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Bank equity and macroprudential policy

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ABSTRACT

This paper proposes an alternative macroprudential policy in the framework of Gertler et al. (2012). In their model, the central bank subsidizes bank outside equity, where the subsidy rate is determined by the shadow cost of the deposit. We find that the alternative rule in which the subsidy rate responds to the aggregate bank outside equity ratio is welfare improving because it has a better stabilization effect on the bank asset deterioration after a financial shock. We disentangle different channels through which macroprudential policies affect the economy and demonstrate that the better stabilization in the post-crisis economy has a positive effect on the economy in normal times through security prices.

1. Introduction

The financial crisis in 2009 aroused considerable attention to macroprudential policies, which aim at the resilience of the financial system to macroeconomic shocks. Many studies show that individual banks do not internalize the importance of bank capital ratio for the stability of the banking sector,[1] so there is a role that macroprudential policies can play. A variety of macroprudential policies have been proposed in the literature, and most of them suggest a high bank capital ratio in normal times and countercyclical capital requirements.[2] But when the economy is hit by a financial crisis, how should the central bank *quantitatively* adjust the capital requirement over time? This paper addresses this question by using the dynamic stochastic general equilibrium (DSGE) framework developed in Gertler et al. (2012) (GKQ hereafter). One advantage of their model is that it incorporates financial intermediaries into a quantitative macroeconomic model. In their framework, banks make an endogenous decision on asset holding, leverage, and the liability structure. The model is rich enough to analyze financial propagation quantitatively through bank borrowing constraint and risk-taking behavior, and thereby it enables one to investigate the effect of different macroprudential policy rules.

In their model, firms' physical capital can only be funded by banks. Banks do not have enough net worth and have to borrow from households by issuing deposits and bank outside equity. The model further assumes that bankers have the potential to divert a fraction of the bank assets. The fraction of the assets that banks can divert increase with the ratio of the

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[1] For example, Lorenzoni (2008), Bianchi (2011), Korinek (2011) and Stein (2012).

[2] For instance, time-varying capital requirements are analyzed by Kashyap and Stein (2004) and Dewatripont and Tirole (2012). Admati et al. (2011) and Hanson et al. (2011) suggest that banks maintain a capital ratio that is substantially higher than that determined by the market. See also other recent papers, e.g., Perotti and Suarez (2009), Elliott (2011), Borio and Zhu (2012), and Galati and Moessner (2013).

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bank outside equity to assets. Because of this potential moral hazard, bankers face a twofold borrowing constraint. First, there is a limit to the amount of assets that a bank can fund with a given amount of net worth. Second, the borrowing constraint becomes tighter when the bank issues too much outside equity.

In the GKQ framework, banks prefer outside equity financing to deposits financing. Outside equity has a hedging effect for the bank because its cash-outflows are matched with the cash-inflows from the bank assets. When a financial shock leads to a deterioration of the bank assets, outside equity can absorb part of the bank's loss, so that it has a stabilizing effect on asset prices and production in the economy. However, the bank does not fully internalize the stabilizing effect of outside equity. As a result, the bank chooses a fraction of outside equity which is lower than the socially desirable level.

GKQ show that this problem can be overcome by a macroprudential policy which subsidizes and promotes the issuance of the bank outside equity. The policy helps banks internalize the hedging effect of outside equity. Another implication of such a policy is that the bank capital ratio is high in normal times and low in bad times, so the policy has an effect that is similar to a 'countercyclical capital requirement'. Also, such a policy has the side benefit that it enhances the equilibrium value of the bank net worth, partially relaxing the borrowing constraint. Thus, the bank can fund more bank assets than that under the no-policy regime.

This paper proposes an alternative macroprudential policy in the GKQ framework. The alternative policy differs from that of GKQ in the way the equity subsidy rate is determined. In the GKQ rule, the subsidy responds inversely to the shadow cost of the deposit issuance to indirectly affect the outside equity-to-asset ratio. In our rule, the subsidy responds directly to the aggregate level of the outside equity-to-asset ratio. It has two advantages: first, the equity-to-asset ratio is a more practical measure because it is easier to observe than the shadow cost of the deposit; second, as we demonstrate, the subsidy responding to the aggregate equity-to-asset ratio achieves higher welfare.

The alternative rule improves welfare for two reasons. First, it has a better stabilization effect on bank assets after the economy is hit by a financial shock. It is because the subsidy rate reacts to shocks more strongly than the GKQ rule after the shock, reducing the outside equity subsidy more. The lower subsidy results in a lower outside equity ratio, encouraging more deposit issuance in bad times. In other words, our rule is more in line with the countercyclical capital requirements in Hanson et al. (2011). It has the following implications: as in the GKQ rule, banks should keep a high equity-to-asset ratio in normal times to hedge the financial risk; and unlike the GKQ rule, the central bank should allow for more deposit issuance in bad times to stabilize the economy. The quantitative effect of the alternative rule in bad times is consistent with the macroprudential capital policy tool of the Bank of England (Harimohan and Nelson (2012)).

Second, our policy rule has the side benefit that the bank assets and production in normal times are slightly higher than under the GKQ rule. It means that the better stabilization effect is not at the cost of production and consumption in normal times. Indeed, the level of outside equity subsidy under our rule is similar to that of the GKQ rule. But our rule achieves a higher level of bank assets in the pre-crisis economy because the better post-shock stabilization effect improves the bank's condition in normal times. The results show that our policy raises the bank's private value of the net worth to a higher level. It results in a higher leverage and hence, a higher level of total bank assets. Our analysis sheds light on the indirect effect of the macroprudential policy on security prices and demonstrates that the stabilization of policy has a significant *positive* effect on the pre-crisis economy.

The rest of the paper is structured as follows. Section 2 describes the model and the macroprudential policy. Section 3 shows simulation results and analyzes the performances of different policy rules. Section 4 concludes the paper.

2. The model

The framework is from GKQ. It is a DSGE model with financial frictions. There are four sectors in the model: households, goods producers, capital producers, and banks. The summary of the system of equations is shown in Appendix A.1.

2.1. Resource constraints

The resource constraint of the economy is

$$Y_t = C_t + \left[1 + f\left(\frac{I_t}{I_{t-1}}\right)\right] I_t, \tag{1}$$

where Y_t is domestic final output, C_t is consumption, and I_t is investment. Here $f(\cdot)$ is an adjustment cost function of investment with $f(1) = f'(1) = 0$ and $f''(x) > 0, \ \forall x > 0$.[3]

Following GKQ, the financial crisis is modelled as a negative exogenous shock to the aggregate physical capital stock:

$$K_{t+1} = \psi_{t+1} S_t, \tag{2}$$

$$S_t = (1-\delta) K_t + I_t, \tag{3}$$

[3] In the simulation, we follow GKQ and specify f as a quadratic function: $f(x) = \Psi(x-1)^2$.