

# Macroprudential policy – effects on the economy and the interaction with monetary policy

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*Macroprudential policy is a new policy area used to counteract the emergence of financial imbalances, and contribute to the stability of the financial system. In this paper we discuss the extent to which monetary policy should take explicit account of financial imbalances once macroprudential policy is actually in place. However, macroprudential policy can also affect both resource utilisation and inflation – a factor that monetary policy may need to take into consideration. We also provide an overview of the rapidly growing scientific literature on the effects produced by various macroprudential tools. One conclusion we draw is that heightened capital requirements primarily bolster the resilience of the banks. In order to reduce household indebtedness, tools that directly target households are more effective, such as the mortgage cap and tax relief on mortgage interest. A conclusion from several studies is also that macroprudential tools, in particular tools directly targeting specific sectors, are more efficient than monetary policy in counteracting financial imbalances.*

Macroprudential policy is a new policy area that has emerged in the wake of the financial crisis. It is the policy area with primary responsibility for counteracting the emergence of financial imbalances, and contributing to the stability of the financial system. Put simply, macroprudential policy has two primary tasks. First, it must strengthen the resilience of the financial system, such as through measures that ensure that banks have sufficient capital to absorb credit losses. Second, it must counteract financial imbalances, which in practice is about preventing credit and debt from rising too rapidly.

Risks in the financial system are usually divided into cyclical and structural risks. This is also a common way of dividing up the various tools of macroprudential policy.<sup>1</sup> The cyclical tools are intended to change over time, and according to the financial imbalances that may arise. The countercyclical buffer is an example of such a tool. When household and corporate lending of the banks rises rapidly, the buffer requirement is increased. When the banks then exercise more restraint in their lending, it can be reduced. The structural tools, on the other hand, are intended to be implemented “once and for all” to create sound,

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<sup>1</sup> See, for example, Nordh Berntsson and Molin (2012).

long-term conditions for a stable financial situation. In practice, however, it is not easy to make a clear distinction between these tools. A certain tool may, under some conditions, be used to counteract both cyclical and structural risks.<sup>2</sup> In this paper we focus primarily on the cyclical tools, because it is primarily those which interact with monetary policy.

From the point of view of a central bank, an important matter is the extent to which monetary policy should take explicit account of financial imbalances once macroprudential policy is actually in place. However, the various macroprudential tools also have effects on other parts of the economy. For example, resource utilisation and inflation can be affected by the various tools, which monetary policy may need to take into consideration.

The paper consists of three sections. The first section contains a discussion of principle and the definition of different types of macroprudential tools. The tools are divided into those that affect credit supply (i.e. tools directed towards banks), and those that affect credit demand (i.e. tools directed towards households and corporations). In the second section, we discuss a selection of empirical studies that shed light on the effects of various macroprudential tools on debt and house prices. In the third and final section, we address the interaction between monetary and macroprudential policies. We discuss, for example, the cost in terms of lower GDP in the short term that arises when various tools are used to reduce financial imbalances. These findings are mainly theoretical and based on simulations in different macro models. At the end of the paper a glossary of the terms used is provided.

## Macroprudential tools can target credit supply or demand

Macroprudential tools can be used to influence either the supply of or demand for credit. Tools targeting supply have the primary purpose of bolstering the banks' resilience against credit losses, and thus strengthening financial stability. If they also curb excessive credit growth, this can be seen as a positive side effect. Tools targeting demand have the primary purpose of bolstering the resilience of households by reducing credit growth.

### MACROPRUDENTIAL TOOLS THAT AFFECT CREDIT SUPPLY

*Capital requirements* form a common macroprudential tool used to influence the banks' equity and supply of credit. The purpose of capital requirements is to enhance the resilience of the financial system. The banks' capital forms a buffer against unexpected losses and can thus reduce the risk of a banking crisis. In addition, the risks that the banks need to use state guarantees and capital injections are reduced if they have a large share of equity.

Following the financial crisis, a new set of international regulations for banks was prepared, Basel III, which sets out how much capital the banks must hold.<sup>3</sup> To start with,

2 Tools that do not change over time can also help curb lending cycles. Blanchard (2015) finds that a suitable distinction between financial regulation and macroprudential policy is that the macroprudential tools are intended to vary over time, while financial rules are intended to be permanent. With this approach, macroprudential policy is limited to consisting of tools that are to counteract cyclical risks in the financial system, while tools to counteract structural risks come under financial regulation.

3 See BIS (2011).

there is a minimum requirement, but in addition there are also several different “buffer requirements”.<sup>4</sup> Then, on top of those requirements there is a “specific own funds requirement” which is the overall assessment of the supervisory authority of an appropriate capital requirement level for each individual bank. In other words, the regulations are relatively complex, yet we can still in a comprehensive way describe how the capital requirements are intended to function. A simplified balance sheet of a bank could be as follows:

$$(1) \quad B^H + B^F = D + A$$

where  $B^H$  denotes household lending and  $B^F$  corporate lending. The sum of  $B^H$  and  $B^F$  is the bank’s total assets. The bank’s total liabilities consist partly of deposits received by the bank from the general public,  $D$ , and partly of equity,  $A$ . Using this balance sheet, we can then define the bank’s capital ratio  $K^\omega$ , i.e. the bank’s equity in relation to its risk-weighted lending, as

$$(2) \quad K^\omega = \frac{A}{\omega_H B^H + \omega_F B^F},$$

where  $\omega_H$  is the risk weight on loans to households and  $\omega_F$  the risk weight on loans to corporations. By dividing the bank’s equity ( $A$ ) by risk-weighted loans to households ( $\omega_H B^H$ ) and risk-weighted loans to corporations ( $\omega_F B^F$ ) we obtain a value for the bank’s capital ratio.

The capital requirement functions such that a minimum level for the capital ratio is set. The purpose of the risk weights is for the capital requirement to be affected by the extent of risk assumed by the bank. If the bank takes greater risks, it must hold more equity. This renders capital allocation in the economy more efficient.

The risk weights can be determined in different ways. Since the Basel II Accord came into effect in 2007, Swedish banks have been permitted to use internal models for calculating the weights that reflect the risk in their lending. In that process, the banks sharply reduced their risk weights for mortgages. In order to prevent the banks from setting risk weights that are far too low, Finansinspektionen thus introduced a risk weight floor for mortgages in May 2013.<sup>5</sup>

When the Basel III regulations are fully implemented, another macroprudential tool will be introduced to complement the risk-weighted capital requirement – the *leverage ratio requirement*. The leverage ratio is a bank’s equity in relation to its total lending. It is defined as

4 The capital conservation buffer, the countercyclical capital buffer, the systemic risk buffer, the capital buffer for global systemically important institutions and the capital buffer for other systemically important institutions, see SOU 2013:65 (chapters 3 and 4) for a more detailed description of the terms.

5 The capital requirement for the Swedish banks is currently 12 per cent. However, various buffer requirements, the risk weight floor for mortgages and specific capital requirements for individual banks render the requirement higher in practice, see Sveriges Riksbank (2014a).

$$(3) \quad K = \frac{A}{B^H + B^F},$$

where  $K$  denotes the leverage ratio. A leverage ratio requirement sets a minimum level for the bank's equity in relation to its total lending. Unlike the risk-based capital requirement, the leverage ratio requirement is thus not affected by the extent of risk presented by the various assets.

High capital requirements thus increase the resilience of the financial system to shocks, which reduces the risk of a financial crisis. However, equity funding is usually more expensive for the banks than debt funding. If the banks must raise funding with more equity, their funding costs therefore increase. This might entail higher lending rates for customers, resulting in lower lending and lower GDP. However, if the households and the firms have excessive debt, borrowing less might be a positive side effect.

#### MACROPRUDENTIAL TOOLS TARGETING CREDIT DEMAND

When house prices rise quickly in combination with rapidly escalating household indebtedness, this usually requires the introduction of some sort of limit on borrowing. The most common types of limitation on borrowing are the *mortgage cap*, which limits the size of the loan in relation to the value of the home, the *loan-to-income cap*, which limits the size of the loan in relation to the household's disposable income, and the *debt-service-to-income cap* which limits the size of interest payments and loan amortisation in relation to the household's disposable income.<sup>6, 7</sup> The loan-to-income cap and the debt-service-to-income cap are, in other words, based on the household's income, while the mortgage cap is based on how much the home is worth. A common feature of this type of macroprudential tool is that they make it more difficult or more expensive for households to take on debt. Hence, they help curb household indebtedness, thus bolstering their resilience.

The essential differences between these tools can be illustrated based on a simplified budget restriction for a household.<sup>8</sup> Assume that the household lives in two periods. In the first period the household consumes  $c_1$  goods and in the second period it consumes  $c_2$  goods. The household also consumes housing services, which correspond to the house  $h$  in this context. In the second period, the household releases its equity in the home to finance its consumption.<sup>9</sup> The budget restriction of the household can thus be described as

6 The mortgage cap is also called the LTV cap (loan-to-value-cap), and the loan-to-income cap is abbreviated as the LTI cap and the debt-service-to-income cap as the DSTI cap. Amortisation requirements are another possible measure to reduce household indebtedness, see e.g. Sveriges Riksbank (2014b).

7 The risk of credit losses among the banks can also decrease if household resilience is strengthened. The mortgage cap can reduce the banks' loss in the event of the borrower defaulting, while the loan-to-income and the debt-service-to-income caps can reduce the probability that households fail to honour their commitments.

8 This description is based on Kuttner and Shim (2013).

9 The first period equals the first part of the life cycle, and the second period the latter part of life.

$$(4) \quad c_1 + p_1 h + \frac{1}{1+r} c_2 = \frac{p_2 h}{1+r} + y_1 + \frac{y_2}{1+r},$$

where  $p_1$  is the house price in the first period,  $p_2$  the house price in the second period,  $r$  the interest rate,  $y_1$  the income in the first period and  $y_2$  the income in the second period.<sup>10</sup> The household's borrowings in the first period,  $B^H$ , are the difference between the consumption of goods and housing services and income in the first period, i.e.

$$(5) \quad B^H = c_1 + p_1 h - y_1.$$

Because of the mortgage cap, it is more difficult for the household to borrow using the home as collateral. In Sweden Finansinspektionen introduced a mortgage cap in October 2010 in the form of general guidelines setting out that a mortgage may not exceed 85 per cent of the market value of the home. The following expression defines the household's mortgage cap,  $\theta$ ,

$$(6) \quad \frac{B^H}{p_1 h} \leq \theta.$$

If the restriction is binding, a tightening – i.e. a reduction – of the mortgage cap means that the household will have less money to spend on housing and consumption in the first period. In general, the household reduces its consumption of both goods and housing services, but the extent thereof depends on its inclination to substitute these utilities with each other.

A feature of the mortgage cap is that it becomes less binding when house prices,  $p_1$ , rise, because the ratio between household borrowing and house value,  $B^H/p_1 h$ , then falls. Rising house prices can therefore fuel a credit boom. Rising house prices can also neutralise the effects of reducing the mortgage cap if the supervisory authority wishes to curb a credit boom.

A loan-to-income cap puts a limit on how much a household can borrow in relation to its income. Banks require, when they perform a credit assessment of a household, that the household has sufficient income to honour its obligations. However, there is no formal cap in Sweden that limits borrowings in relation to income, as there is in other countries. The household's loan-to-income cap,  $\vartheta$ , can be written as follows

$$(7) \quad \frac{B^H}{y_1} \leq \vartheta.$$

Just as in the case of a reduced mortgage cap, the household must cut back on its consumption of goods and housing services if  $\vartheta$  is reduced and the restriction is binding. How and to what extent depend, as in the previous case, on the household's preferences.

<sup>10</sup> The consumption good is the numeraire, i.e. income and house prices are expressed in terms of the consumption good.

In practice, the loan-to-income cap prevents low-income households from taking on excessive loans. The difference compared with a mortgage cap is thus that, with a loan-to-income cap, income is the binding restriction, and not the capital investment.

The debt-service-to-income cap is a way of limiting how much households may borrow based on their repayment ability. In other words, it is the ability of the household to pay interest and amortisation that limits the extent of the loan it may take out. A debt-service-to-income cap,  $\varphi$ , for the household may be defined as follows

$$(8) \quad \frac{rB^H}{y_1} \leq \varphi.$$

In this instance too the household must cut back on consumption of goods and housing services if the debt-service-to-income cap is reduced and the restriction is binding. A binding debt-service-to-income cap illustrates an important link between interest and credit growth, since an interest rate cut brings about reduced interest expenditure and the restriction thus becomes less binding. An interest rate cut can thus have a greater effect on credit when the restriction is binding than when it is not.

## The effects of macroprudential tools in empirical studies

In recent years, a great number of papers have been published that study the effects of various macroprudential tools on financial imbalances. In this section, we highlight some papers which in our view reflect the current picture of this new area of research.

Because the studies differ in terms of analytical method, choice of countries, credit measures and tools that are studied, the comparisons are of a fairly general nature.

Kuttner and Shim (2013) is a much-quoted study of the effects on mortgages and house prices of a great number of economic policy measures in 57 countries during the years 1980-2011. The most common tools according to this study are reserve requirements (whereby the bank must hold part of deposits as reserves in an account at the central bank), mortgage caps and housing-related taxes and tax relief. The most common combination of tools in these countries is the mortgage cap and the debt-service-to-income cap. Around 55 per cent of the tools studied have been of a tightening nature. It is also indicated that tools such as risk weights, provisioning requirements, mortgage caps and debt-service-to-income caps did not start to be used to any great extent until 2005.

We start by describing some studies in which the macroprudential tools are directed at the supply side of the credit market.

### HIGHER CAPITAL REQUIREMENTS WOULD NOT HAVE SUFFICED TO CURB LENDING TO A SUFFICIENT EXTENT AHEAD OF THE FINANCIAL CRISIS IN THE UK AND SPAIN

Several empirical studies of microdata, primarily from the UK, have studied how individual banks are affected by changes to capital requirements. These studies calculate first of all

how the banks' capital ratio changes, and then how that, in turn, affects lending volumes and lending rates.

Francis and Osborne (2009, 2012) use microdata from UK banks to calculate how changes in the capital requirements affected these banks during the period 1996-2007. They study how the banks' targeted capital ratio is affected by changes to capital requirements, and how the banks adapt their balance sheet to achieve a new capital ratio. Changes to capital requirements have a major impact on the banks' capital ratio, but also on their lending. Nevertheless, the authors conclude that if the capital requirements had been increased during the years preceding the financial crisis, this would not have had a sufficiently large effect on lending to prevent the rapid credit expansion.<sup>11</sup>

Aiyar et al. (2012) also find that the lending of UK banks is affected to a relatively great extent by changed capital requirements. However, they also observe that lending increases among banks not covered by the capital regulations, and hence that there is an element of "leakage". Their findings suggest that around a third of the effects on the banks' lending covered by the regulations are offset by the banks not covered by the regulations lending more.

Drehmann and Gambacorta (2012) study how the lending of Spanish banks would have been affected during the period 1986-2007 if a countercyclical capital buffer had been introduced at the time.<sup>12</sup> They find that credit supply during that period would have been around 18 per cent lower. The conclusion is that the effects on lending of the capital buffer might be relatively large, but that they are nevertheless small compared with the sharp credit growth that occurred in the Spanish economy ahead of the financial crisis. So, it is very likely that the countercyclical capital buffer would not have been able to significantly curb credit growth in Spain. In summary, these studies show that banks adapt their capital ratio to a relatively great extent when the capital requirements are changed. The banks reduce lending a great deal, but not sufficiently to be able to slow down a financial cycle in the upturn phase.

#### CAPITAL REQUIREMENTS AFFECT TOTAL LENDING, BUT DO NOT HAVE ANY CLEAR EFFECTS ON MORTGAGES

IMF (2012) is an empirical study that calculates which effects time-varying capital requirements and other macroprudential tools may have on various financial and real variables. The paper estimates the effects on credit, house prices and GDP of various tools in 36 countries during the period 2000-2011. The study also attempts to take account of the fact that the tools might have asymmetrical effects, i.e. that their strength may vary depending on whether it is a matter of easing or tightening. Capital requirements prove to have significant effects on both credit and house prices, but no substantial effects on GDP growth. According to this study, a capital requirement have greater effects on credit during

<sup>11</sup> For further empirical studies of how UK banks reacted to changed capital requirements, see e.g. Bridges et al. (2014) and Noss and Toffano (2014).

<sup>12</sup> See e.g. Juks and Melander (2012) for a description of the countercyclical capital buffer.

financial crises (when the credit volumes are declining), but the effects seem to be equally strong whether the requirement is tightened or relaxed (symmetric effects).

Unlike the IMF study, Kuttner and Shim (2013) do not focus on total credit, but on household mortgages. Tools studied include limitations on exposures to the housing sector, risk weights for mortgages and provisioning requirements that are intended to affect the banks' equity and supply of housing loans.<sup>13</sup> They also study the effects of quantitative limitations on credit growth (such as a limit on how much the banks may increase their lending by month or quarter), reserve requirements and liquidity requirements (whereby the bank must hold part of deposits in liquid funds, such as treasury bills). They find that, out of these different tools, only limitations on the extent to which banks may be exposed to the housing sector have significant effects on mortgages.<sup>14</sup> None of these tools have an effect on house prices.

Akinci and Olmstead-Rumsey (2015) update the databases used by IMF (2012) and Kuttner and Shim (2013), but limit themselves to developments since 2000. Hence, their database comprises macroprudential tools in 57 countries for the period 2000-2013. They study, for example, which effects countercyclical capital requirements, provisioning requirements, restrictions on growth in bank credits and stricter requirements for consumer loans have on total bank credits, mortgages and house prices. They find that provisioning requirements and countercyclical capital requirements have significant effects on total bank credits, but not on mortgages. They also find that capital requirements have significant effects on house prices, but provisioning requirements, however, do not. Although some of these macroprudential tools may have effects on total credit growth, these studies suggest that other tools are required to substantially affect household mortgages. In the next section, we describe some studies in which macroprudential tools target household demand for credit.

#### MORTGAGE CAPS HAVE EFFECTS ON MORTGAGES, AND MOST LIKELY ALSO ON HOUSE PRICES

IMF (2012) also studies the effects of various macroprudential tools geared to households' credit demand. According to the study, the mortgage cap and the loan-to-income cap have little effect on credit growth when they are estimated for all countries.<sup>15</sup> The mortgage cap has significant effects on both house prices and GDP growth, which is not the case for the loan-to-income cap.

Kuttner and Shim (2013) is another study that analyse the effects of macroprudential tools targeting credit demand. They also look at the effects of housing-related taxes and tax relief on mortgage interest. According to one empirical method, the mortgage

<sup>13</sup> Provisioning can take place in the form of the banks setting aside parts of their profit in boom times to have better resilience to credit losses in times of crisis.

<sup>14</sup> Examples of exposure limitations are how high a share of the banks' lending may be to a certain sector, such as the housing sector. Kuttner and Shim (2013) point out however that the number of registered events in terms of exposure limitations are few in the data material.

<sup>15</sup> However, in developing countries these effects are significant.



cap, debt-service-to-income cap and housing-related taxes have significant effects on mortgages, but according to other methods it is only the debt-service-to-income cap that has significant effects on mortgages. Housing-related taxes are the only measures that have any effect on house prices.

McDonald (2015) employs methods and data similar to those of Kuttner and Shim (2013) to study effects from macroprudential tools on growth in mortgages and house prices. However, he limits the analysis to effects of mortgage caps and loan-to-income caps in the 17 countries that were the most active users of these tools between 1990 and 2013. During this period the mortgage cap was cut 54 times and increased 21 times in those countries, while the loan-to-income cap was reduced 20 times and increased 5 times.

McDonald finds that both the loan-to-income cap and the mortgage cap have significant tightening effects on how quickly mortgages rise, and that the tightening effect is greater in countries where house prices are high compared with household income.<sup>16</sup> Also, mortgage caps have had a relatively greater effect on credit growth than loan-to-income caps. When mortgage caps are reduced, this also slows down the rate of increase of house prices.

Akinci and Olmstead-Rumsey (2015) also find that stricter mortgage caps and loan-to-income caps can keep a lid on growth in total bank credit, mortgages and house prices. The authors also draw the conclusion that the use of macroprudential tools gives economically significant results. A counterfactual analysis shows that house prices would have increased at twice the rate in 2011-2013 in the countries that used a macroprudential tool during those years, while growth in mortgages would have been one and a half times higher.

Krznar and Morsink (2014) study the effectiveness of macroprudential tools in Canada. Besides the mortgage cap and amortisation requirements, the terms of mortgage insurance contracts have varied over time, thus affecting credit growth in different ways. Until 2008, the mortgage insurance rules were made more generous, which spurred credit growth. From 2008, credit terms have been tightened instead. Mortgage caps have been lowered, amortisation requirements have been tightened and the mortgage insurance rules have become stricter. Krznar and Morsink find that the combined tools during 2010–2012 had significantly tightening effects on credit growth (and house prices according to a separate analysis). They also describe estimates of which effects the specific mortgage cap and amortisation requirement tools have had. Their findings suggest that mortgage caps for new loans and for refinanced loans have had significantly dampening effects on mortgage growth, while amortisation requirements have not had significant effects when mortgage caps are also included in the estimation. A reduction in the mortgage cap by one percentage point reduces mortgage growth by 0.25-0.5 percentage points. They also do a counterfactual analysis, finding that without the macroprudential tools used since 2008, the loan-to-income ratio at the end of 2013 would have been 170 instead of 165 per cent.

<sup>16</sup> According to McDonald, this might explain differences between countries in terms of effects of macroprudential tools. As an example, it is mentioned that mortgage caps may have had a greater effect in countries such as Hong Kong, China and Singapore compared to countries like Norway, which has much lower house prices in relation to household income.

Krznar and Morsink also discuss international experience from using macroprudential tools to attempt to limit growth in house prices and mortgages. They observe that the mortgage cap is the most used tool. It is also noteworthy that the majority of countries that have introduced mortgage caps have varied them over time and lowered (i.e. tightened) the requirements when the growth rate of house prices is high, and increased (i.e. eased) the requirements when house prices decline. They also observe that the mortgage cap have often been used in combination with the loan-to-income cap.<sup>17</sup>

Based on the Riksbank's previously published analyses, Guibourg and Lagerwall (2015) estimate the macroeconomic effects of a number of tools aimed at limiting household indebtedness. Gains appear to arise through lower indebtedness – and hence reduced risks in the longer term – while costs arise in the short term with lower consumption and GDP growth. They determine that tools that only affect new borrowers in most cases have limited effects on both indebtedness and the macroeconomy in general. Adjusting tax relief on mortgage interest is however a potentially more powerful tool because it affects all borrowers and the effects on both indebtedness and the macroeconomy would thus be greater. The effects of the various tools on the macroeconomy also depend on how much house prices are affected.

#### MORTGAGE CAPS AND INCOME-BASED LOAN CAPS ARE EFFECTIVE IN REDUCING MORTGAGES

One conclusion from the review of the literature is that capital requirements should typically be used when there is a desire to bolster bank balance sheets, while mortgage caps, loan-to-income caps and debt-service-to-income caps should primarily be used when there is a desire to curb rising house prices and the progression of household debt. We also note that there is great uncertainty in terms of which effects the various macroprudential tools produce. There are several reasons for this. The tools have not been in use for very long, so the evaluation period is short. Also, several tools have been used simultaneously, making it difficult to separate the effects of the different tools. Yet, we can nevertheless draw certain conclusions. It seems that capital requirements can affect the banks' capital ratio and limit total lending, but not sufficiently to be able to curb overly rapid credit growth. Several studies show that both mortgage caps and income-based loan caps can be effective in preventing mortgages from rising too quickly. It is therefore not surprising that it is the mortgage cap and the income-based loan cap that seem to be those most used that seem to be those most used, and often in combination with each other. Housing-related taxes such as property tax or tax relief on mortgage interest also have effects on mortgages. Housing-related taxes and mortgage caps also appear to have significant effects on house prices. However, the effects of the other tools on house prices are not clear-cut.

17 As mentioned previously, one reason for this is that mortgage caps can create procyclical dynamics in which sharp upturns and downturns in house prices can create considerable variations in how much households may borrow.

These conclusions are in line with the literature review in Claessens (2014).<sup>18</sup> Claessens emphasises, however, that most empirical studies only study the effect of using one tool at a time, and seldom with varying intensity or length of time. Often, only the effects on lending or house prices are evaluated, and not whether systemic risks decline. On the whole, he nevertheless finds that mortgage caps and loan-to-income caps can probably limit the risk of rising house prices leading to surging borrowing, which in turn fuels house prices in a “feedback loop”. They can hence help reduce systemic risks in the economy.

## Interaction between macroprudential and monetary policies

Monetary policy works by means of, for instance, influencing the volume of credit in the economy. There may thus be a reason for the central bank to attempt to counteract the emergence of financial imbalances, because they can ultimately affect inflation and resource utilisation. However, a well-functioning macroprudential policy should reduce the need to employ monetary policy in such situations, because the various macroprudential tools are normally more effective in managing financial imbalances than monetary policy. Various macroprudential tools also affect lending in the economy, and can therefore affect resource utilisation. High resource utilization leading to overheating of the economy may threaten financial stability. The supervisory authority may therefore wish to work towards resource utilisation not being too high. In terms of both objectives and means the two policy areas are thus interlinked.

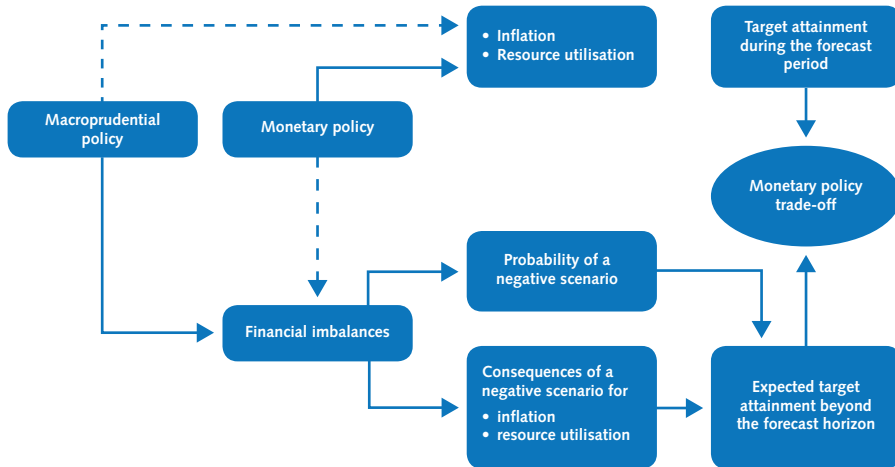
### A CONCEPTUAL FRAMEWORK FOR THE INTERACTION BETWEEN MACROPRUDENTIAL AND MONETARY POLICIES

Sveriges Riksbank (2014c) presents a conceptual framework showing how monetary policy may take account of financial imbalances. In Chart 1 we extend that framework by including also macroprudential policy.

Macroprudential policy is aimed at counteracting the emergence of financial imbalances and limiting the risk of financial crises, as illustrated in the lower area of the diagram. The trade-off for monetary policy is illustrated in the upper area. Price stability is the fundamental objective of monetary policy. In practice, however, most central banks conduct “flexible inflation targeting”, meaning that they set the policy rate such that they can achieve a good target attainment for inflation and resource utilisation in two to three years. Consideration for financial imbalances in monetary policy decisions is illustrated in the lower area of the diagram. The policy rate can affect financial imbalances. Hence, monetary policy can affect the probability of a negative scenario, in which increasing financial imbalances lead up to a financial crisis, but also the consequences if the negative scenario do occur.

<sup>18</sup> See also Galati and Moessner (2014) for a review of literature regarding the effects of various macroprudential tools.

Chart 1. Schematic outline of the interaction between macroprudential and monetary policies



A discussion is under way regarding whether macroprudential policy could counteract financial imbalances without the support of monetary policy.<sup>19</sup> This is an important issue, but thus far there is too little practical experience to be able to draw any sure conclusions. However, whether this is the case or not, it is likely that macroprudential tools affect resource utilisation and inflation – a factor that monetary policy may need to take into account.

**MACROPRUDENTIAL POLICY IS MORE EFFICIENT THAN MONETARY POLICY IN COUNTERACTING SECTOR-SPECIFIC FINANCIAL IMBALANCES**

Alpanda et al. (2014) study the interaction between macroprudential and monetary policies in a “dynamic general equilibrium model” with a relatively comprehensive financial sector. They can thus study the effects of several different macroprudential tools, such as capital requirements, mortgage caps and risk weights for both households and corporations. The model also contains a foreign sector, so exchange rate effects can be taken into account.

Using the model, the authors study the extent to which capital requirements and mortgage caps are more efficient than monetary policy in reducing household debt. In order to decrease household debt by around 8 per cent, GDP declines by around 0.7 per cent if the mortgage cap is used, and by around 2 per cent if the capital requirement is used. If instead monetary policy is used, the drop in GDP is around 7 per cent. The cost of using monetary policy compared to the mortgage cap is thus, according to that analysis, ten times greater. This is because the mortgage cap directly targets the household sector, and therefore takes the greatest effect there. The capital requirement works on a slightly broader front than the mortgage cap and is therefore a little less effective, while monetary policy works on the broadest front.

<sup>19</sup> See e.g. Smets (2013). In the Swedish debate, it is also expressed that macroprudential policy needs the support of fiscal policy (tax relief on mortgage interest, property tax, etc.).

Alpanda and Zubairy (2014) complement Alpanda et al. (2014) in that they also include fiscal policy tools such as property tax and tax relief on mortgage interest in the analysis. A difference from Alpanda et al. (2014) is also that the model is simpler. For example, it does not have an explicit banking sector or foreign sector. On the other hand, it has a relatively detailed model of the mortgage market. The restriction on borrowing is more realistic and pertains only to new loans, unlike many other models, in which the restriction applies to the entire stock, meaning that amortisation and housing equity withdrawal can also be studied.

Tightening monetary policy by one percentage point reduces household borrowing from the banks by around 0.2 per cent in the model of Alpanda and Zubairy. However, the effect on GDP is greater, meaning that the households will get a greater debt in relation to GDP, i.e. the debt ratio increases. Alpanda and Zubairy then compare how efficiently monetary policy can be used to reduce household indebtedness with three other tools: mortgage cap, property tax and tax relief on mortgage interest. All of these tools reduce indebtedness more efficiently than monetary policy. It is most efficient to reduce tax relief on mortgage interest, followed by the mortgage cap and property tax. While reduced tax relief on mortgage interest is indeed a somewhat broader tool than the mortgage cap, and therefore potentially more costly in terms of reduced production, it is ultimately nevertheless more effective to reduce the tax relief on mortgage interest because that also reduces the incentive of households to mortgage their homes.

Boivin et al. (2010) is another paper that studies whether monetary policy should be used to counteract financial imbalances. In the first part of the paper, they study the effects of a time-varying mortgage cap in a model that resembles that in Walentin (2014). The basis is a shock that pushes up both house prices and the credit gap, measured as the deviation from trend of the mortgages. If monetary policy attempts to curb the upswing in the credit gap by increasing the policy rate, this leads to considerable volatility both in the deviation from target of inflation, and in the GDP gap. A better alternative is to allow monetary policy to focus on the inflation target and GDP gap and instead introduce a time-varying mortgage cap that can prevent the credit gap from increasing. This illustrates how a targeted macroprudential tool is, usually, more efficient than monetary policy in counteracting financial imbalances in a certain sector of the economy.

In the second part of the paper, focus is on the countercyclical capital buffer and the aggregate credit volume in the economy. They show that if monetary policy, besides reacting to the deviation from target of inflation and the GDP gap, also reacts to the credit gap, measured as the deviation from trend of bank lending, the fluctuations in inflation, the GDP gap and the credit gap decrease. The introduction of a countercyclical capital buffer does not alter the conclusion that monetary policy should, in that case, react to the credit gap.

A conclusion that we can draw from these studies is that, if financial imbalances are specific to a certain sector, it is often more efficient to use a specific macroprudential tool for that sector. If, for example, the financial imbalances are specific to the

housing market, a mortgage cap or (reduced) tax relief on mortgage interest is more efficient than monetary policy. If, on the other hand, there is a general increase in lending in all sectors, a macroprudential tool that works broadly should be used, such as the countercyclical capital buffer. In that case, monetary policy can also support macroprudential policy.

#### THERE MAY BE ECONOMIC GAINS FROM COORDINATING MONETARY POLICY WITH MACROPRUDENTIAL POLICY

Angelini et al. (2014) study the interaction between monetary policy and the countercyclical capital buffer. The central bank and supervisory authority can choose between coordinating their decisions, and not coordinating them. They show that a lack of coordination can lead to heightened fluctuations in both the policy rate and in the countercyclical capital buffer when supply shocks (productivity shocks) generate cyclical fluctuations. However, coordination is less important in terms of volatility in inflation, the GDP gap and the credit gap. When financial shocks are the reason for cyclical fluctuations (i.e. in financial crises), the introduction of a countercyclical capital buffer considerably reduces volatility in the credit gap and GDP gap, irrespective of whether or not the authorities coordinate decisions.

Jonsson and Moran (2014) study the interaction between monetary policy and the countercyclical capital buffer in a model that resembles that of Angelini et al. (2014). One difference, however, is how they model the banking sector. In the model of Jonsson and Moran, the banks do not have full information about the projects and intentions of borrowers. The banks' task as loan mediators is to mitigate or ideally counter the effects of this information problem. In Angelini et al. (2014) the banks instead have full information about borrowers' projects, but they operate on a market that is not fully competitive. They also assume that it is costly for the banks to deviate from the capital requirements of the supervisory authority in their model.

Jonsson and Moran describe the outcome of two types of shock – a supply shock that affects productivity, and a demand shock that affects public consumption. They show that the GDP gap and the credit gap move in the same direction in the case of supply shocks. If productivity improves, corporations can increase production, leading to an increasing GDP gap. It will also be more profitable to invest, and because the investments are financed by borrowed funds, the credit gap widens too. No trade-off thus arises between stabilising the credit gap and the GDP gap in this case. Coordination between the authorities gives rise to smaller fluctuations in both the credit gap and the GDP gap, compared to when they do not coordinate.

For supply shocks, the GDP gap and the credit gap move in different directions. If public consumption increases, this pushes up total demand and hence the GDP gap. However, that increase in public consumption also crowds out investment, leading to a decline in demand for credit and a drop in the credit gap. In this case, a trade-off emerges between stabilising the GDP gap and the credit gap. Coordination then does not generate any

substantial gains in terms of smaller fluctuations in these variables. But the authorities do not need to act as much to achieve this when they coordinate their decisions, which reduces uncertainty and increases social benefit.

A common feature of these and many other model analyses of the interaction between monetary and macroprudential policy is that a short-run cost arises in terms of a lower GDP when the authorities attempt, using various means, to prevent a rapidly escalating indebtedness. The models can capture this cost, but usually not the long-term gains from a reduction in the risk of financial crises. It is hence not possible to analyse the trade-off between short-term costs and longer-term gains in a formal model. That trade-off must in most cases be done in some other way.

## Summary and concluding comments

Macroprudential policy is a new policy area that has taken shape based on experience from the financial crisis. It is the policy area devised primarily to reduce the risk of the emergence of financial crises. In this paper, we have attempted to provide an overview of the rapidly growing scientific literature on the effects of various macroprudential tools.

A general conclusion from these studies is that, when capital requirements are increased, the banks cut back on their lending, but not to the extent that might be needed to curb overly rapid credit growth. Several studies show that the mortgage cap and tax relief on mortgage interest are two tools that could be effective in preventing household debt from rising too quickly.

The studies also show that when rapid credit expansion occurs on the housing market, a time-varying mortgage cap is more effective than monetary policy in curbing financial imbalances. However, a broader macroprudential tool – such as the countercyclical capital buffer – should be used if the rapid credit expansion is general. It might also be effective to combine it with monetary policy to counteract the rapid credit expansion. A conclusion from several studies is also that macroprudential tools, in particular tools directly targeting specific sectors, are more efficient than monetary policy in counteracting financial imbalances.

## Glossary

**Basel I:** The first of three “Basel Accords”, reached in 1988. The Basel regulations are a set of international rules for financial institutions that primarily regulate the banks’ capital adequacy, i.e. how much capital a bank must keep in relation to the risk it assumes. According to Basel I, a bank’s risk-weighted assets are calculated by assets being classified into different risk categories, and weighted accordingly.

**Basel II:** The second Basel Accord, which enabled the banks to use internal models for calculating the size that their risk-weighted assets must be, provided that the models were approved by the supervisory authorities. Basel II was implemented in Sweden in 2007.

**Basel III:** The third Basel Accord. Compared with Basel II, Basel III contains stricter capital requirements and capital buffer rules. Also, Basel III regulates how the banks manage liquidity. Basel III is currently being implemented gradually through 2019.

**Mortgage cap:** A limit on how much a household may borrow in relation to the value of the home.

**Disposable income:** The sum of all income at the disposal of a person or household after taxes and fees.

**Countercyclical capital buffer:** A countercyclical capital buffer is a new macroprudential tool and part of Basel III. Unlike other capital requirements, a countercyclical capital buffer may vary over time and be activated in the event of strong credit growth, because that increases the risk of a future financial crisis. The purpose of a countercyclical capital buffer is to strengthen the resilience of banks in boom times, and ensure that the banking system has sufficient capital at times when disruptions in the financial system could make it more difficult for the banks to lend. In Sweden, Finansinspektionen is the authority that sets how high the countercyclical capital buffer should be through a qualitative assessment using a buffer guide. That buffer guide is calculated using the Basel Committee's standardised approach, which is based on the credit gap, i.e. how much aggregate household and corporate lending in relation to GDP deviates from its long-term trend.

**Liquidity:** Measure of the ability of a company or organisation to meet its payment obligations in the short term. Can also describe how quickly it is possible to convert an asset into money.

**Loan-to-income cap:** A limit on how much a household may borrow in relation to its income.

**Debt-service-to-income cap:** A limit on how high the borrowing expenses of a household, such as interest expense and loan amortisation, may be in relation to its income.

**Supervisory authority:** The authority charged with monitoring the financial market and counteracting risks which may bring about instability in the financial system. Finansinspektionen is the financial supervisory authority in Sweden.



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