



Should the optimal portfolio be region-specific? A multi-region model with monetary policy and asset price co-movements

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ABSTRACT

A multi-region, dynamic stochastic general equilibrium (MRDSGE) model is built to show that differences in the price elasticity of housing supply can be related to stylized facts on regional differences in (1) house price level, (2) house price volatility, (3) monetary policy propagation mechanism and (4) household asset portfolio. In addition, regional house prices are found to move more closely with regional fundamentals than with the national GDP. The correlation between the national stock price and the regional housing price also vary significantly across regions, which suggests that optimal portfolio should be region specific.

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1. Introduction

Several striking stylized facts on regional economic differences are related to the real estate markets. First, even within the same country, tremendous differences in house prices are observed across regions. For instance, Hwang and Quigley (2006) show that for a sample of U.S. metropolitan areas (MSAs), during the period 1975–2000, the real prices of housing in three California housing markets had more than tripled, while the real housing prices in three other MSAs (Houston, Albany, and Oklahoma City) were stagnant. What accounts for such cross-sectional diversity becomes an important research topic. The empirical works of Glaeser et al. (2005a,b), Hwang and Quigley (2006), among others, suggest that it is the local government regulation, such as “growth control” that limits the increase of housing supply and leads to a higher housing price at the equilibrium. Wheaton and Simonton (2007) find that “real construction costs have fallen slightly over the last 35 years,” suggesting that house price increase is very unlikely to be driven by “cost-inflation.” Recently, Saiz (2010) estimates the price elasticity of housing supply (henceforth,

supply elasticity) and finds that variations across different metropolitan areas are very significant.² For example, the supply elasticities in both Miami and Los Angeles–Long Beach are estimated to be below 0.7, the counterpart in Las Vegas is close to 1.4, while the supply elasticities in Kansas City and Oklahoma City are estimated to be well above 3.0. Saiz (2010) also finds that highly regulated metropolitan areas typically have low estimates of supply elasticities.

Not only the dramatic differences in the level of house prices can be attributed to the differences in the supply elasticities, the differences in the volatility of house prices may also be explained by the differences in the supply elasticities. To show the relation between volatility of real house price and supply elasticity, we construct semi-annual real house price by dividing nominal housing price index from Case–Shiller (monthly data are averaged into semi-annual data) by semi-annual city level CPI data from the BLS.³ We focus on semi-annual data because city-level CPIs are not available on a consistent basis for higher frequency. We choose the longest sample for which we can

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² Green et al. (2005) adopt a different methodology in estimating the price elasticity of housing supply. They also find that the variations across different metropolitan areas are in fact very large.

³ The Case–Shiller index is available through <http://www.standardandpoors.com/indices/sp-case-shillerhome-price-indices/en/us/?indexId=spusa-cashpidiff-p-us->. The Bureau of Labor Statistics data can be found in <http://www.bls.gov/>.

Table 1
Price elasticity of housing supply and volatility of real house price.

Metropolitan areas	Supply elasticity	Std. dev. of real house price (%)
Miami	0.60	12.66
Los Angeles–Long Beach	0.63	11.45
San Francisco	0.66	6.51
San Diego	0.67	10.54
New York	0.76	6.20
Chicago	0.81	5.48
Boston–Worcester–Lawrence–Lowell–Brockton	0.86	4.81
Seattle–Bellevue–Everett	0.88	10.49
Cleveland–Lorain–Elyria	1.02	2.66
Portland–Vancouver	1.07	6.47
Detroit	1.24	5.64
Minneapolis–St. Paul	1.45	6.27
Denver	1.53	3.19
Atlanta	2.55	3.39

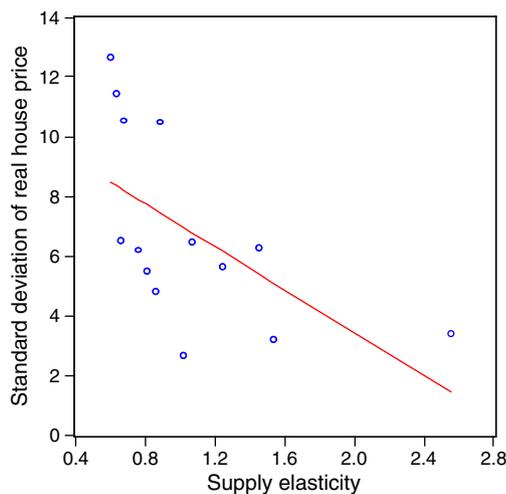


Fig. 1. Supply elasticity versus standard deviation of real house price in 14 US metropolitan areas.

obtain the most data points, resulting in a sample from 1991 S1–2010 S1 (*S* here denotes semi-annual), yielding 39 data points for each of the 14 metropolitan areas we have data. The real house price is then logged and HP filtered with a smoothing parameter of 400 before standard deviation is calculated. The estimates of the supply elasticities are from Saiz (2010). Table 1 reports the data while Fig. 1 provides a scatter-plot of the data together with the OLS regression line (red line). The slope of the regression line is -3.6 ,⁴ which is significant at 5%. It shows that metropolitan areas with higher supply elasticities tend to have lower volatility of real house prices.

The third stylized fact is that the monetary policy propagation mechanism varies across regions. For instance, Carlino and Defina (1998, 1999, 2006), among others, find significant heterogeneity in the income responses to monetary policy across different regions or states. In particular, they find (1) strong evidence that manufacturing-intensive states are more responsive to changes in monetary policy shocks than the more industrially diverse states, and (2) weaker evidence that states containing a relatively larger concentration of small firms tend to be more responsive to monetary policy shifts than states composed of smaller concentrations of small firms. They also

⁴ Note that removing Atlanta (the outlier in terms of supply elasticity) will only make the slope of the regression line steeper.

conclude that the evidence for a broad credit channel is weak. Fratantoni and Schuh (2003) construct a large VAR model in which the regional economic variables (regional house price, regional output, etc.) have potentially time-varying impact on the aggregate variables. The aggregate variables will then affect different regional variables simultaneously through the change in the mortgage rate, among other variables. They show that regional housing markets display heterogeneous responses to monetary policy shocks.

The fourth stylized fact is related to the apparently spatial-dependent household portfolio. For instance, Goetzmann et al. (2004) find that rural portfolios are more diversified than urban portfolios in their Swedish dataset. Moreover, the portfolio diversification of the agents in their sample seems to be characterized by factors associated with urban growth. Kohler and Smith (2005) find that in the Australian data, with a 100 persons/km² increase in urbanization, the portfolio share of home will increase by 0.4 percentage points on average.

While there may be different explanations for each of these stylized facts, this paper attempts to study these facts in a *unifying framework* by extending a standard dynamic stochastic general equilibrium (DSGE) model to a multi-regional setting. While the previous literature focuses on the fiscal policy competition or coordination among regions,⁵ this paper is devoted to study the regional housing markets and their interactions with the monetary policy in a multi-regional setting.⁶ A merit of DSGE model is that both the quantity variables (such as consumption and investment) and price variables (such as non-durable goods price, housing price and stock price) are all endogenously determined. All agents maximize their objective functions in the model. Thus, it is easier to understand the transmission mechanism of the monetary policy.

To highlight the role of the housing market in the aggregate economy as well as the financial market, we assume that the two regions are ex-ante identical except that the housing adjustment costs differ across regions. Without loss of generality, the adjustment cost is assumed to be *lower* in the region 1.⁷ The two regions will then be subject to region-specific shocks. In this model as in practice, history dependent contingent claims are not available. Fortunately, there is a national stock market which (1) “owns” the firms in both regions, and (2) welcomes investment of agents from different regions.⁸ The housing market, however, is “regional.” In particular, we assume that the agents in each region can only purchase and derive utility from the housing stock in the same region.⁹

For monetary policy to have any real effects, we introduce nominal rigidity in the goods market. Following Calvo (1983), the renewal of nominal price contracts are random (which will be explained in more details later). To facilitate the comparison with the literature, the government is restricted to follow the Taylor rule (Taylor, 1993). In

⁵ The literature is too large to be reviewed here. Among others, see the survey papers by Epple and Nechyba (2004).

⁶ To the best of our knowledge, it seems that this paper is the first paper which combines the nominal rigidities and the regional consideration in a DSGE framework. For the earlier literature, see Leung (2004, 2007), Leung and Teo (2010), among others.

⁷ The difference in adjustment costs need not be due to physical or engineering reason, but due to political economy reason. Among others, Ortalo-Magne and Prat (2007) build a political economy model in which the equilibrium housing supply can be inefficiently low, as homeowners try to protect their interests. This paper attempts to focus on the aggregate implications for such difference and will therefore take the difference as given.

⁸ In principle, as one referee wisely observes, since history-dependent contingent claims are not available, the *paths* of the equilibrium price and quantities can be history dependent. In our numerical implementations, since we focus on the *moments* over a sample period rather than the exact time paths, we do not observe significant changes in results with different initial conditions.

⁹ While this assumption will preclude the fact that some people in the North own seasonal homes in the South, say Florida, it seems that the assumption is very realistic for most of the population in the USA.

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