



Do banking shocks matter for the U.S. economy?

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ABSTRACT

The quantitative significance of shocks to the financial intermediary (FI) has not received much attention up to now. We estimate a DSGE model with what we describe as chained credit contracts, using Bayesian technique. In the model, credit-constrained FIs intermediate funds from investors to credit-constrained entrepreneurs through two types of credit contract. We find that the shocks to the FIs' net worth play an important role in the investment dynamics, accounting for 17% of its variations. In particular, in the Great Recession, they are the key determinants of the investment declines, accounting for 36% of the variations.

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1. Introduction

The financial crisis that began in the fall of 2007 demonstrated that financial intermediaries (hereafter, FIs) play a crucial role in economic activity. Adverse shocks to the FI sector increase the borrowing costs for the FIs by deteriorating their net worth. Consequently, the supply of funds to entrepreneurs tightens, leading to an investment decline and a further deterioration in the FIs' net worth. This account is consistent with the literature that focuses on the relationship between the FI sector and the aggregate economy. For example, Peek and Rosengren (1997, 2000), using a novel identification scheme for a loan supply shock, report that the worsening of the FIs' net worth generates economic downturns.

However, there is as yet nobody of the literature determining how important the shocks to the FI sector are to the U.S. business cycle. While macroeconomists agree that shocks to the credit market are an important source of aggregate fluctuations, to the best of our knowledge only a limited number of studies have evaluated the relative impact of shocks to the FI sector.¹ In the existing models, shocks to the entrepreneurial net worth are primarily focus and shocks to the FIs' net worth are often neglected.

To assess the role of the shocks to the FIs' net worth, we estimate the financial accelerator model of Hirakata et al. (2009, 2011, hereafter HSU). Our model is built upon the financial accelerator model in Bernanke et al. (1999, hereafter BGG) where endogenous developments in the entrepreneurial net worth play an important role in amplifying and propagating exogenous shocks. In our model, FIs intermediate funds from investors to entrepreneurs through two types of credit contract. Because the FIs as well as the entrepreneurs are credit constrained, the financial accelerator effect is enhanced due to developments in the FIs' net worth along with the entrepreneurial net worth.

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¹ See, for example, Gilchrist et al. (2009) and Jermann and Quadrini (2009). The notable exceptions are Christiano et al. (2008, 2009, hereafter CMR), who analyze the shocks to the production technology of the banks separately from the shocks to the entrepreneurs. While other empirical work, such as Peek and Rosengren (1997, 2000), emphasizes the balance-sheet effect in the FI sector, the banks in CMR (2008, 2009) are competitive and do not own their net worth. In contrast, we focus on the shocks to the FIs' net worth and their impact on the aggregate economy.

Based on HSU (2009, 2011), we distill the shocks to the FIs' net worth using a Bayesian technique. We employ a set of U.S. macroeconomic variables consisting of output, consumption, investment, inflation, the policy rate, and the net worth of the FI and entrepreneurial sectors.² The sample period runs from 1984Q1 to 2010Q4, and therefore covers the most recent turmoil in the credit market. We find that the estimated adverse shocks to the FIs' net worth typically take large negative values during the recession, and are correlated with an indicator of credit market stress.

A negative shock to the FIs' net worth causes a persistent decline in investment. In particular, during the several quarters since 2007, the shocks to the FIs' net worth were unprecedentedly deep and persistent, contributing to a drastic widening in the borrowing spreads in that period. Their impacts on investment lasted a long time, lowering it for several quarters after the end of the recession.

Quantitatively, the shocks to the FIs net worth are an important source of the investment dynamics, accounting for 17% of the investment variations throughout our sample period. In particular, they are the main source of the investment slump during the Great Recession, accounting for 36% of the investment variations during the period.

Since the shocks to the entrepreneurial net worth also drive a substantial portion of the investment variations, the sum of the two net worth shocks explains 55% and 64% of the investment variations over the entire sample period and the period of the Great Recession, respectively. These net worth shocks are amplified to the macroeconomy thanks to the credit market imperfection, reinforcing each other through the endogenous developments in the two net worths. This transmission mechanism is particularly consistent with the key features of the Great Recession, including the financial market turmoil and the collapse of the major financial institutions associated with the deterioration in the FIs' net worth.

The influence of the shocks to the FIs' net worth on output and inflation is minor, accounting for only 4% of their variations over the entire sample period. Even during the Great Recession, the shocks account for 7% of output variations and 9% of inflation variations. By contrast, the non-financial shocks, in particular, the preference shocks and the technology shocks, play the dominant role in explaining these variables.

Research using the financial accelerator model commonly poses one or both of two questions.³ The first concerns the quantitative importance of the financial shocks that originate in the credit market, and the second concerns the quantitative importance of the financial accelerator effect. For instance, in response to the first question, Nolan and Thoenissen (2009) report that shocks to the credit market account for 45% of the investment variations. In response to the second question, Christensen and Dib (2008) conclude that the financial accelerator mechanism brings the sticky-price dynamic stochastic general equilibrium (DSGE) model closer to the data although they stress that its quantitative contribution is small.⁴

By adding to the model credit-constrained FIs and shocks to their net worth, we provide more extensive answers to the two questions. First, consistent with the existing literature, our result implies that financial shocks originating in the credit market substantially affect the macroeconomy. Moreover, a sizable amount of the estimated shocks to the credit market originates in the FI sector as well as in the entrepreneurial sector. Second, in comparing fit with the data, we find that our model, in which both the FIs and the entrepreneurs are credit constrained, outperforms the model in which only the entrepreneurs are credit constrained. Our comparison suggests that the financial accelerator mechanism linked to endogenous developments in the FIs' net worth is an important element in explaining the data.

The remainder of the paper is organized as follows. In Section 2, we describe our economy. In Section 3, we describe the estimation method and the results. Section 4 concludes.

2. The economy

We consider an economy with a credit market and a goods market. The economy consists of 10 types of agents: investors, FIs, entrepreneurs, a household, final goods producers, retailers, wholesalers, capital goods producers, the government, and the monetary authority.

The setting for the credit market is taken from HSU (2009). There are three types of participants in the credit market: investors, FIs, and entrepreneurs. Investors collect deposits from the household in a competitive market, and invest what they collect in loans to the FIs. FIs are the monopolistic lenders of funds to entrepreneurs. The FIs own their net worth, but not sufficiently to finance their loans to the entrepreneurs. Therefore, they make credit contracts with the investors to borrow the rest of the funds. Entrepreneurs invest in their projects, and also own their net worth, but not sufficiently to finance them. Thus, they make credit contracts with the FIs to borrow the funds. Clearly, these two types of contracts are linked in the economy, and the entrepreneurs cannot finance their projects if either of the credit contracts fails to hold.

In the model, the monopolistic FIs determine the borrowing rates of the two credit contracts, thereby ensuring the participation constraints of entrepreneurs and investors. Agency problems arise from the asymmetric information between lenders and borrowers for both of the credit contracts, one between the FIs and the entrepreneurs (hereafter, FE contracts) and the other between the investors and the FIs (hereafter, IF contracts).⁵ Consequently, the borrowing rates of the credit contracts change with the net worth of the borrowers.

² As discussed below, we conduct several sensitivity analyses of the choice of observable variables.

³ See, for example, CMR (2008), Meier and Muller (2006), Christensen and Dib (2008), De Graeve (2008), and Nolan and Thoenissen (2009).

⁴ Meier and Muller (2006) derive a similar conclusion that the financial accelerator effect is small by investigating impulse response functions to monetary policy shocks using U.S. data.

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