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What is the major source of business cycles: Spillovers from land prices, investment shocks, or anything else?☆

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ABSTRACT

Some recent studies argue that spillovers from land prices into the aggregate economy are the crucial drivers of business cycles. Other studies stress the importance of investment shocks at business cycle frequencies. This study evaluates these two strands of the literature in a single unified framework by estimating a New Keynesian dynamic stochastic general equilibrium model with a collateral constraint on investment financing. The results are twofold: (i) when these features are combined, neither shocks that drive most of land-price fluctuations nor investment shocks are the primary source of U.S. business cycles; and (ii) technology shocks play an important role in business cycles.

1. Introduction

The discussion of what drives business cycles dates back at least to the classic studies of Kydland and Prescott (1982) and Sims (1980). After the Great Recession in the late 2000s, debate over the source of business cycles has gained renewed attention, with a focus on the prominence of financial factors.

The literature, including Iacoviello (2005), Iacoviello and Neri (2010), and Liu et al. (2013), emphasizes the role of housing in the economy. By using dynamic stochastic general equilibrium (DSGE) models, these studies argue that spillovers from fluctuations in land (or housing) prices to other major variables are important sources of business cycles. Among them, Liu et al. (2013) report that land-price dynamics driven by the housing demand account for approximately 28% of the variation in output and 39% of the variation in investments in a neoclassical model with a collateral constraint. Although their simple and tractable model provides a good analytical starting point, it differs from typical business cycle models, such as Christiano et al. (2005) and Smets and Wouters (2007), which recent literature often uses to decompose for business cycles.

Other studies, represented by Justiniano et al. (2010) and Justiniano et al. (2011), use a standard business cycle model with a rich shock propagation mechanism. These studies demonstrate that shocks to the marginal efficiency of investment (MEI) -disturbances in transformation of investment goods into productive capital- are the primary source of fluctuations in output and investments in the U.S.[1] Moreover, they argue that MEI shocks are proxies for financial factors because the estimated MEI shocks correlate highly with

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[1] Among the most influential studies in this area is Smets and Wouters (2007). They argue that labor supply shocks primarily drive fluctuations in business cycles using an estimated medium-scale DSGE model. Justiniano et al. (2010) fault Smets and Wouters (2007)'s conclusions for depending on their definition of investment. As explained in data section, our investment data for estimation is the same definition of Justiniano et al. (2010).

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credit spreads. These studies reinforce the momentum toward developing models that enrich financial frictions.[2] However, Justiniano et al. (2010) and Justiniano et al. (2011) do not consider spillovers from land-price fluctuations in the economy.

This study assesses these views within one unified framework and considers the shock that is a more relevant major driver of business cycles. To this end, we introduce land as a collateral asset in investment financing into a standard medium-scale DSGE model similar to Justiniano et al. (2011). Because a medium-scale DSGE model suitably encompasses several views on the sources of business cycles, it provides a good experimental field for our objective.

In our estimated U.S. model, housing demand shocks determine most of the land-price fluctuations. They account for 74.9% of land-price fluctuations. However, they are not the primary source of business cycles. Housing demand shocks account for 14.8 and 23.0% of the variation in output and investment at business cycle frequencies. These numbers are approximately half of the numbers in the study of Liu et al. (2013). Furthermore, MEI shocks account for only 2.6 and 6.7% of output and investment fluctuations, respectively. In contrast, technology shocks substantially affect macroeconomic variables at business cycle frequencies. 44.9% of the variation in output is attributable to technology shocks.[3] Neither housing demand shocks nor MEI shocks are primary drivers of business cycles.

It is worth noting the reason why our results differ from those of Liu et al. (2013) and Justiniano et al. (2010). Discrepancies in the studies of Liu et al. (2013) and ours stem from an assumption of the labor elasticity. The indivisible labor setting adopted in Liu et al. (2013) implicitly presumes an infinite Frisch elasticity of labor supply (e.g. Hansen, 1985), whereas we allow this elasticity to be finite and estimate it using data as in standard medium-scale DSGE models. The amplification effects of a positive housing demand shock will be dampened in our specification because a lower Frisch elasticity results in lesser substitution effects and greater income effects.

Discrepancies in the studies of Justiniano et al. (2010) and ours stem from the collateral constraint and data used in estimations. A favorable MEI shock creates procyclical movements in consumption and investments but also creates countercyclical movements in stock prices because a MEI shock is a supply shock of capital accumulation. In a model with collateral constraint, countercyclical movements in stock prices are transmitted into movements in credits because stocks are pledged assets for collateral. Hence, credits respond countercyclically to a MEI shock in the model. However, credits move procyclically in actual data. Therefore, MEI shocks fail to be a major source of business cycles when a model is estimated using credit data.

This study also relates to Brzoza-Brzezina and Kolasa (2013), who find the collateral constraint mechanism to be not crucial in fitting their model to the U.S. data. In our model, spillovers from housing demand through land prices are modeled explicitly and estimated using land price data; however, Brzoza-Brzezina and Kolasa (2013) consider only a collateral constraint on the value of capital. Hence, our results complement those of Brzoza-Brzezina and Kolasa (2013).

In the remainder of this paper, Section 2 provides an overview of our model. Section 3 presents our estimation method and data. Section 4 describes the estimation results and discusses their implications. Section 5 concludes the study.

2. The model

A standard medium-scale DSGE model is estimated that shares major features with Christiano et al. (2005), Smets and Wouters (2007) and Justiniano et al. (2011). It contains nominal and real frictions that affect the decisions of economic agents. One key difference from models commonly used in the literature is the collateral constraint, a lá Kiyotaki and Moore (1997), whereby a lender has to post collateral to obtain external funds because of limited enforcement of financial contracts. We extend the model to include a collateral constraint on investment financing so that it can describe spillovers from the housing market into investments through land prices.[4]

The economy is populated by capital owners, households, final-goods producers, intermediate-goods producers and the government. Agents' problems and other constructions are as follows.

2.1. Capital owners

A representative capital owner receives utility from consuming $C_{c,t}$ in each period and invests in capital K_t and land $L_{c,t}$, which are rented to intermediate-goods firms in competitive markets. Its objective is to maximize the following lifetime utility,

$$E_t \sum_{s=0}^{\infty} \widehat{\beta}^{\,s} \log(C_{c,t+s} - \gamma_c C_{c,t+s-1}),$$

where $\gamma_c \in [0, 1]$ is a parameter in the capital owner's formation of consumption habits. $\widehat{\beta} \in (0, 1)$ is a capital owner's subjective discount factor.

The capital owner confronts a flow of funds constraint and a capital accumulation process with quadratic investment adjustment

[2] Wieland et al. (2016) summarize recent developments in this active area.

[3] Kaihatsu and Kurozumi (2014) also point out that technology shocks are the major source of business cycles using an estimated DSGE model.

[4] Iacoviello (2005), Iacoviello and Neri (2010) and Liu et al. (2013) estimate DSGE models with a collateral constraint using US data. In the former two studies, a part of households face a collateral constraint on consumption. These models focus on the housing investment and have difficulties in reproducing positive co-movements between land prices and business investments. In the latter study, a capital owner faces a collateral constraint on business fixed investment. Since we examine the propagation of housing demand shocks through business investment, we adopt a modeling strategy similar to that of Liu et al. (2013).