

Chapter 4

Empirical Results

4.1 Panel unit root test results

The econometric statistical software Eviews 6.0 is used to conduct a panel unit root test with both the levels and first differences of house prices and economic growths. Table 4.1 summarizes the results. The IPS results indicate that each series cannot reject the null hypothesis of a unit root at their levels. On the other hand, the null hypothesis of a unit root is strongly rejected at the 1% significance level for all series at their first difference by both LLC and IPS tests. The results strongly support the conclusion that the series are stationary only after being differenced once. Hence, the unit root tests in table 4.1 indicates that the series are integrated of order one, i.e., $I(1)$ at the 1% significance level.

Table 4.1 Panel unit root test results

Methods Variables	LLC		IPS	
	(C, T)	(C,0)	(C, T)	(C,0)
LnHP	-2.22683**	11.0769	3.40788	13.9719
LnGDP	-5.19938***	12.5269	2.47042	17.9767
Δ LnHP	-13.1677***	-8.72861***	-6.26039***	-6.23670***
Δ LnGDP	-7.49601***	-5.17879***	-2.82905***	-2.46983***

Note: (C, T) indicates the intercept and trend respectively. Δ denotes first differences. ** indicate statistical significance at the 5% level. *** indicate statistical significance at the 1% level.

4.2 Panel cointegration test results

Having established that the HP and GDP series are integrated at the first order, the second step is to test whether there is a long-run relationship between house prices and economic growths. Pedroni's panel cointegration test was conducted.

By performing a GLS approach, the cointegration function for house prices and economic growths is obtained as:

$$\text{LnGDP} = -2.708790 + 1.425136\text{LnHP} \quad (4.1)$$

(-14.78069***) (59.91234***)

where t-values are in parentheses. *** indicate statistical significance at the 1% level.

The cointegration function shows that house prices and economic growths have a positive relationship in the long run. One percent change in house prices follow with a 1.425136 percents change in the economic growths. The result indicates that house prices have big effects on economic growths in the long run. Thus, the stability of house prices can benefit sustainable economic growths.

On the other hand, the Pedroni's results are reported in table 4.2. It can be seen that, 5 out of 7 of Pedroni's statistics significantly reject the null hypothesis of no cointegration. This implies a long run co-movement of house prices and economic growths. Or in other words, the Pedroni's results support a long-run relationship between house prices and economic growths as well.

Table 4.2 Panel cointegration test results based on the Pedroni method

Within dimension		Between dimension	
Panel ν -statistic	41.17611***	Panel ρ -statistics	3.243719
Panel ρ -statistics	1.641046	Panel PP-statistic	-6.257061***
Panel PP-statistic	-4.216795***	Panel ADF-statistic	-6.272861***
Panel ADF-statistic	-5.897235***		

Note: *** indicate statistical significance at the 1% level.

Moreover, the individual panel pooled least square method can be used to examine the specific relationships of house prices on economic growths for different provinces. From table 4.3, it can be seen that, the coefficients β_i of house prices in each region are statistically significant at 1% level, and the effects are positive as expected. The elasticity coefficients of house prices to economic growths are high among each province.

The results also show that real estate sector is a huge contributor to the economic growths in People's Republic of China. Table 4.3 shows that the western part cities, Yunnan, Qinghai, Ningxia and Xinjiang provinces have high elasticity coefficients. It shows when house prices change one percent, the economy in western part cities will change for more than two percents. Taking Yunnan province as an example, when there is a one percent change in the house prices, it will follow a 2.255862 percents change in economies. While the major big cities, Beijing, Shanghai, Tianjin and Chongqing have moderate elasticity coefficients. It indicates that when house prices change one percent, the major cities' economies will change as well, but not so much. Taking Shanghai city as an example, one percent change in house prices will only bring a 1.086337 percents change in economies. Those results indicate that the house sector is a much more important contributor to economic growths in the western part than other parts of People's Republic of China.

Table 4.3 Panel pooled least square results

Region	α_i	β_i (t-value)	Region	α_i	β_i (t-value)
Beijing	-1.649734	1.155860(10.10408) ***	Henan	-3.255160	1.663563(11.20228) ***
Tianjin	-2.536292	1.289512(11.66897) ***	Hubei	-0.924043	1.262309(9.564240) ***
Hebei	-2.842085	1.575572(9.957866) ***	Hunan	-2.379039	1.498411(10.24358) ***
Shanxi	-3.976727	1.626666(11.62026) ***	Guangdong	-4.992281	1.775424(10.39821) ***
Inner Mongolia	-6.688177	1.990263(14.54703) ***	Guangxi	-6.467013	1.916935(9.903777) ***
Liaoning	-4.441915	1.686891(9.474605) ***	Hainan	-0.817028	0.943775(9.131837) ***
Jilin	-7.416210	2.050158(10.44238) ***	Chongqing	-3.798266	1.544370(10.40517) ***
Heilongjiang	-4.497006	1.692169(8.047252) ***	Sichuan	-0.761483	1.261727(9.945667) ***
Shanghai	-0.451504	1.086337(9.920212) ***	Guizhou	-4.664866	1.637328(10.09881) ***
Jiangsu	-0.720705	1.312256(11.49911) ***	Yunan	-9.271476	2.255862(8.585590) ***
Zhejiang	0.887418	1.032081(11.40902) ***	Shannxi	-4.154715	1.615003(12.00655) ***
Anhui	-0.042077	1.135354(9.597771) ***	Gansu	-6.016521	1.813453(9.142426) ***
Fujian	-0.509922	1.152830(9.117018) ***	Qinghai	-8.785340	2.002760(11.04584) ***
Jiangxi	-0.907050	1.254742(10.69973) ***	Ningxia	-9.311909	2.056927(11.26349) ***
Shangdong	-2.833439	1.629715(11.81466) ***	Xinjiang	-9.863856	2.337841(9.208518) ***

Note: t-values are in parentheses. *** indicate statistical significance at the 1% level

4.3 Error correction models and Granger causality test results

Table 4.4 shows the results of the panel Granger-causality test for the relationship between house prices and economic growths on error correction models. It can be seen that, in the house prices equation, the coefficient of one period lagged GDP is significant at 1% level. In the GDP equation, the coefficients of lagged house prices are also significant. These results imply that, in the short run, there is a strong bidirectional Granger-causality between house prices and economic growths.

The error correction terms in the last column suggest that, for the house price equation, the coefficient of the error correction is significant at 1% level. While for the GDP equation, the coefficient of error correction term is not significant. These findings therefore indicate that there exists one-way long run causality from economic growths to house prices, not vice versa.

In addition, the ECT term in the house prices equation is negative as theoretically expected and its value shows the adjustment speed is fast. Given a deviation of house prices from its long-run equilibrium as defined by cointegration relationship, the GDP acts in a dynamic way to correct the disequilibrium.

Table 4.4 Granger causality test results

Dependent variable	Independent variable				
	Short run				Long run
	$\Delta \text{LnHP}_{it-1}$	$\Delta \text{LnHP}_{it-2}$	$\Delta \text{LnGDP}_{it-1}$	$\Delta \text{LnGDP}_{it-2}$	ε_{it-1}
ΔLnGDP_{it}	0.102552 (2.861525) ***	0.061490 (1.750173) *	0.106900 (1.235657)	0.127859 (1.240653)	0.009030 (0.408318)
ΔLnHP_{it}	0.015946 (0.236497)	0.165322 (2.593516) **	0.739606 (6.480741) ***	0.004907 (0.031653)	-0.381768 (-6.463310) ***

Note: 1. t-values are in parentheses.

2. The lag lengths were chosen using Akaike Information Criteria (AIC).

3. *** indicates statistical significance at the 1% level. ** indicates statistical significance at the 5% level.

* indicates statistical significance at the 10% level.