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Financial business cycles ☆

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ABSTRACT

Using Bayesian methods, I estimate a DSGE model where a recession is initiated by losses suffered by banks and exacerbated by their inability to extend credit to the real sector. The event triggering the recession has the workings of a redistribution shock: a small sector of the economy – borrowers who use their home as collateral – defaults on their loans. When banks hold little equity in excess of regulatory requirements, the losses require them to react immediately, either by recapitalizing or by deleveraging. By deleveraging, banks transform the initial shock into a credit crunch, and, to the extent that some firms depend on bank credit, amplify and propagate the shock to the real economy. I find that redistribution and other financial shocks that affect leveraged sectors accounts for two-thirds of output collapse during the Great Recession.

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1. Introduction

In this paper I estimate, using Bayesian methods, a model with banks and financially constrained households and firms. I present a basic model which conveys the main ideas. I then take a richer version of this model to the data, estimate it using Bayesian methods, and use it to provide an accounting of the role played by different financial shocks and frictions during the financial crisis.

The main questions that I ask are: (1) How much can redistributions of wealth – such as those that take place when borrowers default on their debts — disrupt the credit intermediation process? (2) Can changes in credit standards affect business cycles? (3) How important are shocks to asset prices for business fluctuations? To answer these questions, I add financial frictions on banks, on households, and on firms to an otherwise standard RBC model and conduct a horse race between familiar shocks (a shock to the consumption/leisure margin, shocks to technology) and not-so-familiar ones. The not-so-familiar ones are redistribution shocks[1] (transfers of wealth from savers to borrowers that take place in the event of default); credit squeezes (changes in maximum loan-to-value ratios); and asset price shocks (changes in the value of collateral). These "financial shocks" were arguably at the core of the last recession. More generally, financial factors were at

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[1] Throughout the paper, I use the terms "redistribution shocks", "repayment shocks" and "default shocks" interchangeably.

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the core of at least two of the last three recessions in the United States (the 1990–1991 recession and the Great Recession of 2007–2009). Yet a large class of estimated dynamic equilibrium models either ignore financial frictions, or consider one set of financial frictions independently from others. While this approach might be useful for building intuition, it eludes a proper quantification of the role of financial factors in business fluctuations, especially when several sets of financial frictions reinforce and amplify each other.

The estimation of the model parameters and structural shocks gives large prominence to financial business cycles. I find that financial shocks account for two-thirds of the decline in private GDP during the 2007–2009 recession, and they also play an important, although less sizeable, role during other recessions. Although model parameters and shocks are jointly estimated, my approach has also the natural interpretation of a business cycle accounting exercise. This happens because some of the key shocks are directly used as observables at the estimation stage, so that their filtering is decoupled from the estimation of the rest of the model's structural parameters.[2]

At the core of the paper is the idea that business cycles are financial rather than real. That is, rather than originated and propagated by changes in technology, business cycles are mostly caused by disruptions in the flow of resources between different groups of agents. In the model economy of this paper, these disruptions take place when a group of agents defaults on its obligations, therefore paying back less than contractually agreed. Or when credit limits are relaxed or tightened either in response to changes in asset prices or for some other exogenous reason. Of course, many of the stories told here resemble familiar accounts of the Great Recession: the bursting of the housing bubble merely changed the value of houses in units of consumption, yet it lead to a wave of defaults and to a severe crisis in the financial sector. The ensuing problems of the financial institutions that owned mortgages lead to a reduction in the supply of credit to all sectors of the economy. Many of these ideas are all familiar. The novel elements are the financial shocks, and the estimation.[3]

Several of the ideas and modeling devices in this paper build on an important tradition in macroeconomic modeling that treats banks as intermediaries between savers and borrowers. Recent contributions include Brunnermeier and Sannikov (2014), Angeloni and Faia (2013), Gerali et al. (2010), Kiley and Sim (2011), Kollmann et al. (2011), Meh and Moran (2010), Williamson (2012), and Van den Heuvel (2008). The reason why banks exist in my model is purely technological: without banks, the world would be autarchic and agents would be unable to transfer resources across each other and over time. As in the recent work by Gertler and Karadi (2011) and Gertler and Kiyotaki (2010), I give a prominent role to banks by assuming that intermediaries face a balance sheet constraint when obtaining deposits. In these papers however, the shock that causes a financial business cycle is a shock to the quality of bank capital that is, by design, calibrated to produce a downturn as big as in the data. Instead, I either calibrate – in the basic model – the size of the shock by using information on losses suffered by financial intermediaries during the Great Recession, or estimate – in the extended model – all the shocks using Bayesian techniques. The advantage of the estimation strategy is obvious, and opens the avenue for a richer treatment of many of the questions that are left unanswered in the paper. Another important difference is that I combine in the model two sets of financial frictions: on the one hand, banks face frictions in obtaining funds from households; on the other, entrepreneurs face frictions in obtaining funds from banks.

Section 2 describes the basic model and considers how a financial shock that hits the balance sheet of the bank can lead to a decline in output and credit and to a rise in interest rate spreads. Section 3 presents the extended model that is taken to the data and describes the estimation results. Section 4 illustrates the transmission mechanism of financial shocks in the estimated model. Section 5 concludes. Appendices A–D contain additional details on the models and on the data.

2. The basic model and the impact of a financial shock

2.1. Overview of the model

I consider a discrete-time economy. The economy features three agents: households, bankers, and entrepreneurs. Each agent has a unit mass.[4] Households work, consume and buy real estate, and make one-period deposits into a bank. The household sector in the aggregate is net saver. Entrepreneurs accumulate real estate, hire households, and borrow from banks. In between the households and the entrepreneurs, bankers intermediate funds. The nature of the banking activity implies that bankers are borrowers when it comes to their relationship with households, and are lenders when it comes to their relationship with the credit-dependent sector – the entrepreneurs. I design preferences in a way that two frictions coexist and interact in the model's equilibrium: first, bankers are credit constrained in how much they can borrow from the patient savers; second, entrepreneurs are credit constrained in how much they can borrow from bankers.

[2] My approach is inspired by a large body of literature, including the recent work by Jermann and Quadrini (2012) who construct time series for financial and technology shocks using a Solow-residual-style approach and show that the series constructed using this approach are highly correlated with those obtained through a Bayesian estimation exercise.

[3] Regarding the focus on estimation, closely related to my work are the papers of Jermann and Quadrini (2012) and Christiano et al. (2014), but these models do not have an explicit modeling of the banking sector.

[4] Except for the introduction of the banking sector, the model structure closely follows a flexible price version of the basic model in Iacoviello (2005), where credit-constrained entrepreneurs borrow from households directly. Here, banks intermediate between households and entrepreneurs.

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