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Money and Banking Combined

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In this paper we present a policy framework for monetary, macroprudential, and microprudential policies. At the center are two macro policy instruments: the short-term interest rate and the aggregate equity capital ratio for the banking system (ACR). The latter is set by an independent macroprudential policy-maker or by the central bank. A separate bank regulator determines bank-specific capital requirements consistent with the ACR and supervises banks. We illustrate how both macro instruments can be used to pursue price stability and to stabilize the financial system and the real economy. We suggest that these twin macro instruments can set the basis for a sound economy and a robust banking system. Finally, we discuss the pros and cons of a three-institution and a two-institution implementation of the policy framework.

Keywords: financial intermediation, banking crises, monetary policy, macroprudential policies, aggregate equity ratios, banking regulation

JEL Classification: D41, E4, G2

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1 Introduction

The way in which monetary policy, macroprudential policy, and microprudential regulation of banks should be organized and conducted is a major, as yet unresolved issue. In this paper we outline a policy framework¹ for addressing this issue.

Linkages between monetary policy and financial stability

It has always been recognized that monetary policy cannot be fully separated from policies safeguarding the stability of the financial system. The major linkages are

- central banks act as a lender of last resort to commercial banks
- bank crisis resolution may require unconventional monetary policies such as bond purchases
- lax monetary policy may contribute to banking instability
- banking regulation aims at stabilizing output by lowering the likelihood of banking crises or by moderating credit cycles. To some degree, monetary policy also aims at stabilizing output alongside its major objective, price stability.

Historically speaking, the first central banks were commercial bank supervisors.² Later, central banks focused on price stability and, to varying degrees, on output stabilization. Since the financial crisis starting in 2007, central banks have been shouldering greater responsibility than before for the supervision of banks and more generally for the stability of financial systems again.

Macroprudential policies

As the output losses caused by banking crises are normally substantial³ and can be much higher than the drop in GDP caused by recessions, banking stability has become a first-order policy

¹A simple model for this framework has been developed in Gersbach and Hahn (2011).

²Charles Goodhart noted that “the monetary (macro) functions of central banks were largely grafted onto the supervisory functions” (Economist (2011)).

³See e.g. Laeven and Valencia (2008) for recent estimates.

issue after the recent crisis. The opinion is almost unanimous that the “macroprudential“ orientation of banking regulation and supervision has to be strengthened.⁴ The aim of such macroprudential policies is to increase the resilience of the financial system as a whole, thereby reducing the likelihood of financial crises with adverse consequences for the real economy. However, how macroprudential policies should be precisely defined, what instruments should be used, and whether such an approach should be coordinated with monetary policy and bank-specific regulation is still unclear.

The Framework

In a nutshell, we suggest the following policy framework⁵:

- Instruments
 - Macro level: Minimal aggregate bank equity capital ratio (henceforth aggregate capital ratio (ACR)) and short-term interest rate.
 - Micro level: Bank-specific capital requirements are set such that the ACR is met, and individual banks are supervised.
- Organization
 - Monetary policy via short-term interest rates is conducted by the central bank.
 - A macroprudential policy-maker sets ACR.
 - Bank regulator determines bank-specific capital requirements and supervises banks.
- Objectives
 - Central bank minimizes a loss function consisting of inflation and output deviations.
 - The macroprudential policy-maker minimizes output fluctuations caused by lending cycles or banking crises.
 - The microprudential regulator focuses on the soundness of individual banks.

⁴On the origin and current state of macroprudential thinking, see Borio (2011).

⁵A first sketch of this framework has appeared in Gersbach (2010). Interesting suggestions on how to relate price and financial stability can be found in Geraats (2010) and De Grauwe and Gros (2009).

We note that the framework requires three institutions. If the framework is implemented with two institutions, aggregate bank equity policy has to be delegated either to the central bank or to the bank-specific regulator. As we will discuss in subsection 4.2, in such cases, the central bank should conduct both monetary and macroprudential policies.

Outline

The policy framework and its rationale will be detailed in the following sections. In the next section, we focus on the macro instrument ACR and discuss how bank-specific capital requirements consistent with ACR can be determined. In section 3, we outline how both macro policy instruments can work together to stabilize inflation, to alleviate booms and downturns, and to foster the resilience of the financial system. In section 4, we discuss the justification for the arrangements in the three and two-institution solution. In the latter, there is no separate macroprudential policy-maker operating and aggregate bank-capital policy has to be delegated either to the central bank or to the bank regulator. Section 5 concludes.

2 The ACR and Bank-specific Capital Requirements

2.1 Definition

It is best to start with a definition of the macro policy instrument ACR.

Definition ACR

The aggregate capital ratio of the banking sector is defined as the ratio of

- *total equity in the banking sector (held by non-banks) to*
- *total end-borrower lending (loans to non-financial firms, households, and governments), plus other non-bank assets.*

To provide a formal definition, we consider an accounting framework of the banking system following Shin (2009). There are n banks representing all leveraged financial intermediaries.⁶

⁶This set contains commercial banks, universal banks, and leveraged investment banks. Unleveraged financial institutions such as pension or mutual funds and insurance companies are not in the set. Equity capital in our context is best thought of as tier 1 capital.

We introduce the following variables:⁷

- z_i : value of claims of bank i on end-users (such as households or firms)
- d_i : value of obligations of bank i
- s_{ji} : share of bank j 's obligations held by bank i
- e_i : value of equity of bank i
- w_{ji} : share of bank j 's equity held by bank i

The value of bank i 's assets is given by

$$z_i + \sum_{j=1}^n s_{ji}d_j + \sum_{j=1}^n w_{ji}e_j \quad (1)$$

and the balance sheet identity for bank i can be written as

$$z_i + \sum_{j=1}^n s_{ji}d_j + \sum_{j=1}^n w_{ji}e_j = e_i + d_i. \quad (2)$$

The aggregate balance sheet identity for the banking sector is given by

$$\sum_{i=1}^n z_i = \sum_{i=1}^n e_i - \sum_{i=1}^n \sum_{j=1}^n w_{ji}e_j + \sum_{i=1}^n d_i - \sum_{i=1}^n \sum_{j=1}^n s_{ji}d_j$$

The left-hand side represents the total claims of the bank system on end-users. The right-hand side is the total equity held by non-banks and total funding to the banking sector provided by outside, non-equity claim holders.

Accordingly, the aggregate capital ratio is defined as

$$\begin{aligned} ACR &:= \frac{\sum_{i=1}^n e_i - \sum_{i=1}^n \sum_{j=1}^n w_{ji}e_j}{\sum_{i=1}^n z_i} \\ &= \frac{\sum_{i=1}^n e_i - \sum_{i=1}^n \sum_{j=1}^n w_{ji}e_j}{\sum_{i=1}^n e_i - \sum_{i=1}^n \sum_{j=1}^n w_{ji}e_j + \sum_{i=1}^n d_i - \sum_{i=1}^n \sum_{j=1}^n s_{ji}d_j}. \end{aligned} \quad (3)$$

⁷The values are from the balance sheets of banks and thus refer to accounting values. In a frictionless world, these values would be equal to market values.

A number of remarks are in order here. First, ACR is a minimum requirement for the banking system. Second, a given value of ACR is compatible with a wide range of leverage levels for individual banks. As we will see later, changes in the leverage of individual banks may be a reason to change the ACR. Third, a given ACR is consistent with a banking system in which some banks have high and others have low equity ratios. Fourth, while ACR focuses on the banks' balance sheets, it is important to account for off-balance sheet positions – either by incorporating them or by reducing the equity capital that can be used for the calculation of ACR and bank-specific capital requirements accordingly.

2.2 Bank-specific capital requirements

All other regulatory and supervision tasks are executed by bank-regulatory authorities. These authorities act under the aggregate capital ratio constraint. There are different ways of determining bank-specific capital requirements. We provide three main alternatives.⁸

- *Non-risk-sensitive bank-specific capital requirements*

Each bank faces the same capital requirements such that the ACR is met.

- *Simple-risk-adjusted bank-specific capital requirements*

Bank-specific capital requirements as calculated in the first alternative are adjusted upward or downward, depending on whether a particular bank holds a comparatively high-risk or low-risk asset portfolio. The relative riskiness of banks' asset portfolios compared to the average determines whether bank-specific capital requirements are increased or lowered in relation to non-risk-sensitive capital requirements. At the aggregate level, capital requirements have to meet ACR.

- *ACR-consistent risk-sensitive capital requirements (à la Basel III)*

The risk-sensitive capital requirements calculated according to Basel III can also be used to determine bank-specific capital requirements. Those capital requirements are multiplied by a factor λ ($\lambda > 0$) such that the ACR constraint is just met at the aggregate

⁸See Hellwig (2008) on the foundation (or lack) of current banking regulation and Hellwig (1995) for an early critical assessment of bank-capital regulation.

level.⁹ The use of ACR and consistent risk-sensitive requirements also makes it possible to address the inherent procyclicality of (minimal) capital requirements à la Basel III.¹⁰ Procyclicality can be mitigated by increasing ACR when GDP growth is high and lowering it when GDP growth is low. The discretionary capital buffer envisioned in Basel III could be used as a first step in introducing ACR as a macro policy instrument.

3 Interest Rates and ACR

3.1 Objectives and instruments

The call for a second macro instrument follows from two observations. First, according to the Tinbergen rule, pursuing a number of objectives requires at least the same number of instruments. The central bank often has a hard time fulfilling the objectives of price stability and output stability by using short-term interest rates. So adding financial stability objectives without new macro instruments would exacerbate these difficulties. Second, although financial-stability objectives are ultimately output-stabilization objectives, interest rate policies are not an effective instrument for the pursuit of such stabilization objectives, even if other objectives are neglected. For instance, a highly vulnerable banking system cannot be made resilient by interest rate policies.¹¹

Both observations vindicate the necessity for a second macro instrument. However, for ACR to constitute a second macro instrument, it has to be independent of short-term interest rates, i.e. it has to operate through different transmission channels, and its appropriate choice has to foster the resilience of the financial system.

⁹For a given ACR, the value of λ is uniquely determined.

¹⁰See Repullo and Saurino (2011) for a critical assessment of the countercyclical buffer in the new regulatory framework Basel III. See Brunnermeier et al. (2009) for a thorough examination of how to design countercyclical capital buffers in banking regulation.

¹¹Of course, interest rate policies also affect financial stability. For instance, longer periods with comparatively low interest rates tend to contribute to financial instability, and interest hikes can dampen booms, rapid expansions of monetary aggregates, and credit growth.

3.2 Transmission channels for aggregate bank equity policies

The transmission channels involved in monetary policy have been explored in detail and are well understood. The standard channel operates through the IS curve, an increase of the interest rate lowers aggregate demand and as a consequence reduces inflation and output.¹² The transmission channels for raising aggregate bank equity capital are much less well explored and understood. Here we outline four potential effects:¹³

1. lowering the risk of banking crises and thus stabilizing output¹⁴
2. reduction of aggregate demand or aggregate supply through higher loan interest rates/quantity constraints on aggregate borrowing from banks
3. lowering average productivity and thus the natural level of output
4. moderating lending cycles

The first channel is the major justification for using ACR as a macro instruments in the first place. Higher aggregate bank equity in relation to assets reduces excessive risk-taking by banks¹⁵ and constitutes a larger buffer if there are negative shocks to the assets in the banking system. As a consequence, the likelihood of banking crises is lowered.¹⁶ It is important to keep in mind that while increasing ACR is a suitable instrument for preventing banking crises, it is no panacea. Banks tend to find ways of economizing on capital requirements that may themselves increase

¹²There also exist monetary transmission channels that operate via the impact of interest rates on credit constraints. The firm balance-sheet or bank balance-sheet channel refers to situations where tighter monetary conditions decrease net worth of firms or banks. Such balance sheet effects can induce tighter credit constraints on firms in financial markets or a reduction of bank lending, which depresses real activity (see Gertler and Kijotaki (2011)).

¹³Further channels have been identified in the literature. For instance, Diamond and Rajan (2001) and Van den Heuvel (2008) suggest that higher bank equity capital reduces liquidity provision by banks and is therefore welfare-reducing.

¹⁴A banking crisis occurs when a significant part of the banking system is, or is perceived to be, insolvent (or illiquid) thereby threatening the functioning of financial intermediation and the financial infrastructure in the economy.

¹⁵There is a very extensive literature on the relationship between equity levels and excessive risk-taking (see Freixas and Rochet (2008)).

¹⁶Of course, this aggregate perspective on the banking system neglects the fact that two banking systems with the same ACR and the same aggregate non-bank assets and non-bank liabilities may face different probabilities of collapsing, as equity capital distributions and the web of interbank relationships may differ in the two systems. By requiring a higher ACR for the more vulnerable banking system, different levels of risk can be corrected.

the vulnerabilities of the banking system. Some of these attempts – like securitization and off-balance sheet positions – can already be incorporated into the calculation of ACR, while new financial innovations will require aggregate bank-capital rules to be flexibly adjusted to new developments.

The second channel has recently been scrutinized comprehensively by Admati, De Marzo, Hellwig, and Pfleiderer (2010). They state that if a much larger fraction (at least 15%) of banks' total, non-risk-weighted assets were funded by equity, the social benefits would be substantial. Social costs, on the other hand, would be minimal or even non-existent. The authors showed that better-capitalized banks are likely to make less distorted lending decisions. Moreover, any notion of a negative mechanical link between equity capital requirements and lending is illusory. As a consequence, raising equity requirements for banks will have a negligible impact on aggregate demand or may even have a positive impact on the natural level of output.¹⁷

The third channel has been discussed and explored in Gersbach (2003) and applies if bank equity becomes much higher. The argument relies on general equilibrium feedback effects when aggregate bank equity is increased. Requiring higher equity for banks makes equity more expensive, which also affects non-financial firms competing for scarce equity. As a result, the credit constraints on non-financial firms become tighter and funding for projects with comparatively high marginal productivity declines, thereby lowering average productivity.

The fourth channel is outlined in Gersbach and Rochet (2011) and refers to changes of minimal equity requirements across the business cycle. They show that the banking sector amplifies productivity shocks. The reason is that when banks reallocate capital across sectors after aggregate shocks, they maximize their informational rents and do not internalize the impact of their investment decisions on capital prices. These welfare-reducing pecuniary externalities yield excessive fluctuations of credit, output, and asset prices. This justifies increasing capital requirements in boom periods in order to moderate credit cycles. Such types of leaning against booms yield

¹⁷Bolton and Freixas (2006) point out that asymmetric information about the net worth of bonds adds cost to outside equity capital. This may generate credit crunches in which bank lending is constrained by equity capital requirements, and these constraints become tighter in times of crisis (see also Hanson, Kashyap, and Stein (2011) for an assessment of the social costs involved when equity requirements are substantially heightened).

milder downturns and increase aggregate welfare.¹⁸

To sum up, increasing the ACR affects the real economy in different ways. A higher ACR lowers the likelihood of crises and may negatively impact on output. Usually, inflation is hardly affected. Hence, ACR is a macro instrument whose economic impact is largely different from the influence exerted by the short-term interest rate.

3.3 Examples

In this section we illustrate the joint determination of ACR and short-term interest rates for several macroeconomic circumstances.

- Example 1: Low-inflationary boom

Suppose that a favorable supply shock increases output and lowers inflation. Then raising the ACR is the core vehicle for moderating the boom and reducing the risk of a banking crisis (see Gersbach and Hahn (2011)). ACR increase would be more pronounced if monetary aggregates and bank balance sheets expanded rapidly and additional vulnerabilities manifested themselves in the banking sector. Somewhat laxer monetary policy would complement the ACR policy.

- Example 2: High-inflationary downturn

If the economy is hit by adverse supply shocks that drive up inflation and reduce output, capital requirements can be lowered to stimulate output and to complement tighter monetary policy for the stabilization of inflation (see Gersbach and Hahn 2011).

- Example 3: Demand shocks

Suppose that the economy is hit by a pure aggregate demand shock. As demand shocks can be perfectly stabilized by monetary policy, ACR can be left unchanged and interest rate changes alone are sufficient to stabilize such shocks (Gersbach and Hahn 2011).

- Example 4: Pure vulnerability shocks

Suppose vulnerabilities build up in the banking sector without an apparent accompanying

¹⁸A thorough empirical analysis has been provided by Jimenez et al. (2011).

macroeconomic shock. In such circumstances, raising ACR is the instrument of choice. Such vulnerability build-ups come in very different forms. For instance, steep asset and real-estate price increases enable banks to rapidly expand their lending as collateral values increase. This, in turn makes banks vulnerable to sudden drops in asset and real-estate prices. Other examples are more fragile interconnections between banks with increasing reliance on short-term funding or highly correlated risky investments in domestic or foreign markets.

Overall, these examples illustrate how monetary policy and aggregate bank-capital policy can jointly stabilize shocks in the economy. The examples also suggest that these twin macro instruments can set the basis for a sound economy and a robust banking system. The use of ACR can also lessen or avoid the procyclicality of traditional capital requirements.

3.4 Parallels between the two macro instruments

For several decades, monetary policy-making was refined and cultivated by pursuing numerical inflation objectives with the use of short-term interest rates. Interest rates were considered to be sufficient for the stance adopted by monetary policy.¹⁹ The crisis has shattered this belief and a new policy framework is necessary. But various lessons from the past decades continue to be important for both monetary and macroprudential policy-making. We mention three examples (see Gersbach (2010), Gersbach and Hahn (2009)):

- *Policy functions*

Two macro policy functions are at the heart of the policy framework which determine current short-term interest rates and aggregate bank-capital policies. Variables capturing the current state of money and credit may enter into the determination of the short-term interest rate. The aggregate capital ratio function determines the minimal aggregate equity ratio of the banking system for the next period, depending on the currently set ratio, the

¹⁹This is epitomized in the new Keynesian framework (see Clarida, Gali, and Gertler (1999) and Woodford (2003)) and has been a core pillar of inflation targeting (see Bernanke et al. (1999), Leiderman and Svensson (1995), Mishkin (1999), McCallum (1999), Svensson (1997, 1999), Laubach (2003)).

state of money and credit,²⁰ and current vulnerabilities of the banking system.²¹ While it is impossible to specify a fixed formula for the aggregate bank-capital function, it will be essential for such functions to be systematic, transparent and accountable as traditional monetary policy functions.

- *Flexible rules*

As is well-known, a strict form of inflation targeting could lead to excessive output fluctuation. With flexible inflation targeting, the target is reached gradually over a given time frame, thereby avoiding large output swings. Similar considerations are important for aggregate bank-capital policies. For example, when macroeconomic circumstances dictate a swift tightening of aggregate bank-capital policies, these adjustments can best be made step by step to avoid excessive output contraction.

- *Commitment problem*

In most of the common models, optimal monetary policy is not time-consistent. Several measures have been used to solve commitment problems in monetary policy-making:

- **Rules.** By committing to a particular framework, such as inflation targeting or one of the several variants of fixed exchange-rate regimes, several central banks have successfully overcome the time-inconsistency problem.
- **Independence.** If central bankers are shielded from political interference and have a longer time horizon or are more conservative, the time-inconsistency problem is lessened.

Time-inconsistency problems may also arise in aggregate bank-capital policies. From an ex ante perspective, high bank equity levels may be desirable to prevent banks from taking

²⁰On the importance of broader monetary aggregates in assessing the vulnerability of the banking sector see Adrian and Shin (2009).

²¹Examples could be large increases in real-estate prices or rapid expansion of credit. There is an enduring debate on whether central banks should lean against perceived asset-price bubbles and in general should attach some weight to asset prices in monetary policy-making (see e.g. Bernanke and Gertler (1999), Gilchrist and Leahy (2002), Cecchetti et al. (2000), and Bordo and Jeanne (2002, 2004) for the first wave of contributions and Assenmacher-Wesche and Gerlach (2010) for a recent empirical study.) In our context, ACR can and should be used to moderate rapid credit growth and asset-price increases.

excessive risks. In a downturn, the strict enforcement of such requirements may not be optimal ex post as this may cause excessive deleveraging of banks and thus a credit crunch.

Overall, these parallels illustrate that macroprudential policy-makers face similar challenges to monetary policy-makers. We stress that important lessons from monetary policy-making should not be forgotten. For instance, flexible rules and solutions to commitment problems are lessons that will play a major role in macroprudential policy-making. A more complete set of parallels is summarized in Gersbach and Hahn (2009). There we also argue that sophisticated models should be used cautiously, not only in monetary policy but also in aggregate bank-capital policy. Moreover, balanced transparency requirements can improve policies and their effectiveness.

4 Delegation and Second-Best institutions

4.1 First-best institutions

Who should be in charge of macroprudential policy-making and thus have the competency to vary ACR? This is a challenging issue. In this section, we assume frictionless coordination of policies across different institutions. In such a world,

- monetary policy should be delegated to an independent central bank
- macroprudential policy should be delegated to an independent macroprudential policy-maker
- a third authority should be in charge of bank-specific regulation and supervision.

There are two basic lines of argument justifying this institutional framework.

Separation of macroprudential policy from monetary policy

Following the analysis by Gersbach and Hahn (2011), we first justify the statement that macroprudential policy-making should be separated from monetary policy. Monetary policy suffers from time-inconsistency problems. As a consequence, delegation of monetary policy to a conservative central banker is desirable, as he is not (or less) tempted to engage in futile output stabilization. As such conservative central bankers do not share the preferences of society, they

would pursue inefficient ACR policies. In contrast, macroprudential policy-makers should share the preferences of society. Thus, this policy should be separated from monetary policy.²²

Delegation of macroprudential policy-making to an independent institution

A second line of reasoning suggests that it is best to delegate macroprudential policy-making to an independent institution, separate from bank-specific regulation and supervision. First, aggregate bank-capital policy is a flexible rule determined by the policy-maker and is thus quite different from a formula- and law-based determination of bank-specific capital requirements and supervision. Second, aggregate bank-capital policy affects the entire economy, including the returns that share- and debt holders and banking managers will earn. As a consequence, there may be fierce lobbying against increasing aggregate bank equity. This can be alleviated by making the macroprudential authority independent. Third, by making an authority independent, the risk that the time horizon of the policy-maker is too short, and thus policies are too lenient, is lower.

4.2 Second-best institutions

We next examine second-best institutions. Second-best refers to the choice of institutions under the constraint that only two already existing public authorities, central banks and bank regulators, perform monetary policy, macroprudential policy, and microprudential regulation. This constraint may arise because frictions in the delegation of the policy framework to three institutions are too large, or the three-institution framework may not be politically feasible.

Allowing bank regulators to perform both aggregate bank-capital policy and bank-specific capital requirements would introduce the problems of regulatory capture set out in the preceding paragraphs. Moreover, pursuing aggregate bank-capital policy and determining bank-specific capital requirements in the same institution may create a variety of conflicts, as the former, like monetary policy, relies on models and judgment, while the latter is formula-based.²³

²²It is conceivable that time-inconsistency problems may also arise in setting ACR as discussed in the last section. These are different in nature and are best solved by making the macroprudential policy-maker independent.

²³However, bank regulators also need to use their judgment when they apply the second pillar of Basel III and e.g. assess the professional quality of bank managers.

Making the central bank the macroprudential policy-maker has the following advantages: Information from bank-capital policy-making may be valuable for monetary policies and vice versa.²⁴ Moreover, interest-rate policy impacts on the credit supply of financial intermediaries, which in turn affects the optimal level of aggregate bank-capital. Thus, having both macro instruments in one hand facilitates the coordination of policies.

These advantages have to be traded off with the benefits, as outlined in 4.1, of separating aggregate bank-capital policies from monetary policies. Furthermore, creating an authority with such wide-ranging competencies can bring about a concentration of power that democratic societies may not want to allow.²⁵

5 Conclusion

We have outlined a framework that encompasses monetary policy, macroprudential policies, and microprudential regulation. Although numerous aspects of the framework deserve further scrutiny, it outlines a possible approach enabling societies to safeguard price stability, the resilience of the banking system, and the stability of the real economy.

²⁴See Peek, Rosengren, and Tootell (1999).

²⁵In the near future, these conflicts will not play a large role, as current bank equity capital levels are much lower than those many experts advocate.

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