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Financial intermediation and real estate prices impact on business cycles: A Bayesian analysis☆

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ABSTRACT

How do financial intermediation and real estate prices impinge on the business cycle? I develop a two-sector stochastic general equilibrium model with financial intermediation and real estate collateral to assess the impact of financial conditions and land prices on aggregate fluctuations. I estimate the model with Bayesian methods using a novel data set that includes U.S. macro and financial variables during the period 1975–2010. The results from the estimated model show that financial conditions have a sizable effect on the variability of investment spending, while productivity shocks are the main source of consumption fluctuations. Specifically, on the macro side, (1) financial shocks explain about three quarters of investment spending variability and one third of the variance in hours worked. On the financial side, (2) financial shocks explain most of the variability in land prices, credit spread, and aggregate net worth of the financial sector. The model also accounts for observed unconditional moments of macro and financial variables. Our quantitative results are suggestive of the impact of diverse sources of financial instability, and as such relevant for macro prudential policy analysis.

1. Introduction

The Great Recession (2007–2009) underscored the importance of real estate prices and financial intermediation on business fluctuations. This recent episode of economic turmoil reignited interest on the structural linkages between financial conditions and real outcomes (see Bernanke & Gertler, 1989; Kiyotaki & Moore, 1997 for seminal contributions). Prior to 2009, studies that investigated the sources of aggregate fluctuations during the period known as the Great Moderation (1984–2007) ascribed an increasingly important role to non-productivity shocks (Gali & Gambetti, 2009; Smets & Wouters, 2007; henceforth SW, 2007, among others). After 2009, a growing strand of macro literature focused on studying the role of financial market conditions on real activity (Christiano, Motto, & Rostagno, 2014; Gilchrist & Zakrajsek, 2012; Gertler & Kiyotaki, 2010; Gertler & Karadi, 2011; Iacoviello, 2015; Justiniano, Primiceri, & Tambalotti, 2010; Liu, Wang, & Zha, 2013; henceforth LWZ, 2013).

Most studies have focused on the prices of financial assets while the role of real estate prices has not been explored to the same extent.[1] I contribute to the literature with a quantitative study of the *joint* effects of real estate prices and financial intermediation on aggregate fluctuations. Specifically, in this study I ask: How much do real estate and financial conditions impinge on the volatility of macro and financial variables? I approach this question in two steps. First, on the theoretical side, I extend a two-sector real business cycle (RBC) model with heterogeneous households to include a credit channel through financial intermediaries whose function is to

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[1] Important exceptions are Goodhart and Hofmann (2007), Iacoviello (2005), Iacoviello and Neri (2010), Leamer (2007), and LWZ (2013).

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channel funds from lenders to borrowers and firms. I draw on the financial intermediation framework of Gertler and Karadi (2011), henceforth GKI (2011) and Gertler and Kiyotaki (2010), where the financial accelerator mechanism Bernanke, Gertler, and Gilchrist (1999) is introduced to model the dynamics of the financial intermediary's balance sheet. In this framework, an increase in financial intermediary's assets favors the supply of credit and a subsequent expansion of aggregate economic activity; in a similar fashion, poor balance sheet conditions in the financial intermediary reduce the credit that borrowing households and firms can obtain, subsequently reducing aggregate economic activity. As a result, the financial accelerator operating through financial intermediation effectively propagates the transmission of financial shocks (i.e., shocks which affect the balance sheet of the bank).

Second, I estimate the model using Bayesian methods applied to a novel data set of U.S. macroeconomic and financial variables during the period 1975–2010. The results of the estimated model suggest that the credit (i.e., bank lending) channel is a quantitatively important mechanism for the transmission of financial shocks that ripple into the real economy. Importantly, the joint effect of credit supply, net worth, real estate, and quality of capital shocks accounts for a sizable share of the variability of key macroeconomic and financial variables over U.S. business cycles.

Recent studies suggest mixed evidence on the importance of real estate markets in determining aggregate fluctuations. On the one side, studies by Claessens and Kose (2009), Goodhart and Hofmann (2007), and Leamer (2007) provide ample empirical evidence that credit and housing cycles are strongly associated with the business cycle. On the other side, quantitative studies such as Iacoviello (2005) and Iacoviello and Neri (2010) find that housing shocks have a small effect on the economy. In contrast, the study by LWZ (2013) argues that land prices are a quantitatively important mechanism for the transmission and amplification of aggregate fluctuations.[2]

Other studies focus on the role of financial intermediation and credit in driving aggregate fluctuations. Important contributions are studies by Gertler and Kiyotaki (2010), GKI (2011), and Iacoviello (2015). These studies develop models in which asymmetric information applied to financial intermediation plays an important role in influencing real outcomes.

The aforementioned separation in the two strands of the literature is startling given that it is widely accepted that major financial disruptions are associated with disturbances in (i) asset markets as well as (ii) disruptions in financial intermediation. This study aims to bridge this gap on two fronts. First, by explicitly decomposing real and financial linkages through the *joint* role of financial intermediaries and real estate collateral on aggregate fluctuations. Specifically, I extend the financial intermediation framework of Gertler and Kiyotaki (2010) and GKI (2011) to a two-sector real RBC model (saver and borrower households) with two asset classes: firm equity and housing collateral.[3] Second, I use a novel data set that combines key macro and financial variables to estimate the model and quantify the importance of financial conditions over U.S. business cycles during the period 1975–2010. I use seven macro and financial time series and estimate the model with Bayesian methods. The new financial data include corporate bond credit spread, total (household and business) debt, land prices, and aggregate net worth of financial institutions.

The quantitative analysis of the estimated model indicates that financial conditions have a sizable impact in driving U.S. business cycles for the period under study. Specifically, financial conditions, defined as the joint effect of credit supply, net worth, quality of capital, and real estate shocks, explain 77% of the variation in private business investment and 33% of the variation in hours worked. Moreover, these shocks explain 96% of the variability in financial intermediation net worth, 96% of the variability in credit spread, 64% of the variability in land prices, and 34% of the variability in total debt.[4] Last, I show that the estimated model is a good fit in matching a key set of macro and financial statistics over U.S. business cycles during the period 1975–2010.

The rest of the paper proceeds as follows. Section 2 describes the model. Section 3 discusses the solution and estimation methods. Section 4 analyzes the workings of the model and discusses the quantitative implications of different sources of aggregate fluctuations. Section 5 examines the empirical fit of the model in matching unconditional moments of both macro and financial variables. Section 6 checks for robustness of the results, and Section 7 concludes.

2. Model

To study the role of financial and real estate linkages in aggregate fluctuations I develop a two-sector RBC model where I introduce (i) a housing sector, and (ii) financial intermediation.

There are three agents in the economy. (1) Households who enjoy utility from consumption, leisure, and housing holdings; (2) Financial intermediaries who channel funds by borrowing from (saver) households and lending to firms and (borrowing) households; and (3) Firms that use capital, labor, and land as factors of production.

2.1. Households

As in Iacoviello (2005) there are two types of households in the economy, unconstrained or patient households (savers) and

[2] Studies such as Davis and Heathcote (2007) and LWZ (2013) use land price data arguing that most of the variation in house prices comes from land prices rather than the cost of structures.

[3] This study uses a simplified RBC framework in order to abstract from important modeling challenges associated with the zero lower bound (ZLB) of nominal interest rates. We acknowledge that a richer version of the model can be developed with nominal rigidities and monopolistic competition as to provide insight on the role of non-conventinional monetary policy.

[4] Our quantitative results are meant to be suggestive of a large effect of financial shocks on aggregate fluctuations, yet these results need to be taken with caution as this study focuses on the size of the balance sheet of financial intermediaries, rather than its composition. We conjecture that the composition effect of the balance sheet may be dominant due to important asset return differentials.