

Assessment of Housing Price Dynamics in China

Man Cho

KDI & KDI School of Public Policy & Mgt.

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Outline

- Objective & motivation
- Market fundamentals
 - Economic growth & urbanization
 - Credit surge
 - Housing investment
- Empirical test & findings
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Objective & motivation

Objectives

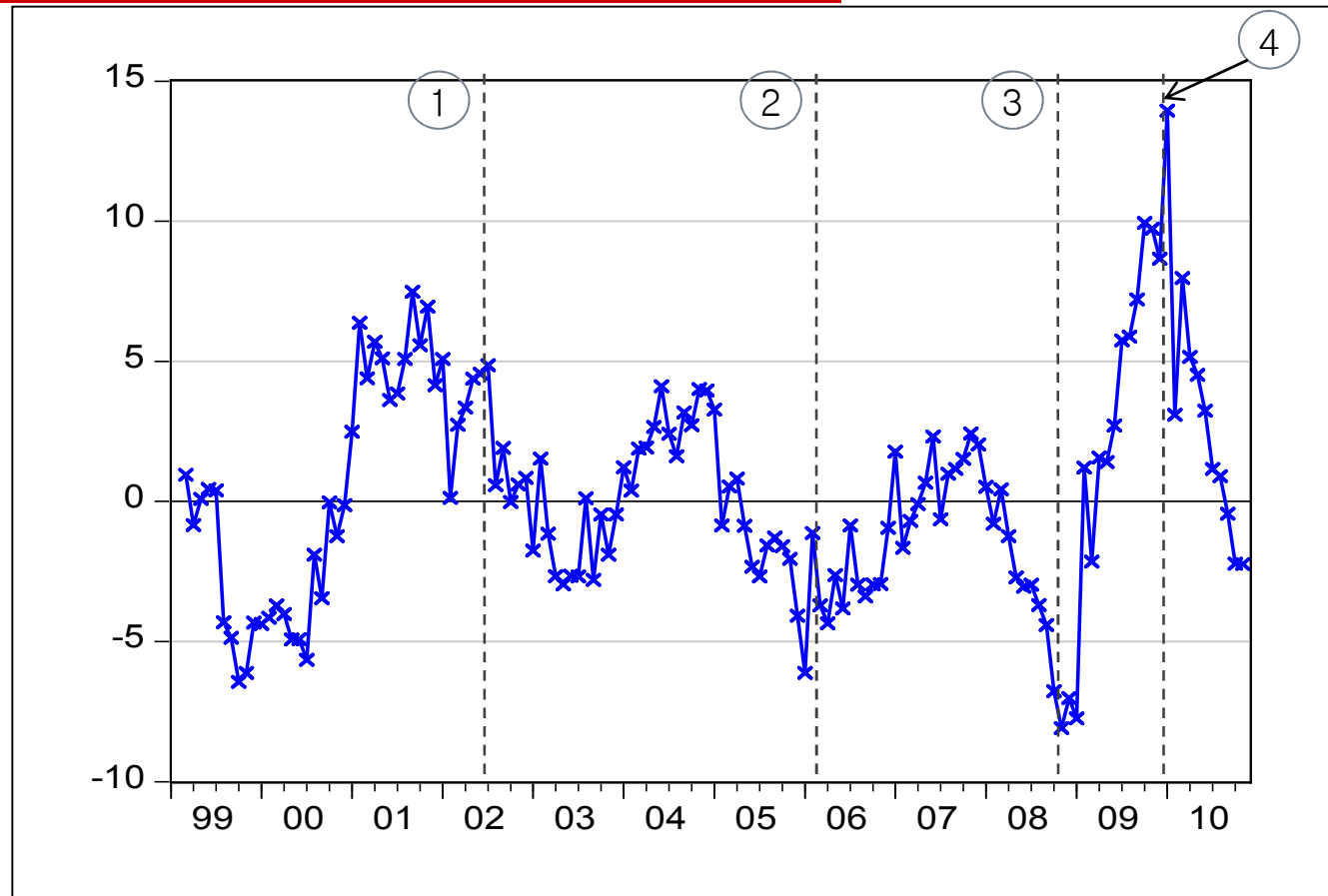
- Understand Chinese housing markets in terms of demand- & supply-side fundamentals
- Assess housing price dynamics in large Chinese cities, via 2S-ECM; Judge hard/soft landing
- Discuss policy implications of key findings

Major policy shifts in China

- ❑ Transition to the cash allowance for housing (1998)
- ❑ “Management Provisions on Resident Housing Loan” (1998)
- ❑ “Regulations on the Grant of State-owned Land Use Rights by Invitation of Bids, Auction and Listing for Sale” (2002)
- ❑ Anti-speculative regulations (1) (2006): Dual housing markets between economic housing (EH) vs. luxurious housing (LH); Max LTVs in mortgage lending, 80% for EH and 70% for LH
- ❑ Expansionary monetary policy with the 4 tr. RMB stimulus package (2009)
- ❑ Anti-speculative regulations (2) (2010): Drop the max LTV 80%→70%, 50% for 2nd home, lending restrictions for 3+ homes; Holding taxes levied by local governments

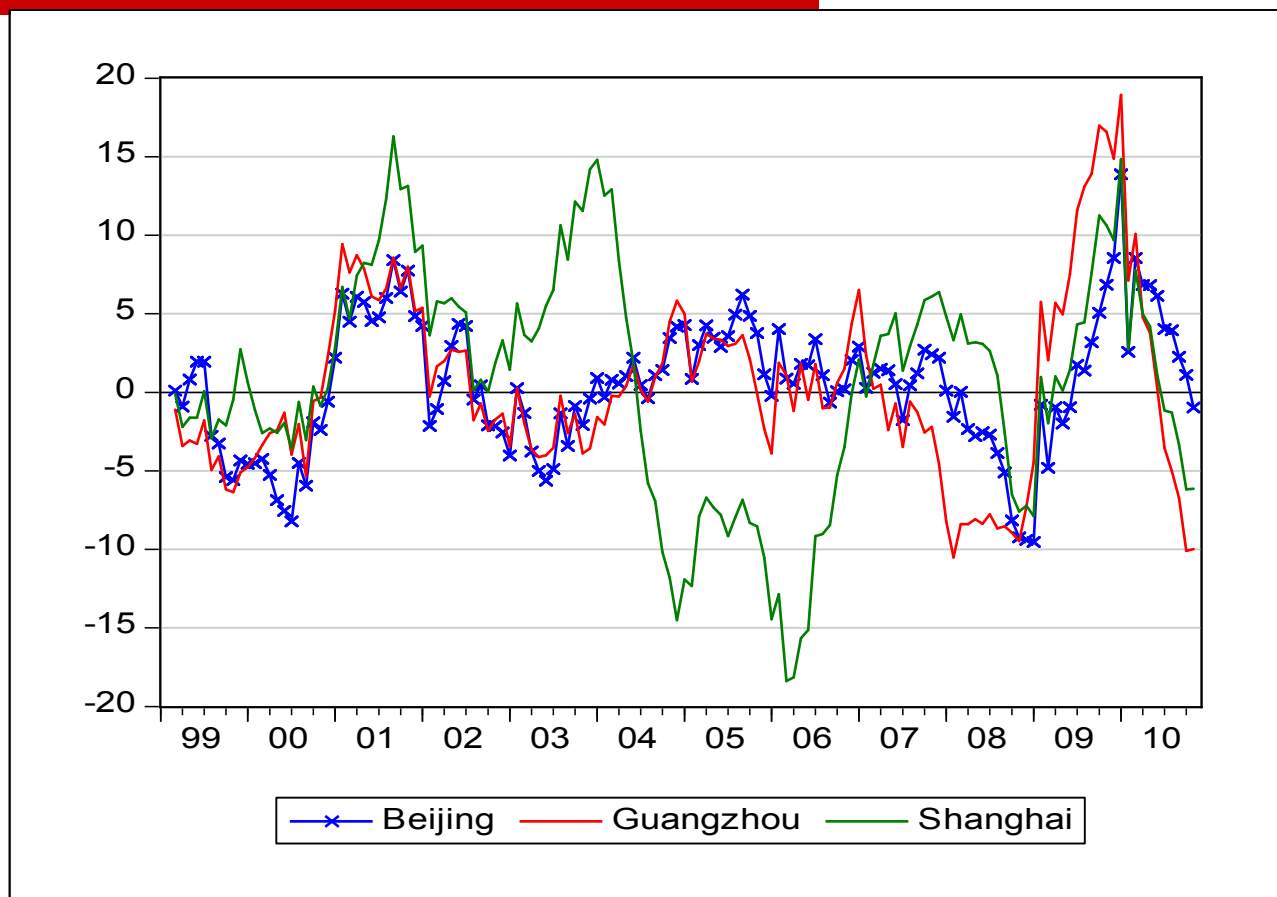
Real annual HP growth rates, China

(unit: %)



Source: CEIC

Real annual HP growth rates, 1st-line cities



Source: CEIC

Lessons from the subprime mortgage debacle in the U.S.

- Lesson #1 “What goes up (too much) comes down”: Hard landing after the huge boom, with a large deviation of HP growth from market fundamentals
- Lesson #2 “Credit surge fueled by bad underwriting almost always results in an NPL crisis”: Big surge in liquidity via securitization combined with the bad underwriting and “exotic mortgage products” causing 30+% delinquency rates
- Lesson #3: “Quantity cycle with a sustained period of over-supply exacerbates price decline”: 4–5 years’ highly above-trend housing construction resulting in a large inventory of unsold new housing units

Figure 1.

Real and Nominal Home Price Growth Rates, Annualized - US

(Source: OFHEO HPI (75-87) & Case-Shiller HPI (88-09))

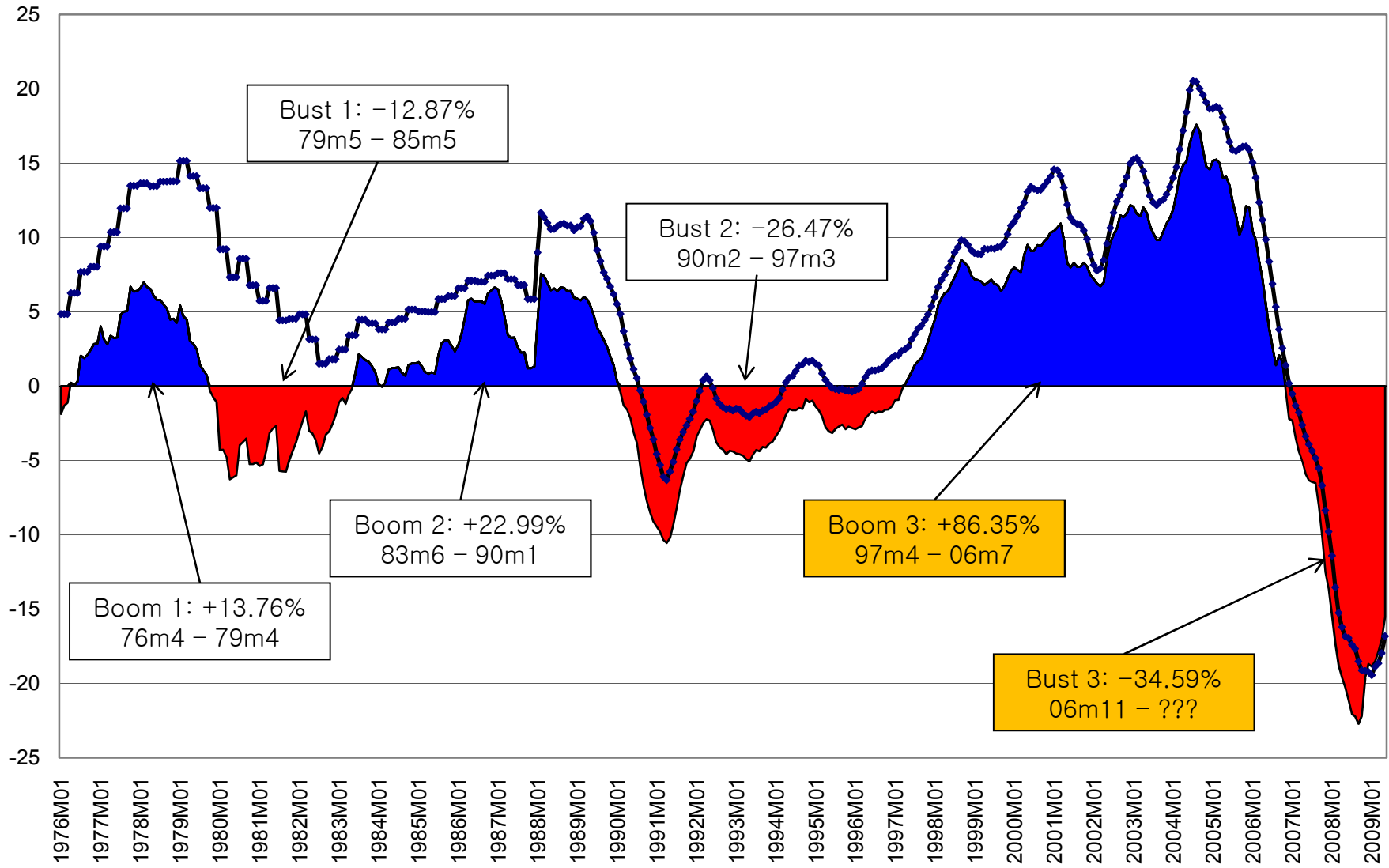
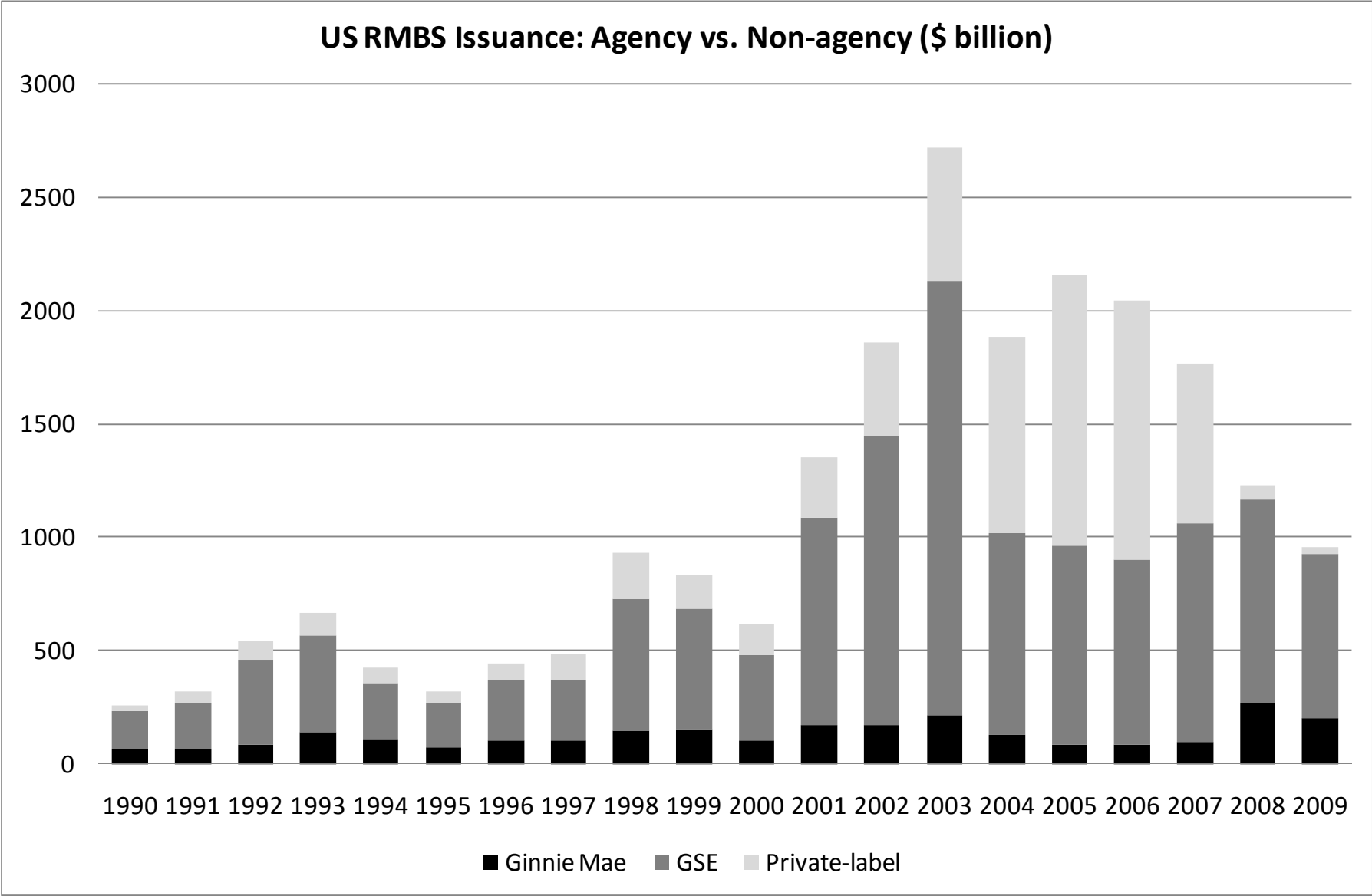


Figure 4.



Market fundamentals in China

Determinants of HP boom–bust

- Conventional determinants of HP dynamics:
 - Household income, UCC & other market fundamentals (Abraham and Hendershott (1996), Capozza, Hendershott, Mack (2004), Himmelberg et al. (2005), Meen (2009))
 - Supply elasticity, or regulatory restrictiveness (Glaeser and Gyourko (2005), Glaeser, Gyourko, and Saiz (2008))

- Key drivers identified for the current HP cycle:
 - User cost of capital (UCC) for owning (Duca, et al. (2009) among others)
 - Overhang from excess supply (Ellis (2009))
 - Lending side stories (Gorton (2008), Mian and Sufi (2009), Pavlov and Wachter (2011), and so on)

Determinants HP boom–bust (Cont'd)

- Mortgage demand as a filtered demand from the housing market (UCC and other demand–side variables) (Green and Wachter (2007) and others)
- Net interest margin (NIM), e.g., yield spread shown by 10–year vs. 1–year CMT rates (Linneman and Cho (2009), Acharya and Richardson (2008)); Subsequent slides as demonstration
- Risk appetite as shown by the continuously worsening loan quality and underwriting standards (Mian and Sufi (2009), Gorton (2008), Duca et al. (2009), Mason and Rosner (2007)); And incrementally more complicated RMBS products (Ashcraft and Schaumann (2009), Fender and Mitchell (2009), and Gorton (2008))
- RMBS credit ratings by CRAs, both initial ratings and post–issuance adjustments (Benmelech and Dlugosz (2009), Ashcraft and Schaumann (2009), and Griffin and Tang (2010))

Market fundamental in China (1): Economic growth and urbanization

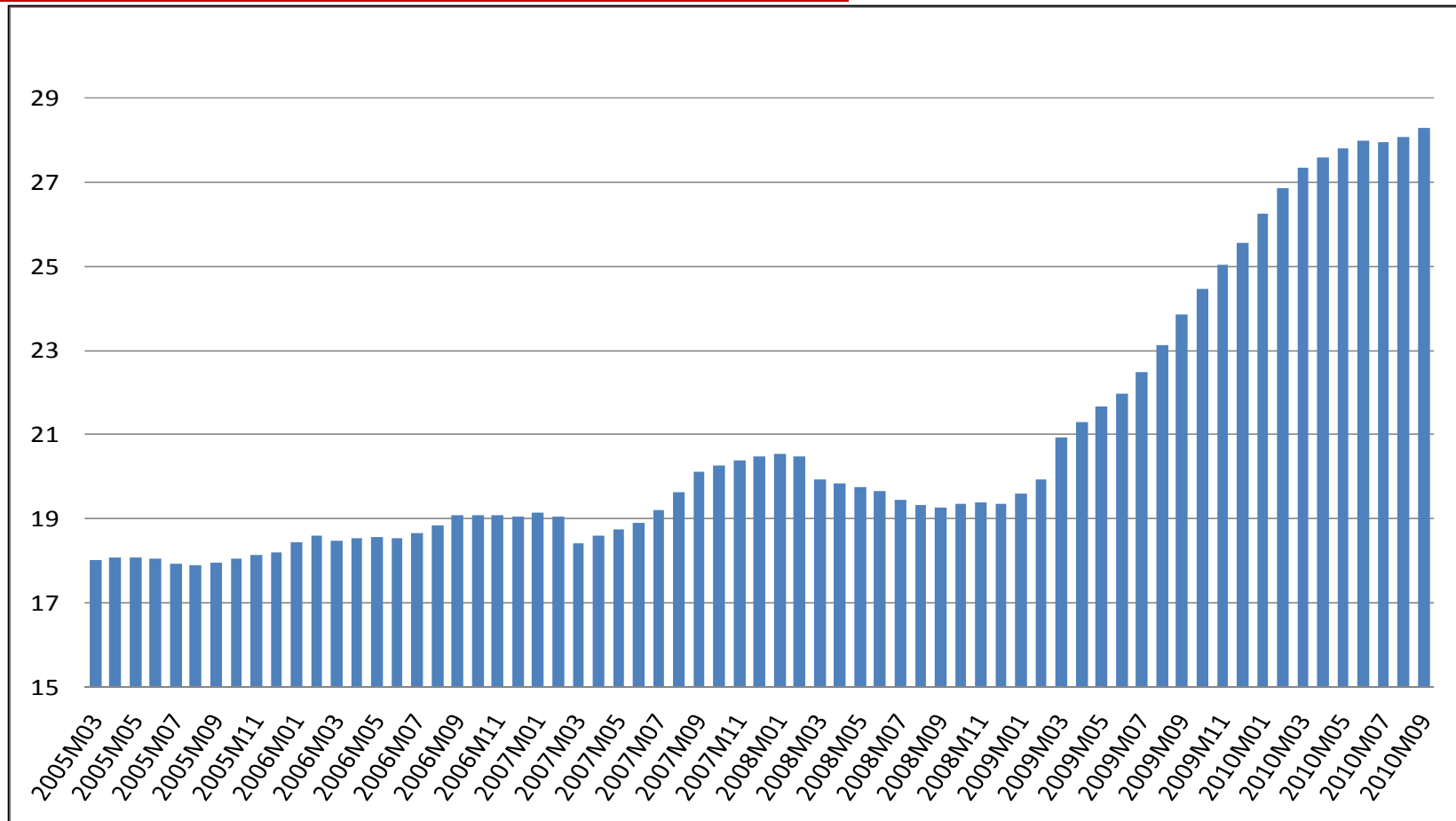
- Explosive economic growth with the average nominal GDP growth rate recorded 17% per annum in 2003–2008; Temporarily dropped to a 5% range in 2009, but recovered to 15% range from the second half in 2010
- Continued rise in urbanization rate from 25% in 1975 to 50% in 2010 (570m urban residents), expected to further rise to 64% by 2025 (930m urban population)
- Mega cities with 10m+ population from 2 in 2005 (Beijing and Shanghai) to 8 in 2025, and those w/ 1m+ to be 225 in 2025

Market fundamental in China (2): Surge of mortgage credit

- Mortgage debt outstanding (MDO) being increased from 19b RMB to 6.2 tr. In 2010Q4 (about 1,026 tr. KRW)
- MDO-to-GDP ratio being 18% in 2005, 19% in early 2009, and 28% in 2010 (9 pt ↑ within a year and half period!)
- Almost all adjustable-rate mortgages (ARMs) w/ max LTV 80% and max DTI 70%, maturities up to 30 years, amortizing principal if longer than 1-yr, and income & other documentations
- 4 national banks having a 90% market share; Top 2 banks having a 70% market share

MDO-to-GDP ratio, China

(unit: %)



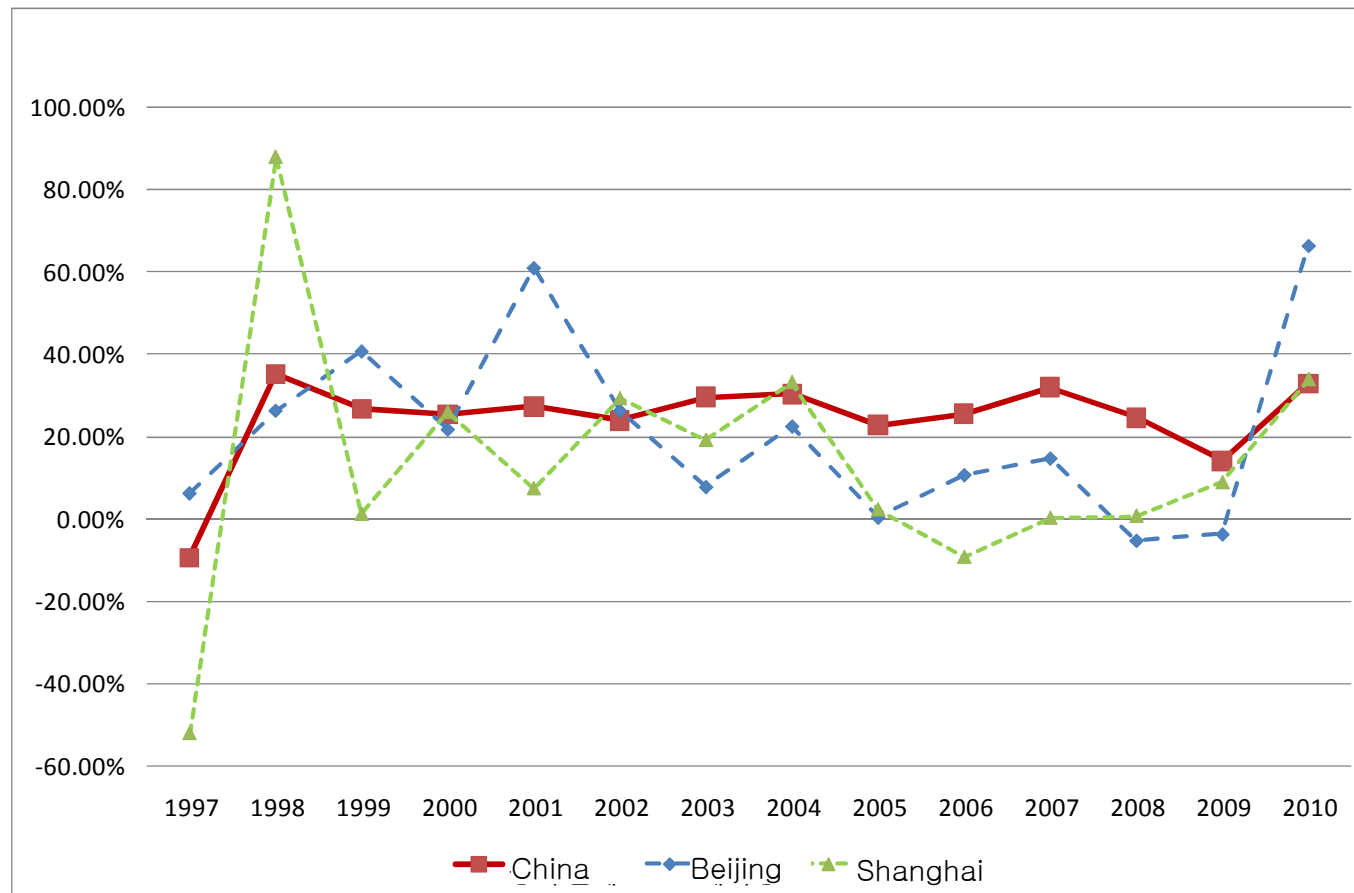
Market fundamental in China (3): Very low user cost (UC) of capital

- Rise of UC ($=R/P$) under expansionary monetary policy, due to low mortgage interest rates, relaxed underwriting criteria, and high expected price appreciation (Duca, Muellbauer, and Murphy (2010))
- Price-to-rent ratios ($=P/R$) in large Chinese cities having risen from 26 in 2007 to 46 in 2010, implying UC being lowered to 2.2% (about the lowest among those observed in Korean and the U.S. cities)
- In the empirical analysis, the relative rent-to-price levels of the 1st-line and 2nd-line Chinese cities being used

Market fundamental (4): Rising land price & housing investment

- Constant quality land price index (CQLPI) having risen eight-fold between 2003–2007; Share of land value in housing price also risen from 30–40% in 2003–2007 to 60% in 2008–2010 (Wu, Gyourko, and Deng (2010))
- Housing investment rate (relative to GDP) having increased from 1% in 1998 to 5% in 2010Q4, similar to the LT mean in Korea (7–8% during the 2 million housing construction drive in the late 1980s and the early 1990s)
- “Over-hang” from the large scale excess housing supply being one of the key culprits of the hard landing in the U.S. (Ellis (2008))

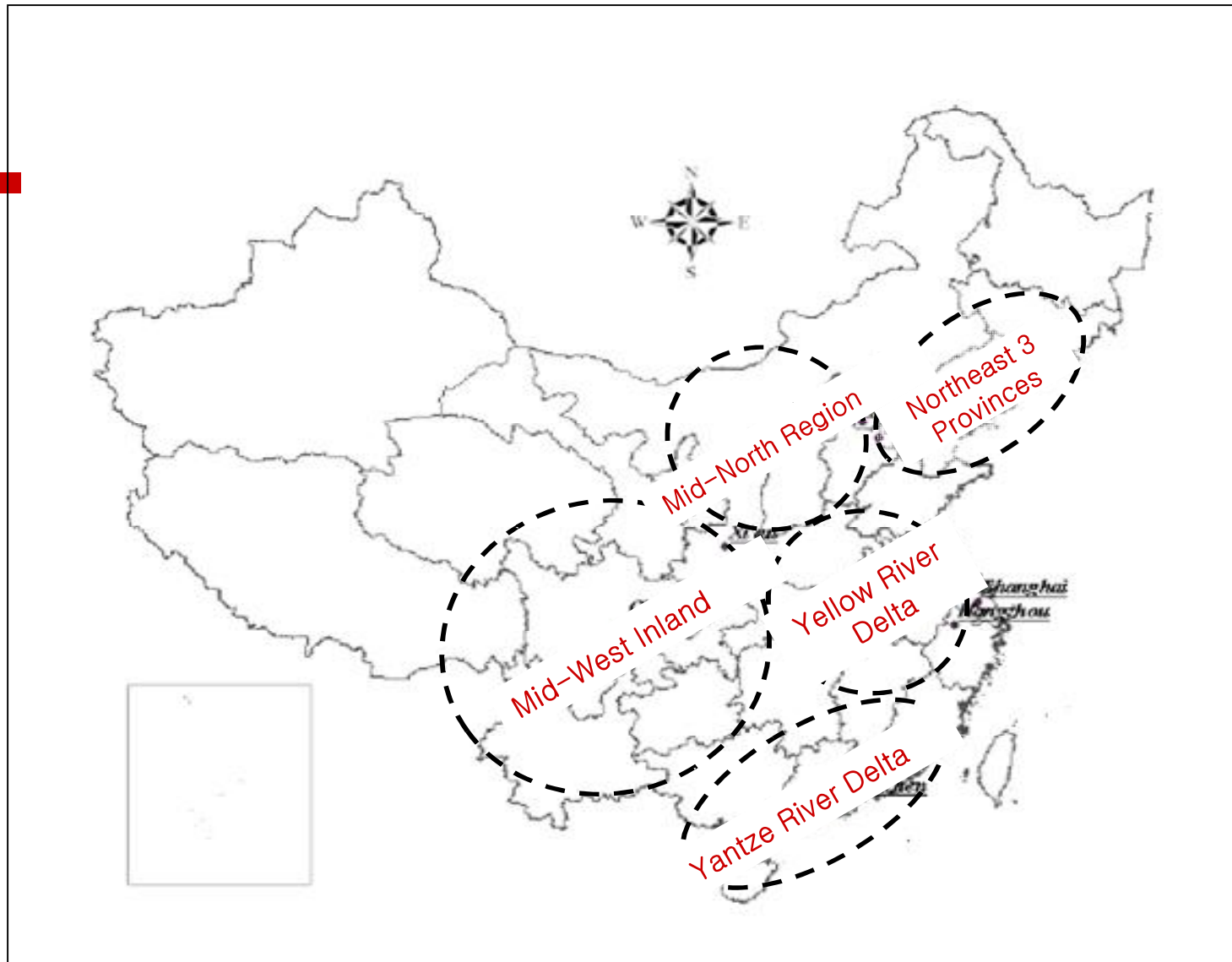
Changes in Housing Investment Rates (China, Beijing, Shanghai)



Empirical tests

Design of the empirical test

- 2-stage error correction model (2S-ECM) with the price level equation in the 1st-stage (the fundamentals in RHS) and the price dynamics in the 2nd-stage
- 1st-line and 2nd-line cities from five geographical areas (see the map in the next slide) as cross-sectional observations, and two time periods (1998–2010 and 2005–2010, monthly) as intertemporal observations
- Endogenous relationship between HP and housing investment (HI) being controlled by using predicted, rather than realized, HI values in the 1st-stage estimation



2S-ECM: Model specification

$$(1) \quad H_{i,t} = f(X_{i,t}; \theta) + \alpha_i + \epsilon_{i,t}$$

$$(2) \quad h_{i,t} = \alpha h_{i,t-1} + \beta (H_{i,t-k}^* - H_{i,t-k}) + v_{i,t}$$

- H: Real home price index (Log, city i time t)
- Real GDP (Log, seasonally adjusted, national) (+)
- Real housing investment (Log, seasonally adjusted, national) (-)
- Mortgage interest rate, 3-yr maturity (national) (-)
- Real land price index (Log, city-level) (+)
- Rent-to-price ratio (Log, city-level) (-)
- MDO-to-GDP ratio (national, 2005-1010) (+)

Summary of findings

- More robust results from the regional pooled estimation (2005–2010) – Result (3) – than the city–level separate estimations:
 - GDP effects being all positive & highly significant, with a range +1.13 (Mid–North) to +1.85 (Yellow River Delta)
 - Housing investment having negative and significant effects, with a range –0.9 (Mid–North) to –1.4 (Yellow River Delta)
 - LPI having positive and significant effects only in North–East (+0.06) and Mid–West (+1.5)
 - UC supplement (RPI/HPI) having negative and significant effects in all regions, –0.25 (Mid–North) to –0.88 (Yantze River Delta)
 - MDO–to–GDP having positive and highly significant effects in all regions, +4.8 (Mid–West) and +6.1 (Yellow River Delta)
- Smaller over–valuation trends in the 1st–line cities being observed (compared to the U.S. cities); And the converting–oscillating mean reversion patterns being detected

Result (1): 1st line cities, pooled estimation

	98m3-10m9	98m3-04m12	05m1-10m9
log(Real GDP, sa)	-0.137*** (-7.37)	-0.004 (-0.07)	0.040 (1.14)
log(Real housing investment_sa)	0.068*** (7.03)	0.024 (1.30)	-0.097*** (-3.84)
Log(Real LPI)	0.529*** (17.52)	0.569*** (19.17)	0.365*** (8.69)
log(RPI - HPI)	-0.140*** (-9.61)	-0.038*** (-2.80)	-0.626*** (-18.67)
MDO-to-GDP	-	-	0.732*** (9.36)
Constant	3.769*** (232.09)	3.542*** (42.04)	4.182*** (72.75)
Fixed Effects (Cross)	Beijing	0.142	0.140
	Shanghai	-0.173	-0.182
	Guangzhou	0.031	0.042
R-squared (Adj.)	0.94 (0.94)	0.95 (0.95)	0.99 (0.99)
Included observations(after adjustments)	151	82	67
Cross-sections included	3	3	3
Total pool (balanced) observations	453	246	201

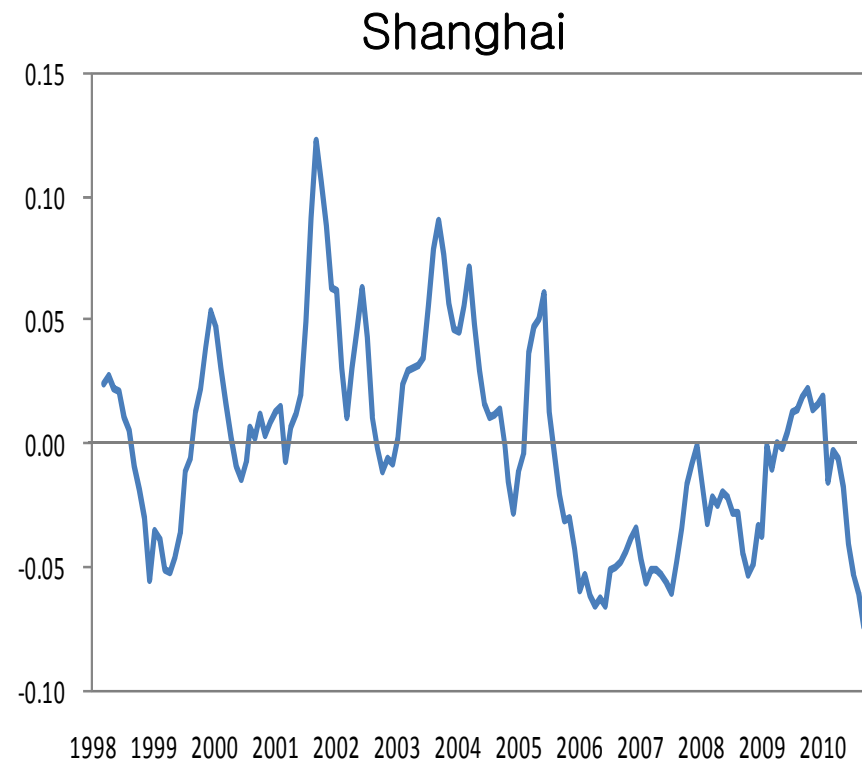
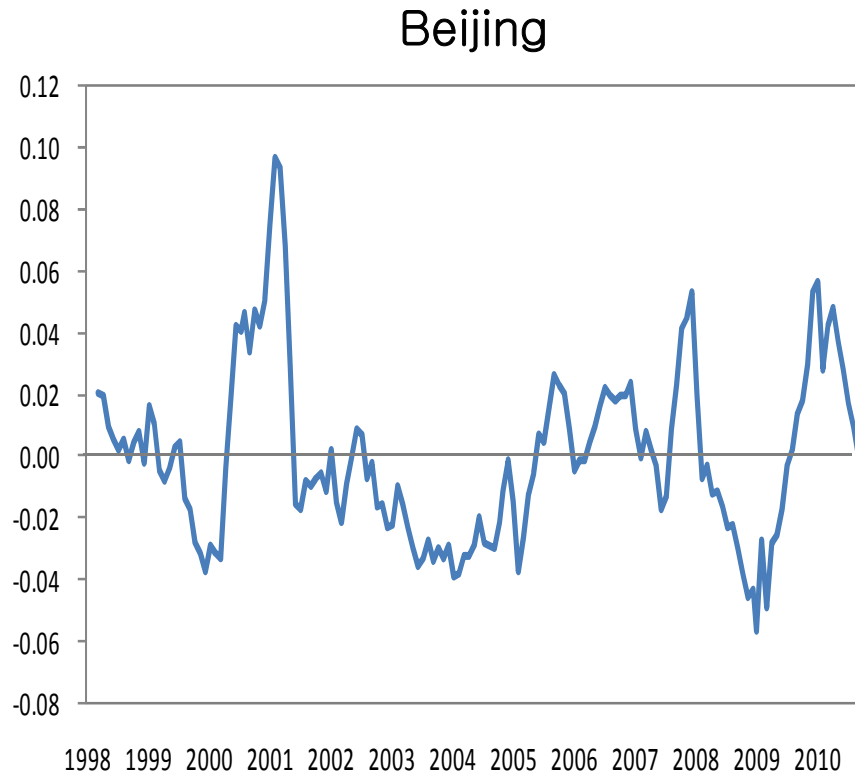
Result (2): 1st line cities, separate estimation (2005–2010)

	Beijing	Guangzhou	Shanghai
log(Real GDP_sa)	0.101 (0.36)	0.522*** (2.55)	2.566*** (11.19)
Log(Real housing investment_sa)_hat	-0.165 (-0.80)	-0.479*** (-3.15)	-1.956*** (-11.23)
Log(Real LPI)	0.336*** (3.10)	0.458*** (7.88)	-0.435*** (-5.35)
log(RPI-HPI)	-0.493*** (-8.87)	-0.836*** (-17.67)	-0.944*** (-26.63)
MDO-to-GDP	1.257*** (4.65)	1.239*** (6.36)	3.125*** (10.23)
Constant	4.509*** (12.24)	5.072*** (17.78)	7.301*** (21.91)
R-squared (Adj.)	0.77 (0.76)	0.95 (0.94)	0.96 (0.96)
#(observations)	67	67	67

Result (3): 1st-line & 2nd-line cities, pooled estimation by region (2005–2010)

	North-east	Mid-North	YellowR Delta	Mid-west	YantzeR Delta
log(Real GDP_sa)	1.476*** (9.60)	1.131*** (9.96)	1.849*** (14.17)	1.347*** (12.81)	1.675*** (9.48)
log(Real housing investment _sa)_hat	-1.127*** (-9.72)	-0.904*** (-10.62)	-1.407*** (-14.35)	-1.034*** (-13.12)	-1.290*** (-9.72)
log(Real LPI)	0.059*** (2.57)	0.025 (1.39)	-0.011 (-0.93)	0.145*** (6.71)	-0.044* (-1.93)
log(RPI-HPI)	-0.385*** (-10.05)	-0.250*** (-9.64)	-0.753*** (-24.33)	-0.518*** (-17.26)	-0.881*** (-30.68)
MDO-to-GDP	1.777*** (10.30)	1.775*** (14.75)	2.175*** (14.82)	1.783*** (16.09)	1.983*** (10.79)
Constant	5.263*** (23.19)	5.067*** (31.04)	6.053*** (31.98)	4.789*** (31.44)	5.950*** (23.25)
R-squared (Adj.)	0.985 (0.985)	0.998 (0.998)	0.983 (0.982)	0.992 (0.992)	0.998 (0.998)
Included observations(after adjustments)	67	67	67	67	67
Cross-sections included	4	5	3	7	4
Total pool (balanced) observations	268	335	201	469	268

Result (4): Over- or under-valuation trends



Result (5): 2nd-stage estimation (serial correlation & mean reversion)

Mean reversion patterns - International comparison				
	α	β	Convergence*	Oscillating**
<i>Korean cities</i>				
Gangnam, Seoul	0.9918	(0.0765)	Convergence	Oscillating
Gangbuk, Seoul	1.0330	(0.1489)	Explosive	Oscillating
Daegu	1.0210	(0.1085)	Explosive	Oscillating
<i>Chinese cities</i>				
Beijing	0.6779	(0.0098)	Convergence	Oscillating
Shanghai	0.7450	(0.0123)	Convergence	Oscillating
Guangzhou	0.5268	(0.0481)	Convergence	Oscillating
<i>U.S. cities</i>				
New York	0.9890	(0.0171)	Convergence	Oscillating
Los Angeles	1.0041	(0.0210)	Explosive	Oscillating
Boston	0.9952	(0.0122)	Convergence	Oscillating
Miami	1.0102	(0.0202)	Explosive	Non-oscillating
Las Vegas	1.0096	(0.0273)	Explosive	Oscillating
* "Convergent" if $\alpha < 1$; "Explosive" otherwise				
** "Oscillating" if $(1+\alpha+\beta)^2 < 4\alpha$;			"Non-oscillating" otherwise	

Conclusion & next steps

- Chance of a bubble–bust, or a hard–landing in price trend, in Chinese cities being low, or at least much smaller than that of the U.S. cities in the mid–2000s
- Credit surge (MDO–to–GDP) being the major determinant of HP appreciations in recent years, whose sudden drop and credit crunch being a low probability event as well
- Land price effect being highest in the Mid–West Inland, possibly indicating strong incentives on the part of local governments therein toward real estate driven regional growth
- More research to be performed on data & institutional factors (e.g., *Hukou*, data and methodology used to estimate HPs)