



Housing market dynamics in China: Findings from an estimated DSGE model



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ABSTRACT

We use an estimated dynamic stochastic general equilibrium model to study housing market fluctuations in China. More than one-third of the volatility of housing prices is driven by housing preference shocks. The volatility of residential investment is mainly driven by housing technology shocks with more than one-half variance contribution. Monetary shocks explain 12–32% of variance in housing prices and residential investments. However, the contribution of monetary factors appears more important in the 1990s and less important in the 2000s. We find that two observables with “Chinese characteristics” capture part of the housing preference shocks. The shocks are positively related to the sex ratio and negatively related to the equity market index.

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1. Introduction

What drives fluctuations in the housing market? This is an important question for policy makers and academia. Cross-country experiences suggest that some booms in housing prices end with protracted busts. The collapse in the housing market could cause negative spillovers to the aggregate economy. For instance, if many households spend a significant fraction of their income for mortgage payment, a bust in the housing market decreases the wealth of households. The drop in wealth then reduces private consumption.

In this paper, we use an estimated dynamic stochastic general equilibrium (DSGE) model to study the sources

and consequences of fluctuations in the Chinese housing market. We focus on understanding the nature of shocks driving the dynamics in housing prices and residential investment and the spillovers from the housing market to the aggregate economy. The model is based on that of [Iacoviello and Neri \(2010\)](#). On the supply side, using different production technologies, the non-housing sector produces non-durable goods and the housing sector produces new houses. On the demand side, households derive utility from consumption of non-durable goods and accumulation of housing. The non-durable goods are also used for business investment. A fraction of households are relatively impatient and subject to a borrowing constraint with housing being used as collateral for loans. Fluctuations in housing prices affect the borrowing capacity of the impatient households and the profitability of housing production. These processes generate spillover effects on the consumption and investment decisions of

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households and firms. There are a number of shocks driving fluctuations in the aggregate economy, including the sectoral productivity shocks, housing preference shocks, monetary shocks, cost-push shocks, and other demand/supply shocks. The rich set of shocks allows us to compare the relative importance of each shock hitting the housing market.

We estimate the model using Bayesian methods with annual data of ten observables over the period 1991–2012. In terms of the sources of cyclical fluctuations in the Chinese housing market, the variance decomposition suggests that housing demand and supply shocks and monetary shocks play a significant major role. The volatility of real housing prices is mainly driven by housing preference shocks. The shocks explain 43% of the variance in housing prices in the short run (1- or 2-year forecast horizons) and about 30% in the long run (asymptotically). Over short horizons, monetary shocks also contribute significantly and explain 24–32% of the variance in housing prices. Over long horizons, however, housing technology shocks become more important and explain 33% asymptotically. The cyclical fluctuations in residential investment are driven mainly by housing technology shocks, which account for 52–62% of the volatility of housing investment at different horizons. Housing preference shocks and monetary shocks also play an important role. The former explains 20–25% while the latter explains 12–20% at different horizons. The historical shock decomposition further suggests that the contribution of monetary factors to cyclical movements in housing prices and residential investment appears more important in the 1990s but less important in the 2000s.

In terms of the spillovers from the housing market to the aggregate economy, the impulse responses indicate that the effects depend on the nature of the shocks. A positive housing preference shock generates a positive spillover from the housing market to consumption. The positive preference shock raises real housing prices. This increases the collateral capacity of impatient households, which in turn increases borrowing and consumption. A positive housing technology shock, however, generates a negligible spillover effect. On the one hand, the positive technology shock increases rental income of capital in the housing sector and consumption of patient households. On the other hand, the positive technology shock decreases real housing prices, borrowing, and consumption of impatient households. The overall effect on consumption is therefore small. We also estimate the reduced-form elasticity of consumption to housing wealth using the simulated data generated by the model. We find that a 10% increase in housing wealth is associated with a 1.12% increase in aggregate consumption.

To further investigate whether housing preference shocks represent shifts in tastes in housing or other exogenous shocks being excluded from the model, we conduct a simple regression analysis on housing preference shocks against other potential explanatory variables. Interestingly, we find that housing preferences shocks are positively related to the sex ratio (male to female) and negative related to the equity market index. The positive correlation between housing preference shocks and the sex

ratio is consistent with the finding of [Wei and Zhang \(2011\)](#) that housing values in China are positively related to sex ratios. The negative relationship between housing preference shocks and the equity market index may reflect high substitutability between residential and equity investment.

This paper is related to the empirical literature on studying the determinants of housing prices in China. Using the various econometric models, the existing studies find that housing prices in China can be explained by the real and monetary factors. These factors include income, wealth and city-level population density ([Ahuja et al., 2010](#)), speculative capital inflow ([Guo and Huang, 2010](#)), land supply and financial regimes ([Yan et al., 2010](#)), urban economic openness ([Wang et al., 2011](#)), land prices ([Du et al., 2011](#)), monetary policy variables including bank loan rate, excess liquidity, money supply growth, mortgage rate, and mortgage down payment requirement ([Yu, 2010](#); [Guo and Li, 2011](#); [Xu and Chen, 2012](#); [Zhang et al., 2012a,b](#)), impact fees charged to developers ([Dong et al., 2013](#)), income and construction cost ([Chow and Niu, 2014](#)), and other fundamental factors such as urban hukou population, wage income, and urban land supply ([Wang and Zhang, 2014](#)). [Han \(2010\)](#) focuses on housing demand in Shanghai and finds that price-income ratios, age composition and size of household are important demand factors. In general, the parameters of the regression models in the literature are not structural or the “deep parameters” (related to preference of households or technology of firms) that govern the behavior of economic agents are not modeled. Hence, the estimated regression results, to some extent, are subject to the Lucas critique. By contrast, the current paper uses a micro-foundation structural model (together with the Chinese data) to analyze the relationship between endogenous housing variables and other macroeconomic variables.

This paper also contributes to the recent literature on using a micro-foundation based DSGE modeling approach to study the macroeconomic issues in China. [Zhang \(2009\)](#) uses a DSGE model of the Chinese economy to evaluate the effectiveness of two monetary policy rules. [Straub and Thimann \(2010\)](#) utilize an open-economy multi-country DSGE framework to analyze the macroeconomic adjustment in China under both flexible and fixed exchange-rate regimes. [Chen et al. \(2012\)](#) develop a DSGE model to study the effects of different types of China’s unconventional monetary policy tools. [Mehrotra et al. \(2013\)](#) use a variant of the model of [Christiano et al. \(2005\)](#) to assess the impact of economic rebalancing of the Chinese economy from the investment-led growth to consumption-led growth. [Chang et al. \(2013\)](#) examine optimal monetary policy under prevailing Chinese policies of capital controls and exchange rate targets. [Le et al. \(2014\)](#) build a model of the Chinese economy with a banking sector to study the impact of the recent global banking crisis. [Dixon et al. \(2013\)](#) examine the influences of inter-generational transfers on the Chinese economy using a DSGE model with overlapping generation framework. The current paper differs from the existing studies by considering an estimated DSGE model with explicit modeling of the price and quantity of the housing sector and using the

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