APPENDIX

Appendix A: The Original Results of House Price Dynamics

Appendix 1.1: Panel Unit Root Test of LNHP

methods	levels		First difference	
	statistic	probabilities	statistic	probabilities
Null Hypothesis: unit root (common unit root process)				
LLC				
Individual effects	**0.83479**	**0.7981**	**-6.75024**	**0.0000**
Individual effects, individual Linear trends	**-6.76076**	**0.0000**	**-8.44582**	**0.0000**
None	**5.84735**	**1.0000**	**-2.01560**	**0.0219**
Breitung				
Individual effects, individual Linear trends	**0.11048**	**0.5440**	**-4.00844**	**0.0000**
Null: unit root (individual unit root process)				
IPS				
Individual effects	**6.4037**	**1.0000**	**-2.9804**	**0.0014**
Individual effects, individual Linear trends	**-1.09093**	**0.1377**	**-1.31795**	**0.0938**
Maddala and Wu and Choi				
ADF-Fisher Chi-square				
Individual effects	**10.3175**	**1.0000**	**74.1920**	**0.0016**
Individual effects, individual Linear trends	**58.3990**	**0.0476**	**67.9015**	**0.0069**
None	**7.91100**	**1.0000**	**39.4237**	**0.5847**
PP-Fisher Chi-square				
Individual effects	**16.0221**	**0.9999**	**78.5405**	**0.0005**
Individual effects, individual Linear trends	**32.0489**	**0.8668**	**85.2919**	**0.0001**
None	**1.04507**	**1.0000**	**36.4015**	**0.7542**

Appendix 1.2: Panel Unit Root Test of LNPPI

methods	levels		First difference	
	statistic	probabilities	statistic	probabilities
Null Hypothesis: unit root (common unit root process)				
LLC				
Individual effects	**-1.63013**	**0.0515**	**-13.1051**	**0.0000**
Individual effects, individual Linear trends	**-8.14113**	**0.0000**	**-14.0339**	**0.0000**
None	**45.8426**	**1.0000**	**-2.05386**	**0.0200**
Breitung				
Individual effects, individual Linear trends	**-0.03203**	**0.4872**	**-4.56022**	**0.0000**
Null: unit root (individual unit root process)				
IPS				
Individual effects	**5.41100**	**1.0000**	**-5.52897**	**0.0000**
Individual effects, individual Linear trends	**-0.17321**	**0.4312**	**-3.29971**	**0.0005**
Maddala and Wu and Choi				
ADF-Fisher Chi-square				
Individual effects	**19.2807**	**0.9990**	**108.181**	**0.0000**
Individual effects, individual Linear trends	**47.3974**	**0.2619**	**96.2305**	**0.0000**
None	**0.32351**	**1.0000**	**40.2922**	**0.5461**
PP-Fisher Chi-square				
Individual effects	**46.7350**	**0.2841**	**107.015**	**0.0000**
Individual effects, individual Linear trends	**33.4780**	**0.8231**	**125.739**	**0.0000**
None	**0.30003**	**1.0000**	**52.6310**	**0.1259**

Appendix 1.3: Panel Unit Root Test of LNGDP

methods	levels		First difference	
	statistic	probabilities	statistic	probabilities
Null Hypothesis: unit root (common unit root process)				
LLC				
Individual effects	**-1.65425**	**0.0490**	**-7.57520**	**0.0000**
Individual effects, individual Linear trends	**-3.04285**	**0.0012**	**-9.66857**	**0.0000**
None	**41.1299**	**1.0000**	**-1.34374**	**0.0895**
Breitung				
Individual effects, individual Linear trends	**1.81553**	**0.9653**	**-2.35739**	**0.0092**
Null: unit root (individual unit root process)				
IPS				
Individual effects	**4.51989**	**1.0000**	**-3.30829**	**0.0005**
Individual effects, individual Linear trends	**1.50235**	**0.9335**	**-1.56551**	**0.0587**
Maddala and Wu and Choi				
ADF-Fisher Chi-square				
Individual effects	**21.3038**	**0.9967**	**77.1734**	**0.0008**
Individual effects, individual Linear trends	**31.3245**	**0.8863**	**69.8472**	**0.0044**
None	**1.31670**	**1.0000**	**28.9282**	**0.9375**
PP-Fisher Chi-square				
Individual effects	**45.4689**	**0.3297**	**100.271**	**0.0000**
Individual effects, individual Linear trends	**48.3792**	**0.2310**	**102.703**	**0.0000**
None	**0.00423**	**1.0000**	**28.8100**	**0.9395**

Appendix 1.4: Panel Unit Root Test of LNLP

methods	levels		First difference	
	statistic	probabilities	statistic	probabilities
Null Hypothesis: unit root (common unit root process)				
LLC				
Individual effects	**1.87089**	**0.9693**	**-10.6604**	**0.0000**
Individual effects, individual Linear trends	**-8.86227**	**0.0000**	**-10.7376**	**0.0000**
None	**8.94595**	**1.0000**	**-3.19357**	**0.0007**
Breitung				
Individual effects, individual Linear trends	**4.75692**	**1.0000**	**-2.09392**	**0.0181**
Null: unit root (individual unit root process)				
IPS				
Individual effects	**7.17840**	**1.0000**	**-4.99815**	**0.0000**
Individual effects, individual Linear trends	**-1.56113**	**0.0592**	**-2.22722**	**0.0130**
Maddala and Wu and Choi				
ADF-Fisher Chi-square				
Individual effects	**13.1420**	**1.0000**	**105.078**	**0.0000**
Individual effects, individual Linear trends	**73.3749**	**0.0019**	**86.7941**	**0.0001**
None	**5.52911**	**1.0000**	**57.4299**	**0.0567**
PP-Fisher Chi-square				
Individual effects	**27.4906**	**0.9590**	**126.835**	**0.0000**
Individual effects, individual Linear trends	**87.8636**	**0.0000**	**120.964**	**0.0000**
None	**3.78591**	**1.0000**	**62.0175**	**0.0238**

Appendix 1.5: Panel Unit Root Test of LNR

methods	levels		First difference	
	statistic	probabilities	statistic	probabilities
Null Hypothesis: unit root (common unit root process)				
LLC				
None	**-0.64378**	**0.2599**	**-17.5445**	**0.0000**
Null: unit root (individual unit root process)				
IPS				
Maddala and Wu and Choi				
ADF-Fisher Chi-square				
None	**20.6856**	**0.9977**	**235.624**	**0.0000**
PP-Fisher Chi-square				
None	**20.6938**	**0.9976**	**190.641**	**0.0000**

Appendix 1.6: Panel Cointegration test-Pedroni Test (Engle-Granger Based) of LNHP, LNGDP, LNR, LNPPI and LNLP with No Deterministic Trend

Pedroni Residual Cointegration Test
Series: LNHP LNGDP LNR LNPPI LNLP
Date: 11/07/11 Time: 19:31
Sample: 2000 2010
Included observations: 231
Cross-sections included: 21
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
Automatic lag length selection based on SIC with a max lag of 0
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-1.335929	0.9092	-3.032113	0.9988
Panel rho-Statistic	3.915175	1.0000	3.702853	0.9999
Panel PP-Statistic	-0.621911	0.2670	-6.529957	0.0000
Panel ADF-Statistic	-0.588806	0.2780	-3.926317	0.0000

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	5.571032	1.0000
Group PP-Statistic	-7.171826	0.0000
Group ADF-Statistic	-3.472677	0.0003

Appendix 1.7：Panel Cointegration test-Pedroni Test (Engle-Granger Based) of LNHP, LNGDP, LNR, LNPPI and LNLP with Deterministic Intercept and Trend

Pedroni Residual Cointegration Test
Series: LNHP LNGDP LNR LNPPI LNLP
Date: 11/07/11 Time: 19:33
Sample: 2000 2010
Included observations: 231
Null Hypothesis: No cointegration
Trend assumption: Deterministic intercept and trend
Automatic lag length selection based on SIC with a max lag of 0
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-0.629569	0.7355	-4.683898	1.0000
Panel rho-Statistic	5.349852	1.0000	5.498969	1.0000
Panel PP-Statistic	-4.497034	0.0000	-9.430848	0.0000
Panel ADF-Statistic	-2.375495	0.0088	-3.476944	0.0003

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	6.788937	1.0000
Group PP-Statistic	-13.29691	0.0000
Group ADF-Statistic	-4.973705	0.0000

Appendix 1.8: Panel Cointegration test-Pedroni Test (Engle-Granger Based) of LNHP, LNGDP, LNR, LNPPI and LNLP with No Deterministic Intercept or Trend

Pedroni Residual Cointegration Test
Series: LNHP LNGDP LNR LNPPI LNLP
Date: 11/07/11 Time: 19:33
Sample: 2000 2010
Included observations: 231
Cross-sections included: 21
Null Hypothesis: No cointegration
Trend assumption: No deterministic intercept or trend
Automatic lag length selection based on SIC with a max lag of 1
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	-2.249144	0.9877	-3.320761	0.9996
Panel rho-Statistic	3.186642	0.9993	2.585844	0.9951
Panel PP-Statistic	1.122805	0.8692	-2.995211	0.0014
Panel ADF-Statistic	0.113260	0.5451	-3.780778	0.0001

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	5.104502	1.0000
Group PP-Statistic	-3.933034	0.0000
Group ADF-Statistic	-6.956560	0.0000

Appendix 1.9：Panel Cointegration test-Kao Residual Cointegration Test of LNHP, LNGDP, LNR, LNPPI and LNLP with No Deterministic Trend

Kao Residual Cointegration Test
Series: LNHP LNR LNPPI LNLP LNGDP
Date: 12/18/11 Time: 10:03
Sample: 2000 2010
Included observations: 231
Null Hypothesis: No cointegration
Trend assumption: No deterministic trend
Automatic lag length selection based on SIC with a max lag of 2
Newey-West automatic bandwidth selection and Bartlett kernel

	t-Statistic	Prob.
ADF	-6.963081	0.0000
Residual variance	0.001166	
HAC variance	0.001910	

Augmented Dickey-Fuller Test Equation
Dependent Variable: D(RESID)
Method: Least Squares
Date: 12/18/11 Time: 10:03
Sample (adjusted): 2002 2010
Included observations: 189 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESID(-1)	-0.330167	0.037018	-8.919085	0.0000
D(RESID(-1))	0.466821	0.054794	8.519534	0.0000

R-squared	0.428574	Mean dependent var	0.001485
Adjusted R-squared	0.425518	S.D. dependent var	0.034813
S.E. of regression	0.026386	Akaike info criterion	-4.421418
Sum squared resid	0.130196	Schwarz criterion	-4.387114
Log likelihood	419.8240	Hannan-Quinn criter.	-4.407521
Durbin-Watson stat	2.176002		

Appendix 1.10: Panel Dynamic OLS Estimation-Fixed/Random Effects Testing-related Random Effects-Hausman Test

Correlated Random Effects – Hausman Te
Equation: Untitled
Test cross-section random effects

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
Cross-section random	35.364479	4	0.0000

Cross-section random effects test comparisons:

Variable	Fixed	Random	Var(Diff.)
LNR	0.114160	0.134970	0.000014
LNPPI	0.122186	0.187023	0.000412
LNLP	0.097717	0.121352	0.000046
LNGDP	0.257631	0.191264	0.000264

Appendix 1.11: Panel OLS Estimation –Fixed Effects Estimation

Dependent Variable: LNHP
Method: Panel Least Squares
Date: 11/07/11 Time: 19:35
Sample: 2000 2010
Periods included: 11
Cross-sections included: 21
Total panel (balanced) observations: 231

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGDP	0.286339	0.029062	9.852735	0.0000
LNR	0.122391	0.050394	2.428671	0.0160
LNPPI	0.129158	0.042946	3.007439	0.0030
LNLP	0.016475	0.004887	3.371361	0.0009
C	-3.436896	0.215862	-15.92173	0.0000

Effects Specification

Cross-section fixed (dummy variables)

R-squared	0.918475	Mean dependent var	0.239664
Adjusted R-squared	0.908977	S.D. dependent var	0.211332
S.E. of regression	0.063759	Akaike info criterion	-2.565502
Sum squared resid	0.837435	Schwarz criterion	-2.192946
Log likelihood	321.3155	Hannan-Quinn criter.	-2.415237
F-statistic	96.70099	Durbin-Watson stat	0.345185
Prob(F-statistic)	0.000000		

Appendix 1.12: Panel Dynamic OLS Estimation –Fixed Effects Estimation

Dependent Variable: LNHP
Method: Panel Least Squares
Date: 11/07/11 Time: 19:38
Sample (adjusted): 2001 2010
Periods included: 10
Cross-sections included: 21
Total panel (balanced) observations: 210

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNGDP	0.052414	0.018998	2.758877	0.0063
LNR	0.418755	0.127910	3.273829	0.0012
LNPPI	0.232356	0.038452	6.042689	0.0000
LNLP	0.083181	0.024565	3.386104	0.0009
D(LNGDP-1)	-0.069156	0.223520	-0.309395	0.7573
D(LNR-1)	-0.178315	0.128842	-1.383981	0.1679
D(LNPPI-1)	0.566324	0.223924	2.529094	0.0122
D(LNLP-1)	-0.136748	0.060515	-2.259744	0.0249
C	-3.196961	0.307857	-10.38457	0.0000

R-squared	0.578486	Mean dependent var	0.263630
Adjusted R-squared	0.561710	S.D. dependent var	0.206882
S.E. of regression	0.136963	Akaike info criterion	-1.096296
Sum squared resid	3.770548	Schwarz criterion	-0.952848
Log likelihood	124.1111	Hannan-Quinn criter.	-1.038305
F-statistic	34.48160	Durbin-Watson stat	0.243698
Prob(F-statistic)	0.000000		

Appendix B: The Original Results of Detecting Bubble Data

Appendix 2.1: Panel Unit Root Test –IPS Test of LNHP with Individual Effects (at level, 1-st difference and 2-st difference)

Null Hypothesis: Unit root (individual unit root process)
Series: HP
Date: 12/18/11 Time: 12:27
Sample: 2000 2010
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Total number of observations: 198
Cross-sections included: 21

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-0.59748	0.2751

** Probabilities are computed assuming asympotic normality

Null Hypothesis: Unit root (individual unit root process)
Series: D(HP)
Date: 12/18/11 Time: 12:27
Sample: 2000 2010
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Total number of observations: 178
Cross-sections included: 21

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-1.61110	0.0536

** Probabilities are computed assuming asympotic normality

Series: D(HP,2)
Date: 12/18/11 Time: 12:27
Sample: 2000 2010
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Total number of observations: 152
Cross-sections included: 21

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-1.81945	0.0344

Appendix 2.2: Panel Unit Root Test –IPS Test of LNRP with Individual Effects (at level, 1-st difference and 2-st difference)

Null Hypothesis: Unit root (individual unit root process)
Series: RP
Date: 12/18/11 Time: 12:28
Sample: 2000 2010
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Total number of observations: 200
Cross-sections included: 21

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	1.00138	0.8417

** Probabilities are computed assuming asympotic normality

Null Hypothesis: Unit root (individual unit root process)
Series: D(RP)
Date: 12/18/11 Time: 12:30
Sample: 2000 2010
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Total number of observations: 180
Cross-sections included: 21

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-1.17760	0.1195

** Probabilities are computed assuming asympotic normality

Null Hypothesis: Unit root (individual unit root process)
Series: D(RP,2)
Date: 12/18/11 Time: 12:30
Sample: 2000 2010
Exogenous variables: Individual effects, individual linear trends
Automatic selection of maximum lags
Automatic lag length selection based on SIC: 0 to 1
Total number of observations: 156
Cross-sections included: 21

Method	Statistic	Prob.**
Im, Pesaran and Shin W-stat	-2.19987	0.0139

Appendix 2.3: Panel Cointegration test-Pedroni Test (Engle-Granger Based) of Sales Price Index and Rental Prices Index with Dectermistic Intercept and Trend

Pedroni Residual Cointegration Test
Series: HP RP
Date: 12/18/11 Time: 12:36
Sample: 2000 2010
Included observations: 231
Cross-sections included: 21
Null Hypothesis: No cointegration
Trend assumption: Deterministic intercept and trend
Automatic lag length selection based on SIC with a max lag of 1
Newey-West automatic bandwidth selection and Bartlett kernel

Alternative hypothesis: common AR coefs. (within-dimension)

	Statistic	Prob.	Weighted Statistic	Prob.
Panel v-Statistic	6.168983	0.0000	1.268941	0.1022
Panel rho-Statistic	1.684521	0.9540	2.594763	0.9953
Panel PP-Statistic	-1.117003	0.1320	0.691157	0.7553
Panel ADF-Statistic	-4.545364	0.0000	-2.642466	0.0041

Alternative hypothesis: individual AR coefs. (between-dimension)

	Statistic	Prob.
Group rho-Statistic	3.698499	0.9999
Group PP-Statistic	0.405775	0.6575
Group ADF-Statistic	-2.970171	0.0015

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