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Bank capital, the state contingency of banks' assets and its role for the transmission of shocks

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ABSTRACT

I show how the evolution of bank capital depends on the share of non-state-contingent assets in banks' balance sheets and present the implications for macroeconomic dynamics. State-contingent securities impact on banks' balance sheets through changes in their returns (and their prices), both of which depend on the current state of the economy. Non-state-contingent assets are signed before shocks are realized and their repayment is guaranteed. For this reason, they insulate banks' balance sheets from recent economic activity in the absence of defaults. Non-state-contingent assets in banks' balance sheets attenuate the amplification of shocks resulting from financial frictions. The same effect can be achieved if more weight is placed on the state-contingent assets in the equity related constraint against the costs of long-run output losses.

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1. Introduction

An erosion of bank capital was one of the key features of the 2007–2009 financial crisis, and the resulting need for banks to delever contributed significantly to the Great Recession (Brunnermeier, 2009). A reduction in bank capital increased the leverage ratio, making banks' balance sheets more vulnerable to new adverse shocks, thereby constraining banks' ability to obtain external funds. This led to a cut in the credit supply, which fed back to the real economy and eventually amplified developments originating in the real sector. Nearly 25 years ago, a shortage of bank capital was also one of the main drivers of the “credit crunch” (or “capital crunch”) in the USA in the late 1980s and early 1990s, which largely contributed to the recession at that time (Bernanke and Lown, 1991).

One propagation channel of shocks through the banking sector largely stems from a general financial contracting problem between banks and their creditors (see Christiano and Ikeda, 2013, for example). Banks' leverage constraint generally affects the business cycle and amplifies shocks. This is the reason why recent macroeconomic models place great emphasis on the role of bank capital as a propagation channel for shocks to the real economy (Gerali et al., 2010; Hirakata et al., 2011; Meh and Moran, 2010).² Since bank capital is a major determinant of banks' leverage, which, in turn, affects how shocks are

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E-mail address: michael.kuehl@bundesbank.de¹ The opinions expressed in this paper are those of the author and do not necessarily reflect the views of the Deutsche Bundesbank or its staff.² Alternatively, a contracting problem between financial intermediaries and the non-financial firms, which receive credits, produces a propagation mechanism in which firms' leverage is of crucial importance (Carlstrom and Fuerst, 1997; Bernanke et al., 1999).<http://dx.doi.org/10.1016/j.jmacro.2017.02.006>

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propagated through the banking sector to the real economy, it is also important to focus on the channels which determine the evolution of bank capital in a macroeconomic context. If banks' balance sheets are dominated by assets which are traded on a market, asset price changes will mainly affect the evolution of bank capital (Gertler and Karadi, 2011; 2013). A drop in asset prices weakens bank capital and increases banks' leverage. Non-market-based assets – the typical bank loan for example – might produce different effects because the price effect is missing (Gertler, 2013).³ In this case, changes in asset returns predominantly affect banks' profits, which translates into the evolution of bank capital. Accordingly, the state contingency of assets is expected to be an important driver of bank capital. While the returns (and prices) on a state-contingent asset depend on the current state of the economy, this is not the case for non-state-contingent assets. From this point of view, it is of interest to understand how the structure of assets in banks' balance sheets affect banks' profits, which determine bank capital and banks' leverage ratio, and, therefore, ultimately macroeconomic dynamics. The use of a dynamic macroeconomic model with a banking sector is best suited to scrutinizing such interdependent effects.

This paper contributes to the discussion of how bank capital affects economic dynamics. By using a New Keynesian dynamic general equilibrium model, I investigate the composition of banks' balance sheets in order to gain an insight into how this composition affects the propagation of macroeconomic shocks to the real economy. Specifically, I show how the evolution of bank capital depends on the share of non-state-contingent assets in banks' balance sheets and present the implications for macroeconomic dynamics. I use a New Keynesian DSGE model which builds on Gertler and Karadi (2011, 2013). Non-state-contingent assets are understood as non-market-based loan commitments which comprise typical bank loans but also debt securities held until maturity. Conversely, state-contingent assets are defined as securities traded on a market and which are exposed to the state of the economy to a greater extent. Data underscore the significance of this kind of assets for banks' balance sheets although they do not dominate banks' balance sheets.

I utilize a two-sided financial contracting problem, which allows me to introduce a non-state-contingent asset into banks' balance sheets alongside a state-contingent asset, i.e. banks hold two assets. A state-contingent asset is modeled by allowing its price to vary with the state of the economy, i.e. it has a market-determined price positively correlated with real economic activity. I split up capital production into two sectors. Non-state contingency is introduced into my model by assuming that a financial contracting problem exists between the bank and one of the two capital-producing sectors, whereas the resulting loan contract is signed before shocks are realized. The other sector remains financially unconstrained.

My results show that the amplification of shocks to the real economy caused by financial frictions in the banking sector is dampened as the weight of non-state-contingent assets in banks' balance sheets increases. In the case of my non-state-contingent assets, firms' net worth makes it possible to sign a financial contract with fixed payments. Since agents agree on contractual payments before shocks are realized and these payments are guaranteed, this debt contract insulates banks' balance sheets from recent economic activity in the absence of defaults. For the dominance of the state-contingent asset, returns and asset prices, which are influenced by the current state of the economy, instantaneously affect banks' balance sheets. In this case, the economy becomes more volatile, because the banking sector depends to a major extent on real economic activity, which then feeds back into the real sector. These results are also robust after replacing the contracting problem and allowing for collateralized lending where the volume of credit is tied to the (expected) value of a collateral.

Though conceptually slightly different, my model makes it possible to contribute to the discussion about the regulatory framework as outlined in the Basel III regulation. State-contingent assets can be interpreted as assets marked to market because of their marketability. In the model, I investigate the effects of higher weights on the state-contingent assets in the equity-like incentive constraint. This would be equivalent to the view that assets marked to market require higher capital shares. Higher weights have two opposing effects. On the one hand, they reduce steady-state output, because banks need to attract more capital by raising lending rates, which makes borrowing more expensive. On the other hand, they reduce business cycle volatility. From this point of view, higher weights on assets in the trading book of banks will basically stabilize business cycle fluctuations.

I derive my results in a setting which abstracts from defaults in loans in order to highlight the implications stemming from the general properties of non-state-contingent assets. However, the effects of defaults on banks' balance sheets are implicitly captured by the state-contingent asset; downturns incur capital losses for the bank. My results help in gaining an understanding of the interdependency between (the returns on) assets held by banks and the real economy.

This paper relates heavily to the seminal paper of Holmstrom and Tirole (1997) by drawing on an environment in which both non-financial firms and intermediaries are capital-constrained. I give an important role to net worth, i.e. leverage, in the entrepreneurial and the banking sectors, whereas both leverage constraints arise endogenously from two distinct but similar moral hazard problems. Similarly, my paper also draws on issues raised by Chen (2001) who extend the framework of Holmstrom and Tirole (1997) to investigate the interdependencies between the banking sector, asset prices and real economic activity. In Chen (2001) a real business cycle model is utilized to show how entrepreneurial net worth and aggregate bank capital interrelate. For a shock on total factor productivity, he shows that the bank capital ratio and firm's leverage behave countercyclically.⁴ By using a different model setup Rannenberg (2016) derives similar results in a New Keynesian

³ Gertler (2013) refers to the distinction between the book value and the market value of assets, which is translated into measuring bank equity.

⁴ Since the bank leverage ratio is the inverse of the bank capital ratio, it follows that bank leverage is procyclical.

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