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The financial accelerator in an estimated New Keynesian model ☆

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Abstract

This paper estimates and simulates a sticky-price dynamic stochastic general-equilibrium model with a financial accelerator, à la Bernanke et al. [Bernanke, B., Gertler, M., Gilchrist, S., 1999. The financial accelerator in a quantitative business cycle framework. In: Handbook of Macroeconomics. North-Holland, Amsterdam], to assess the importance of the financial accelerator mechanism in fitting the data and its role in the amplification and propagation of transitory shocks. Structural parameters of two models, one with and one without a financial accelerator, are estimated using a maximum-likelihood procedure and post-1979 US data. The estimation and simulation results provide quantitative evidence in favor of the financial-accelerator model. The model without a financial accelerator is statistically rejected in favor of a model with it. The presence of the financial accelerator amplifies and propagates the effects of demand shocks on investment, but it dampens those of supply shocks. However, we find that the importance of the financial accelerator for output fluctuations is relatively minor.

JEL classification: E30; E32; E37; E44; E50

Keywords: Business cycles; Financial accelerator; Investment shocks; Sticky prices

1. Introduction

Policy-makers, academics, and the business media often follow and discuss credit market conditions extensively. The regular public communications of central banks analyze interest rate spreads or discuss recent trends in the growth of business lending. This discussion reflects a view that the ability of firms to obtain financing plays an active role in investment behavior. Bernanke and Gertler (1989) show that the presence of asymmetric information in credit markets can give the balance sheet conditions of borrowers a role to play in the business cycle through their impact on the cost of external finance. The procyclical nature of net worth leads the wedge between the cost of external finance and internal funds, the external finance premium, to fall during booms and to rise during recessions. Bernanke et al. (1999) and others, including Kiyotaki and Moore (1997) and Carlstrom and Fuerst (1997), demonstrate that these financial frictions may significantly amplify the magnitude and the persistence of fluctuations in economic activity.

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Despite this interest among researchers, mainstream macroeconomic models used for monetary policy analysis, such as the models used by Christiano et al. (2005), contain no role for financial frictions.

One reason for the omission of financial frictions from standard models is that there is little agreement about their importance for business cycle fluctuations. As a result, quantifying the importance of credit market frictions continues to be the subject of much research. To this end, we estimate a sticky-price dynamic stochastic general-equilibrium (DSGE) model similar to that of Ireland (2003), but with the addition of financial frictions as described in Bernanke et al. (1999). We investigate whether these financial frictions can improve the estimated model's ability to account for key features of the data, particularly those related to output and investment. We also assess the nature of the role it plays in the estimated model's dynamics.

Based on earlier work by Bernanke and Gertler (1989), Bernanke et al. (1999) develop a model in which there is a two-way link between the borrowing costs of firms and their net worth.[1] This link has come to be known as the "financial accelerator." In this model, entrepreneurs, who borrow funds to undertake investment projects, face an external finance premium that rises when their leverage increases. A tightening in monetary policy, for example, reduces the return on capital resulting in a decline in the net worth of firms. Declines in net worth increase firm leverage, leading to further raising in external financing costs and reducing the demand for capital. The drop in demand for capital reinforces the decline in its value. This mechanism is often called an "accelerator" effect, because the lower price of capital has a feedback effect, further lowering the net worth of firms.

Carlstrom and Fuerst (1997) first demonstrated the quantitative importance of the Bernanke and Gertler (1989) mechanism, finding that it could produce a hump-shaped output response to shocks in an otherwise standard real business cycle model. The propagation brought about by the financial friction allows the model to better match this key feature of the data, but it did not amplify the response of output. Using a sticky-price model calibrated to postwar US data, Bernanke et al. (1999) show that a different setup for the financial-accelerator mechanism both amplifies the impact of shocks and provides a quantitatively important mechanism that propagates shocks at business cycle frequencies.[2]

In this paper, we develop and estimate a sticky-price DSGE model that includes the financial-accelerator mechanism proposed by Bernanke et al. (1999).[3] Our model, however, differs from Bernanke et al.'s in two important ways. First, the debt contracts in the model are written in terms of the nominal interest rate, which better reflects the nature of debt contracts in the United States. This adds the additional possibility of debt-deflation effects as in Fisher (1933). Second, following Ireland (2003), we allow monetary policy to be characterized by a modified Taylor-type rule, under which the monetary authority adjusts short-term nominal interest rates in response to inflation, output, and money-growth changes.[4] This is potentially important because the conduct of the monetary authorities will be an important element determining the quantitative importance of the financial accelerator. For example, Bernanke et al. (1999) have noted that policy rules that stabilize output will also counteract, and may eliminate, the impact of the financial accelerator on output or investment (see Fukunaga, 2002 for an example).[5]

We use our model to empirically evaluate the importance of the financial accelerator in the amplification and propagation of the effects of transitory shocks to the economy. We estimate the main structural parameters of two versions of the model: a model that includes a financial accelerator and a model without it. We then assess the ability of each model to account for key features of the data. To estimate the models, we use a maximum-likelihood procedure with a Kalman filter and post-1979 US macro data on output, investment, real balances, the nominal interest rate, and inflation. We use data on investment because financial frictions exert an influence directly on investment behavior.

[1] An alternative approach is to introduce financial frictions by giving financial intermediaries an ability to change credit conditions without a change in borrower creditworthiness. See Cook (1999) for an example.

[2] Subsequent work using the Bernanke et al. (1999) model for other countries has provided similar results (see Hall, 2001 for the United Kingdom and Fukunaga, 2002 for Japan). A number of studies have used this financial-accelerator mechanism to account for macroeconomic developments at times of financial crisis. Cespedes et al. (2004), Gertler et al. (2003), Tovar (2006), and Elekdag et al. (2006) consider the case of open economies in emerging markets. Christiano et al. (2003) use the financial accelerator in their analysis of the Great Depression in the United States.

[3] As in previous research on the financial accelerator, we use a closed economy model for the US because it is a large economy where external linkages are relatively small.

[4] As in Ireland (2003) the household's utility function in our model is non-separable in consumption and real balances. Since this allows money demand shocks to affect aggregate fluctuations, the monetary authority can respond to money-growth directly.

[5] See Bernanke et al. (1999). The effects of the financial accelerator may, nonetheless, show up elsewhere, such as in the size of the monetary policy response required to dampen output fluctuations.