies. However, we anticipated this literature as being limited in size, since the strand is still developing (Galati and Moessner, 2013). Therefore, we also considered other forms of monetary policy or macroprudential literature that develop our knowledge of the interaction of monetary and macroprudential policies. In order to provide a robust examination, sources were limited to English peer-reviewed journals, representing high-impact, validated knowledge (Podsakoff *et al.*, 2005). Moreover, an approach was followed which was somewhat similar to those of Meier (2011) and Savino *et al.* (2017), in that we considered only publications in scholarly journals with an Impact Factor greater than or equal to the median Impact

Factor for the related category (in this case: Economics, Business, Finance and Management) in the 2015 Journal Citation Reports® (Thomson Reuters, 2015)<sup>8</sup>. There was no restriction regarding the definition of a monetary regime, so that we could acquire a comprehensive understanding around this subject. Similarly, the search was not limited to a particular country or research method.

Second, keywords were designed consistent with the selection criteria. The search objective was to be as comprehensive as possible, to avoid overlooking potentially important studies. In order to formulate the list of keywords, the author carefully scrutinised the keywords of the positioning study review. This process resulted in a list of 70 keywords, which were divided into several groups representing the exploratory areas: monetary policy, macroprudential policy, capital flows, inflation, unemployment, and payment system<sup>9</sup>. Each group was combined with the Boolean operator “AND” to give search strings relevant to the review question and sub-questions we intended to explore, as described in Figure 4.

**Figure 4 Search strings**



## A.2. Data Collection

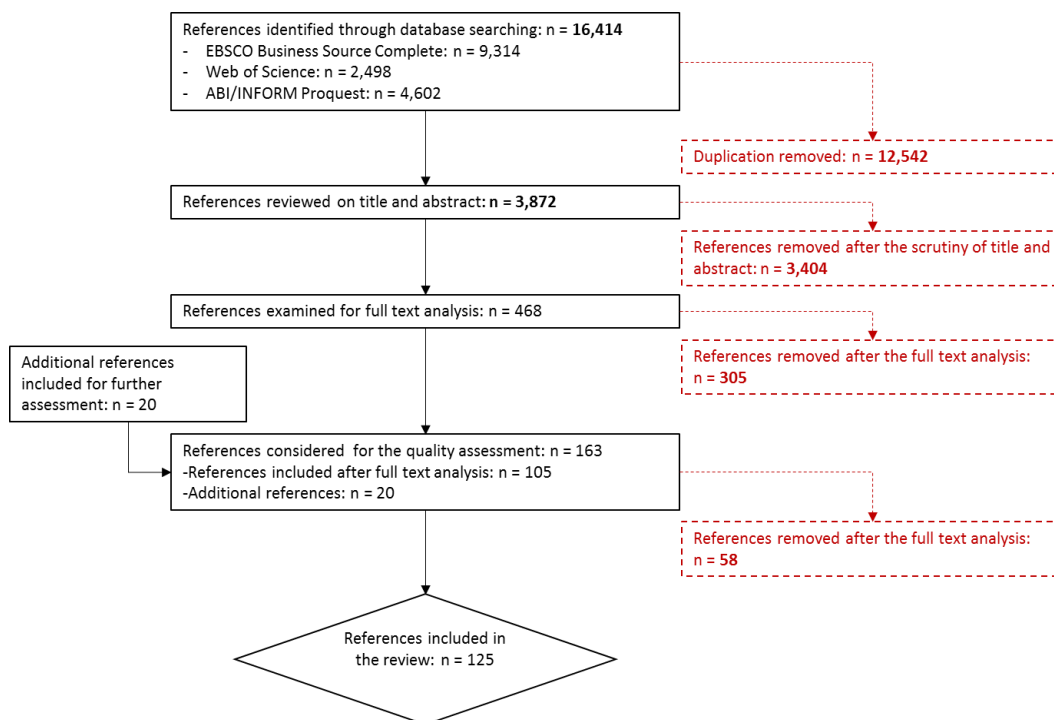
After defining a clear review strategy, the following step in the SLR process involved the selection of pertinent studies. A selection of keywords were applied to selected databases, namely ABI/INFORM Complete, EBSCO Business Source Complete and Web of Science. This initial search resulted in a total of 16,414 hits. Then, 12,542 citations were excluded because of duplication and failure to meet the set criteria. The final sample comprised 3,872 references to be assessed based on title and abstract. By examining the title and abstract based on the inclusion and exclusion criteria, we omitted 3,404 of these references.

<sup>8</sup> See Appendix B for the detailed inclusion and exclusion criteria.

<sup>9</sup> See Appendix C for the detailed list of keywords.

The following step in our review was to perform a full-text analysis for the remaining group of 468 articles. After performing a careful assessment on the basis of the inclusion and exclusion criteria, we classified the references into A (highly relevant), B (moderately relevant) and C (non-relevant). This resulted in 105 articles being classified as highly relevant. To extend our search, given the aforementioned constraint of there being a limited number of studies in this research stream, we examined the reference sections of all the included articles, to find relevant studies we had not obtained through our keyword search. This procedure added 20 more articles to our sample. Figure 5 presents a summary of our selection process.

**Figure 5 Summary of the selection process**

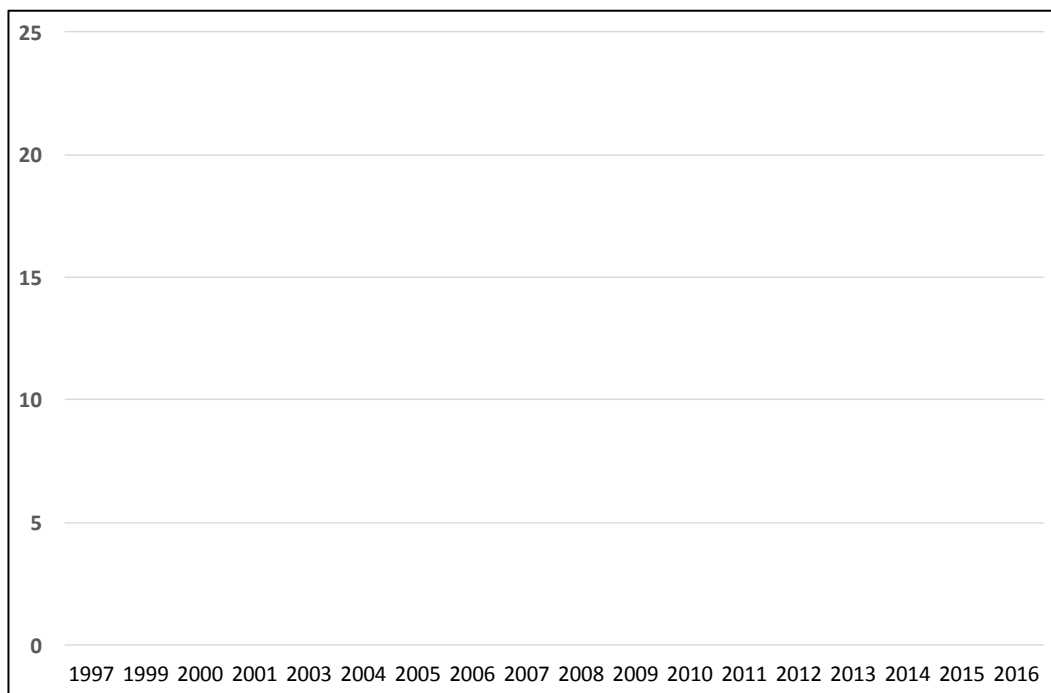


The distribution of the 125 articles in the final sample, by journal title, is presented in Table 3. The Journal of International Money and Finance, the International Journal of Central Banking and Economic Modelling are the dominant journals for the discussion of the research topic, accounting for 10%, 10% and 9% of the overall sample, respectively. Figure 6 portrays the number of articles in the sample by year of publication, ranging from 1997 to 2016. It can be argued that this review topic is a relatively new area, and the increasing number of studies, reflecting a growing interest in this topic, indicates the importance of the attempt to shed light on the key issues surrounding this area.

**Table 3 Distribution of sample articles by journal**

Journal	No. of Articles	% of Total Sample
Journal of International Money and Finance	11	10%
International Journal of Central Banking	11	10%
Economic Modelling	9	9%
Journal of Financial Stability	8	8%
Journal of Monetary Economics	7	7%
Journal of Money, Credit and Banking	7	7%
Journal of Economic Dynamics & Control	6	6%
International Review of Economics & Finance	5	5%
Journal of Banking & Finance	5	5%
Journal of International Economics	5	5%
IMF Economic Review	4	4%
Scandinavian Journal of Economics	3	3%
Economic Policy	2	2%
American Economic Review	2	2%
Journal of Development Economics	2	2%
Journal of Policy Modeling	2	2%
European Economic Review	2	2%
Journal of Political Economy; Economic Theory; Quarterly Journal of Economics; Review of Economic Studies; Journal of Financial Intermediation; Review of Financial Studies; Oxford Bulletin of Economics and Statistics; Annual Review of Economics; Economic Inquiry; Journal of Corporate Finance; Annual Review of Financial Economics; Review of International Political Economy; Journal of International Financial Markets Institutions & Money; Journal of Economic Surveys	1	1%

**Figure 6 Number of articles per year of publication**



## Appendix B. Inclusion and Exclusion Criteria

Area	Inclusion criteria	Exclusion criteria	Justification
Language	English	Any other language not formally translated	Limited resources for translation and may not be accessible to a wider audience
Peer Review	Peer reviewed journals only	Non-peer reviewed documents	A peer reviewed journal has undergone a peer review which assumes a minimum quality in terms of data quality and methodology applied.
Country	All countries		Provide a comprehensive view of various practices
Monetary Regime	Broad definition of monetary policy that includes inflation targeting, monetary targeting or exchange rate targeting		Provide a comprehensive view of various regimes
Monetary and Macroprudential instrument	All monetary instruments		Provide a comprehensive view of various instruments
Research methods	All included		
Impact of the publication	Publication in a peer-review journal with an impact factor greater or equal to the median impact factor for the relevant category (in our case: Economics, business, finance and management) according to the 2015 Journal Citation Reports© (Thomson Reuters, 2016)	Publication in a peer-review journal with an impact factor greater or equal to the median impact factor for the relevant category	An impact factor threshold may provide us a useful method to limit the number of relevant studies which arguably have a better contribution to the knowledge and better quality.

## Appendix C Details of Keywords

Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Monetary Policy	Macroprudential Policy	Capital Flows	Inflation	Unemployment	Payment System
"monetary polic**" OR "monetary choc**" OR "monetary expansion**" OR "monetary impulse**" OR "monetary contraction**" OR "monetary transmission" OR "interest rate**" OR "policy rate**" OR "optimal interest rate rule" OR "interest rate rules" OR "financial accelerator" OR "monetary stability" OR "monetary operation**" OR "monetary theory" OR "non-standard monetary instrument**" OR "policy tradeoffs and monetary policy transmission"	"macroprudential polic**" OR "financial system**" OR "financial intermedia**" OR "financial institution**" OR "financial firm**" OR "financial sector**" OR "financial industr**" OR "financial friction**" OR "Financial instability" OR "Financial Stability" OR "credit friction**" OR "credit market**" OR "bank**" OR "credit market imperfection**" OR "capital requirement**" OR "financial fragility" OR "liability structure" OR "loan loss provisioning" OR "loan to value ratio" OR "macroprudential measures" OR "macroprudential regulation" OR "prudential policy"	"Capital flo**" OR "Capital flow m**" OR "Capital inflow**" OR "Capital inflows management" OR "Capital mo**" OR "Bank capital flow**" OR "Bond flow**" OR "Capital control**"	"inflation" OR "macroeconomic stability" OR "economic stabilization" OR "Inflation target**" OR "macroeconomic stability" OR "optimal long-run inflation rate" OR "price stability"	"unemployment" OR "income inequality" OR "wage bargaining" OR "welfare" OR "wealth effects" OR "consumption and wealth" OR "welfare analysis" OR "welfare economics"	"payment system" OR "payment" OR "financial transactions processing**" OR "electronic money" OR "electronic fund**" OR "debit card**" OR "credit card**" OR "credit card issuing" OR "money market" OR "wage payment system**"

# What can we learn from the implementation of monetary and macroprudential policies: a systematic literature review

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