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The Convergence of Regional House Prices in China

by

Fang Zhang

Department of Economics, University of Bath

And

Bruce Morley*

Department of Economics, University of Bath

Abstract: This aim of this study is to determine the extent of any convergence in house prices across China, using a regional panel dataset. The results show little evidence of convergence across the regions, although there is evidence of a ripple effect starting in Shanghai, Guangzhou and Beijing, although only the former two regions are affected by the distance from them to the respective cities.

Keywords: convergence, house price, China, ripple effect

JEL: R3, R5.

*Department of Economics, University of Bath, Bath, BA2 7AY, UK. Tel. +44 1225 386497, E-mail: bm232@bath.ac.uk, Fax: +44 1225 383423.

1. Introduction

The aim of this study is to determine whether there is any evidence of convergence across China's regional housing markets during the last decade. In addition the related concept of a 'ripple effect' is also assessed, where house prices rise in a particular area before gradually rippling out to other neighbouring areas. Although there have been a number of studies of the USA and UK markets, there have as yet been fewer studies aimed at the Chinese market. Given the importance of China's housing market to the economy and the substantial rise in house prices over recent years, this is an increasingly important area for research.

With the worldwide real estate boom in the 1990s, an extensive literature has analysed the properties and behaviour of regional house prices by principally focusing on testing the convergence or ripple effects of regional house prices in a certain economy, such as the US (Holmes, Otero, and Panagiotidis, 2011) and the UK (Cook and Thomas, 2003) as well as recently Taiwan (Chen, Chien and Lee, 2011). As a result of the immobility of housing assets, we would expect variations in regional house prices to be persistent or even permanent. So far the evidence on convergence is mixed although a range of studies have found support for a causal link between house prices for instance in the South East and other regions in the UK through cross-correlation matrices and Granger causality tests.

In recent years, new evidence from panel datasets indicates mixed evidence of convergence of regional house prices across the UK. Holmes (2007) employs a three-stage testing approach for regional house price convergence by applying a univariate ADF test, which indicates no long-run convergence because most of the regions' house price differentials are non-stationary at the 5% significance level, except for London and the Northern regions.

House prices in China's metropolitan areas have recently exhibited rapid growth, which has encouraged investigation into the behaviour of regional house prices. However, there is only a limited literature on China's regional house price convergence or ripple effects such as Liu and Zhang (2008). This study used the Regional Economy Three-sector Equilibrium Model to examine house price ripple effects within cities. Zhang and Liu (2009) selected eight main capital cities' house price indexes between 1998 and 2007, finding that there were ripple effects between eight cities' house price indexes, with Shenzhen being the initiating city for nationwide house price rises and Peking and Shanghai being secondary.

Following the introduction the next section discusses the methodology used in this study. There is then a discussion of the results and finally there is a conclusion and suggestions for any policy implications.

2. Methodology

This study uses the standard panel unit root tests to test for convergence as well as testing for β-convergence, which aims to use a regression equation in which the growth rate is regressed against the initial level. In the panel data model, the regression equation for β-convergence in China's regional house prices can be expressed as:

$$GHPI_{i,t} = \alpha + \beta HPI_{i,t-1} + \varepsilon \qquad (1)$$

Where $GHPI_{i,t}$ is the growth rate of HPI (House Price Index) for region i in the time period t; $HPI_{i,t-1}$ is HPI for region i in the previous time period $t-1$; and ε is the error term. If the coefficient β is negative and significant, we can say there is β-convergence between regional house prices in China.

A cross-section model is also used to measure convergence, the house price growth rate for each city needs to be identified firstly by the following equation:

$$G = (HPI_N - HPI_1) / HPI_1 * 100 \qquad (2)$$

Where G is the growth rate, HPI_N is the house price in the last period, and HPI_1 is the house price in the first period. Then the cross-section model is estimated between the growth rate and the house price index in the first time period:

$$G_i = \alpha + \beta HPI_{i,1} + \varepsilon \quad (3)$$

Where G_i is the growth rate for region i, $HPI_{i,1}$ is the house price index of region i in the first time period, and ε is the error term.

To measure the ripple effect we use the stationary variable DLHP and then estimate the following models:

$$DLHP_{i,\tau} = \alpha + \delta_1 DLHP_{B,\tau-1} + \delta_2 DLHP_{S,\tau-1} + \delta_3 DLHP_{G,\tau-1} + \beta DLHP_{i,\tau-1} + \varepsilon_{i,\tau} \quad (4)$$

$$\begin{aligned} DLHP_{i,\tau} &= \alpha + \delta_1 DLHP_{B,\tau-1} + \delta_2 DLHP_{S,\tau-1} + \delta_3 DLHP_{G,\tau-1} \\ &\eta_1 dDLHP_{B,\tau-1} + \eta_2 dDLHP_{S,\tau-1} + \eta_3 dDLHP_{G,\tau-1} + \beta DLHP_{i,\tau-1} + \varepsilon_{i,\tau} \end{aligned} \quad (5)$$

The above equations indicate the ripple effects for quarterly house price changes in Beijing, Shanghai and Guangzhou. Where τ denotes the time period from 1997Q1 to 2010Q4; $i=1,2,\ldots,32$, denotes the 32 cities used excluding Beijing, Shanghai and Guangzhou. $DLHP_B$, $DLHP_S$ and $DLHP_G$ are quarterly house price changes of the core cities—Beijing, Shanghai and Guangzhou respectively. $dDLHP_B$ is the log of distance between city i and Beijing multiplied by Beijing house prices, the same procedure is than conducted for Shanghai and Guangzhou.

3. Data and Results

This study uses the house price link index (HPI) (the same quarter of last year=100) for 35 cities from 1998Q1 to 2010Q4, where the 35 cities include 30 capital cities and 5 municipalities (Dalian, Qingdao, Ningbo, Xiamen and Shenzhen) with independent planning status. The data also includes highway mileage between other cities and Beijing/Shanghai/Guangzhou respectively taken from the webpage of Nanning (China-ASEAN) Commodity Exchange (http://www.ncce.biz/) and the link index[1] of the HPI data comes from the official database of the NBSC (http://www.stats.gov.cn/).

Table 1 summarises the results from the panel unit root tests on the ratio between the regional and national house prices as also used by Cook (2003). The Levin, Lin & Chu (LLC) test, Im, Pesaran & Shin (IPS) test and ADF test all strongly fail to reject the null of a unit root at the 1% significance level, indicating the variables are I(1), which implies non-convergence of regional house prices[2]. The β -convergence results are contained in Table 2, the value of both β coefficients are negative; but the t-statistics are not significant, suggesting little evidence to support β-convergence, which backs up the results of the unit root tests.

Table 3 suggests that house price changes in other cities are significantly affected by their own previous changes and previous house price changes in Beijing, Shanghai and Guangzhou at the 5% significance level, regardless of whether the distance factor is included. In other words, the house price shocks in the three core cities 'ripple out' to the other regions, as has been found in similar studies of the UK, as growth in the three biggest economic zones stimulates house price growth of the comparatively lesser developed regions. Additionally, the positive coefficients of the core cities' house price changes indicates that house prices in core cities play a leading role in determining the other regions. Another interesting result is the different impact of the ripple effects, which are particularly large for Beijing's. This

[1] The link index is based on the same quarter of last year; for example, if HPI in the last quarter was 100 and it increased by 10% over the last 12 months, HPI in this quarter is 110. In this paper, we need to transform the link index into the constant growth index (the first period index=100): for example, if HPI in the first quarter is 100 and it increased by 10% in the next quarter, HPI in the second quarter is 110.

[2] These unit root tests were also conducted on the house prices and produced the same result.

suggests a rise of 1% in Beijing increases the average peripheral house prices by about 0.4% a quarter later. This is much higher than for Shanghai and Guangzhou.

Furthermore, the ripple effects seem to be affected by the distance from Shanghai and Guangzhou but not Beijing, as well as their house prices. Also the negativity of the coefficients of the distance factors implies that the further the city is away from the economic zones, the less powerful the distance factor is. This evidence shows that the 'ripple effects' in core cities weakens as the distance from them increases. However, a possible reason for the insignificance of Beijing's distance factor could be that there is a more developed transportation system around Beijing, giving this city's inhabitants greater and easier access to the peripheral areas of China producing a more immediate effect.

4. Conclusions

There is little evidence of any convergence across China's regional house prices, over the recent past. However there is evidence of the ripple effect in China, originating in the three main centres of Shanghai, Guangzhou and Beijing. In addition the ripple effect seems to weaken as the distance from one of the centres increases. The implications of these findings are that the authorities can use changes in the central cities to predict house prices in the outer regions and implement policies to accommodate their housing policies through monetary and fiscal changes accordingly.

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Table 1: Panel Unit Root Tests on China's regional house prices.

Panel Unit Root Test		House Price Ratio (HPR)	
		Statistic	Prob.
Method		Lags: 4 Cross-sections: 35 Without time trend	
Levin, Lin & Chu (H_0: Unit root (assumes common unit root process))		-0.9481	0.1715
H_0: Unit root (assumes individual unit root process)	Im, Pesaran and Shin	1.5988	0.9451
	ADF – Fisher	59.3058	0.8152
	Cross-sections: 35 Periods: 56 Without time trend		
Hadri (H_0: All panels are stationary)		154.6292	0.0000***

Table 2: The results of panel and cross-section β -convergence models

Panel β-convergence model			Cross-section β-convergence model		
Dependent Variable	$GLHP_{i,\tau}$		Dependent Variable	$GLHP_i$	
Number of obs	1925		Number of obs	35	
Explanatory Variable	Coefficient	P-value	Explanatory Variable	Coefficient	P-value
$LHP_{i,\tau-1}$	-0.045 (-0.47)	0.635	$LHP_{i,1}$	-14.675 (-0.83)	0.415
cons	0.410 (0.90)	0.369	cons	78.350 (0.96)	0.343
Note: ( ) denotes the t-statistics of the respective coefficients. *** indicates significance at 1% level, ** indicates significance at 5% level. * indicates significance at 10% level.					

Table 3: The results of the Ripple Effect Regressions for Beijing, Shanghai and Guangzhou (the first difference quarterly change)

Dependent Variable	Quarterly house price changes (DLHP) in city *i*				
Explanatory Variable	Coefficient	P-value	**Explanatory Variable**	Coefficient	P-value
L.DLHP	-0.261 (-11.33)	0.000***	*L.DLHP*	-0.201 (-2.28)	0.023**
$L.DLHP_B$	0.410 (7.96)	0.000***	$L.DLHP_B$	0.414(8.04)	0.000***
			$L.dDLHP_B$	-0.010(-0.81)	0.419
$L.DLHP_S$	0.058 (2.15)	0.031**	$L.DLHP_S$	0.604(2.37)	0.018**
			$L.dDLHP_S$	-0.075(-2.15)	0.032**
$L.DLHP_G$	0.095 (3.23)	0.001***	$L.DLHP_G$	0.778(2.61)	0.009***
			$L.dDLHP_G$	-0.092(-2.30)	0.021**
cons	0.007 (6.33)	0.000***	cons	0.007 (6.38)	0.000***

Note:
1). 'L.' indicates the first lag of variables.
2). ( ) denotes the t statistics of the respective coefficients. *** indicates significance at 1% level, ** indicates significance at 5% level. * indicates significance at 10% level.