

## Discussion

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Skander Van den Heuvel's paper is valuable and impressive for two reasons. First, it provides the first quantitative model that investigates the role of bank capital (net worth) and its regulation for the transmission mechanism of monetary policy. This is an important contribution in light of the adoption of the Basel Accord and evidence that bank capital affects the supply of bank lending (see Peek and Rosengren 1997, 2000). Second, the author has taken great care in constructing this particularly rich model. I like the fact that it is non-linear and can therefore potentially address the distributional effects of monetary policy shocks.

The paper's main finding is that the effects of monetary policy depend on the capitalization of the banking system. More specifically, lending by under-capitalized banks has a delayed and then amplified reaction to interest rate shocks, relative to well-capitalized banks.

This result is derived from a dynamic model of bank liability and asset management, featuring three key assumptions. First, banks face regulatory capital requirements. Second, since they are unable to issue new equity from the outside equity market, they rely on retained earnings. Third, banks' balance sheets are mismatched in such a way that their profits are exposed to interest rate shocks. In particular, they make long-term loans and borrow short term, so that when interest rates increase, their profits fall.

Given these assumptions, the transmission of monetary policy in the presence of bank capital—the capital channel—can be summarized as follows:

interest rate  $\uparrow$   $\rightarrow$  bank profits  $\downarrow$   $\rightarrow$  bank equity  $\downarrow$   $\rightarrow$  bank lending  $\downarrow$ .

An increase in the interest rate decreases bank profits because of the maturity mismatch of the banks' balance sheets. This decrease in bank profits leads to a decrease in retained earnings and bank equity. Because of the absence of the outside equity market, the fall in the capital position of banks cannot be offset by outside equity, and therefore the regulatory capital requirement binds severely. This results in a decrease in bank lending and economic activity.

Given the carefulness of the paper, I will briefly discuss two of the model assumptions: (i) the maturity mismatch of banks' balance sheets, a crucial assumption for the existence of the bank capital channel; and (ii) the absence of general-equilibrium effects. I will then focus on three possible extensions or issues that arise from the bank capital channel: (i) optimal monetary policy and bank capitalization; (ii) heterogeneity in bank capital-asset ratios (CARs) across countries; and (iii) the issue of regulatory requirement, market discipline, or both.

## **Maturity Mismatch**

The bank capital channel relies heavily on the maturity mismatch of banks' balance sheets. A natural question that emerges is how significant this assumption is. Since bank profits are sensitive to interest risks, why don't banks hedge these risks (at least partially) by using swaps and other financial derivatives? In fact, there is evidence that a large fraction of commercial loans are repriced within thirty days as a markup over some base rate.<sup>1</sup> It would be useful for a full understanding of the bank capital channel if it were possible to quantify the size of the effects of interest rate movements on bank profits for a given period and to see how these effects have changed over time. This is important, since the number of financial instruments has substantially increased in recent years (thus easing risk diversification).

## **General Equilibrium**

As the author acknowledges, the bank capital channel has still to be embedded in a fully dynamic general-equilibrium framework for a full understanding of this new channel. See Meh and Moran (2003) for an example of such a research program.

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1. See the *Survey of Terms of Business Lending*, E2, 2001, of the Federal Reserve Board.

I will now discuss three issues that emerge from Van den Heuvel's paper.

**Issue 1: Optimal monetary policy and bank capitalization.** In this paper, the effects of shocks depend on both bank capitalization and the distribution of capital. From an optimal monetary policy perspective, should central banks react explicitly to bank capitalization? If they were to find that to do so is optimal, the natural question would then be: Do central banks act this way in reality? In a recent paper, Cechetti and Li (2003) estimate a policy rule that accounts explicitly for bank CARs. They do this for the United States, Japan, and Germany (pre-European monetary union). The authors find that central banks do react positively but modestly to CARs. However, they account for only the average CAR of the banking system, and not for the distribution of capital across banks. Therefore, research should devote attention to the task of estimating policy rules that account for both the average CAR and the distribution of capital across banks.

**Issue 2: Heterogeneity in CARs across countries.** There is a fair amount of heterogeneity in CARs across countries. On the one hand, Cechetti (1999) provides an empirical study where he shows that lax enforcement of laws leads to less healthy banks, which in turn lead monetary policy to have strong effects on economic activity. On the other hand, Van den Heuvel shows that undercapitalized banks react more to monetary policy shocks. Given these results, can we build a model in which the heterogeneity in bank capitalization comes from the underlying heterogeneity in law enforcement? If so, we can use the model to analyze the distributional impacts of monetary policy innovations in the European monetary union.

**Issue 3: Regulatory requirement, market discipline, or both?** In Van den Heuvel's paper, bank capital matters in equilibrium because of regulatory capital requirements. In Chen (2001) and Meh and Moran (2003), however, market discipline governs the importance of bank capital. Can we build a model in which market discipline and government regulation interact? This is an important question, given Pillar 1 and Pillar 2 of Basel II (see Rochet 2003).

I like this paper very much. It has persuasively demonstrated that the capital structure of banks is important in understanding the transmission mechanism of monetary policy. This is an important contribution.

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