Are China's Top 13 Cities Housing Markets in Bubbles?

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Motivation

- **Cover important period** from 2007Q2–2015Q3, incorporating the prosperity period of the "golden age" (2003 – 2013) and the "new normal" era (2014 onwards) in China's real estate industry.
- **Top 13 important cultural, economic, developed cities'** house prices, contribute largely to China's economy.
- Understanding bubble risk, main drivers of house prices important for business decision makers and government policy makers.
- **House prices, Bubble, Macroeconomy, OLS, VECM, business decision makings, policy implementations.**

Research questions

- RQ1: whether there are bubbles in China (top 13 cities) housing market?

- RQ2: what are the main drives of China (top 13 cities) housing prices?

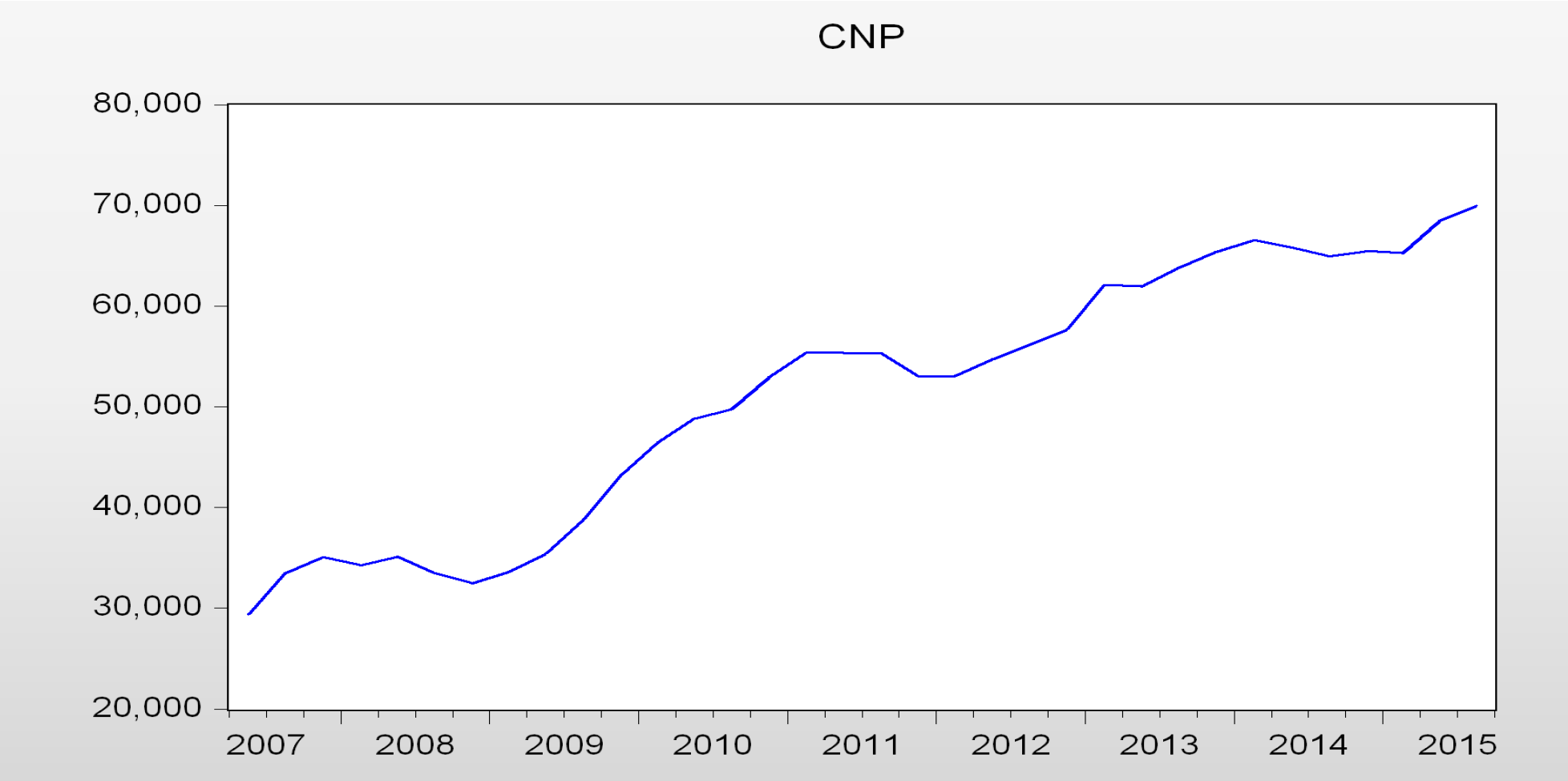
China top 13 cities (First tier, 5)

1. Beijing: Political, economic, cultural center.
2. Shanghai: Biggest city, global financial hub
3. Guangzhou: Third biggest city, China's biggest transport and trade hub
4. Shenzhen: One of the five largest and wealthiest cities, special economic zone
5. Tianjin: Major port city in Northern eastern China, one of the five national central cities

China top 13 cities (Second tier, top 8)

1. Hangzhou, Nanjing: Provincial capital cities, tourist cities.
2. Jinan: provincial capital city.
3. Chongqing: Modern port city, the most economic developed city in West China. Biggest inland city in China.
4. Dalian: Major seaport in Northeast China.
5. Ningbo: A major port and industry hub in East China
6. Xiamen: A gate in South China, Port city and tourist city.
7. In 2015, count 25% of total GDP.

China top 13 cities house prices



Source: CitiRE

China top 13 cities house prices

- Calculated based on **principal component** methods

- National house prices have been through three troughs during the last eight years. (2007-2015), 2008Q4 ,GFC, 2011Q4 and 2014Q3, reflecting the **cyclical nature** of China's housing markets.

- average **house prices** increased from RMB 29,358 per square meter in 2007Q2 to RMB 70,003 per square meter in 2015Q3, which is an **increase by 138.45%, *more than double over 8 years.***

Macroeconomic Variables Historical Statistics (National)

	Mean	St Dev	Min	Max
CNIR (%)	6.01	0.75	4.60	7.47
Wages per yr (YMB)	41,115.10	11,643.55	22,966.5	60,862
CNSHARE	2776.30	845.04	1820.8	5552.30
CNUNEMPLOY (%)	4.11	0.09	4.00	4.30
CNGDP (USD billion)	10,076.03	1,764.30	6,767	12,557

Source: Trading economics database

Macroeconomic Variables (National)

- unemployment (CNUNEMPLOY) remains steady over the estimation period at approximately 4%. GFC time, **RMB 4 trillion fiscal stimulus post GFC** increased infrastructure and employment opportunities.
- Wages per annum increased by 165% from 2007Q2 to 2015Q3, reflecting the large annual GDP growth in China at this time.
- for share market performance (CNSHARE) suggests a cyclical trend. **Real estate share important investment vehicles**
- lending rate of People's Bank of China (CNIR) , a cyclical trend. **Continuous reductions stimulate economy.**
- **No regional macroeconomic variables, limitation.**

Methodologically sound

- The estimation techniques used are ordinary least squares **(OLS),** and co-integration techniques Vector Error **Correction(VECM)** Models.
- Using advanced time series analysis techniques such as the variance inflation factor (Multicollinearity), Durbin–Watson statistic (autocorrelation), Glejser test (Homoscedasticity), Jarque-Beta statistic (normality assumption) to test **OLS assumptions.**
- VECM to test for house price bubbles, **the long run economic equilibrium** is a condition and economic forces are balanced, resolve the spurious correlation diagnostic concerns. **Augmented Dickery-Fuller (ADF) is employed to test stationarity.**
- Transformed empirical variables may be a better indicator for visualisation and interpretation.

Theoretical bases

- ***Housing demand model***
- Demand for residential real estate property obeys the fundamental law of demand, highlighting three main types of drivers: i) population, households and employment, or output, as determined by metropolitan growth processes; ii) income and wealth, which represent purchasing power; and iii) relative prices or expectations over prices and growth (Sivitanidou, 2011).
- ***Rational expectation model***
- The assumptions of rational expectations are that firms maximize profits and individuals maximize utility (Chernoma and Hudson, 2017) which are bases for household purchase decisions.

Econometric specifications:

1. OLS

$$CNHP = \beta_0 + \beta_1 CNIR + \beta_2 CNGDP + \beta_3 CNSHARE$$

$$+\beta_4 CNUNEMP + \beta_5 CNHP(-1) + \mu$$

2. VECM

$$\Delta \, Ln\,(CNHP_{t)} = \alpha_0 + \gamma_0 \Delta \, Ln\,(\,X_t\,) + \delta\,(Ln\,(CNHP_{t-1}) - \beta_0\, Ln\,(X_{t-1})) + \mu_{\,t}$$

OLS Result (main drivers):

Variables	Coefficient	t statistics	p
CNIR	-1552.96	-3.24	0.00[a]
CNGDP	1.41	4.55	0.00[a]
CNUNEMPLOY	-1559.73	-0.38	0.71
CNSHARE	1.13	3.79	0.00[a]
CNP (-1)	0.80	16.75	0.00[a]
C	-1.29	-1.49	0.15
R^2	0.99		
Durbin – Watson	1.72		

Note: a, b significance at 1% and 5% levels respectively.

OLS result

- **the p-values for residuals is 0.99,** 99% of the variations in the value of the house prices can be attributed to the four main drivers identified in the model
- **A Durbin-Watson test statistic of 1.72**, minor first order linear autocorrelation in the regression residuals.
- **Variance inflation factor (VIF)** for the main drivers, except for the GDP of the house prices **ranges between 1 and 5**, suggesting moderate multicollinearity identified,
- **Glejser test shows the p-values are > 0.05**, homoscedasticity assumption met

OLS result

- **A negative significant relationship** between mortgage interest rates **(CNIR)** and China's house prices (CNP).
- **A positive significant relationship** between **China's GDP (CNGDP)** and China's house prices (CNP).
- **Unemployment (CNUNEMPLOY)** in the main drivers of housing price equations are **negative but insignificant**.
- **A positive significant coefficient from China's share market index (CNSHARE)**. **Real estate share important investment vehicles**

ADF and Johansen co-integration results (bubble):

- **Augmented Dickey–Fuller (ADF) unit root test** was employed to test the **stationarity** of the variables affecting China's house price.
- All variables are identified as stationary at first differences, that is **at I (1). No unit root problems.**
- Johansen test suggest a co-integration relationship between China's house prices and the four main macroeconomic variables.
- long run co-integration relationships are identifiable through Johansen co-integration test, we can **proceed to the VECM test.**

VECM Result:

	Coefficient	t statistics	p
Error correction	D(ln(CNP)		
CoinEq1	-0.16	-2.93	0.01[a]

Note: a,b significance at 1% and 5% levels respectively

VECM Results:

- The parameter estimates for the **error correction term (ECT) are significant with the expected negative sign**, suggesting the speed at which housing prices return to equilibrium after short-term disequilibrium correction.

- the ECT (-1) estimated coefficient is -0.16, suggesting **that 16% of the short-term disequilibrium is corrected within 3 months by main drivers.**

Contribution

- **Better understanding** of the house price dynamics and bubble risks in China's top 13 cities.
- 13 cities house prices analysis **provides us with a unique opportunity** to study the major real estate markets, which has significant impacts in China's overall economy and contribute to major implications on business decisions makings and policy setting.
- **Important data period** includes the prosperity period of the "golden age" (2003 – 2013) and the "new normal" era (2014 onwards)
- Devising of an OLS and VECM model using the **rigorous advanced time series econometric techniques and co-integration techniques.**
- **Theoretical continuity of** house price dynamic study and bubble analysis based on existing theories.

Policy implications

- Monetary policy shocks, may have a differential impact on the top 13 cities' house prices performance and regional economic developments. Policy maker implement **balanced fiscal, monetary, other housing policies** to avoid the sensitivity of the economy to exogenous financial shocks, which may result in negative consequences for macroeconomic stability. **Achieve sustainable outcomes.**
- Continuous interest cutes lead to financial stability risks and volatility in business investors and financial institutional lenders setting business policies. **Businesses set industry policies to ease the volatility, avoid over focusing on financial levers, focusing on institutional, broad drivers.**
- Variations in affordability rates in top 13 cities in China may suggest government have **regional affordability measures.**