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Abstract

Whether the real estate development in China is overheated and whether there are bubbles in the industry is the focus of some dispute among researchers. However, they agree that real estate investment to some extent can promote China's economic growth but empirical results on the intensity of the influence differ widely. This thesis uses the Input-Output Model to examine the driving effect of the real estate investment on the national economy. Based on time-series data of China's GDP and real estate investment in the period of 1986 to 2008, we also use quantitative methods, such as co-integration analysis and impulse response analysis, to examine the relationship between the real estate and economy growth. We also list some problems existing in the recent development of China's real estate industry and provide some proper advice based on previous literatures and theories.

Key words: real estate investment; economic growth; Input-Output Model, Co-integration analysis

Zusammenfassung

Ob die Immobilienentwicklung in China überhitzt ist und ob es Blasen in der Branche gibt, steht im Mittelpunkt der wissenschaftlichen Auseinandersetzung. Allerdings ist die Meinung verbreitet, dass das Immobilieninvestment zu einem gewissen Ausmaß das Wirtschaftswachstum fördern kann, aber die empirischen Forschungsergebnisse über die Intensität des Einflusses variieren. Diese Arbeit benutzt das Input-Output-Model, um die treibende Kraft der Immobilieninvestitionen auf nationale Wirtschaft zu untersuchen. Basierend auf Zeitreihendaten des Chinesischen Bruttoinlandsprodukts und der Immobilieninvestitionen im Zeitraum von 1986 bis 2008, verwenden wir auch quantitative Methoden, wie z.B. Kointegrationsanalyse und Impulsantwortanalyse, um die Beziehung zwischen den Immobilieninvestitionen und dem Wirtschaftswachstum zu untersuchen. Diese Arbeit listet auch einige bestehende Probleme in der jüngsten Entwicklung der Immobilienwirtschaft Chinas auf und gibt einige Ratschläge.

Schlüsselwörter: Immobilieninvestment; Wirtschaftswachstum; Input-Output-Model; Kointegrationsanalyse; Impulsantwortanalyse

1. Introduction

1.1. Background

Real estate industry is a new industry in China with only 20-odd year's development. Before the founding of the People's Republic of China in 1949, real estate had a certain development but no historical data can be found. After that real estate industry has been in a dormant stage due to historical reasons. Since the reform and opening-up in 1978, especially after former Chinese leader Deng Xiaoping's southern tour in 1992, China's real estate industry has developed at an unprecedented rate. Figures used to study China's real estate industry were available since 1986. Relatively few studies on the relationship between China's real estate investment and national economic growth have been made, especially few researches on reasonable investment scale, structure and risk prevention for real estate industry. Numbers of pressing issues have occurred in the development process of real estate such as high housing prices, land speculating, reform of housing system, social security and so on. Real estate is a fundamental factor of production and thus its trend of development relates to the health of national economy. Hence, how to use governmental macro controls to coordinate the real estate industry with the development of the national economy is well worth looking into.

Concerning the problem of coordination between real estate industry and national economic growth, heated discussions with different views occurred. These discussions mainly focused on the nature of real estate industry, as well as its status and function in the national economy. Issues such as the intensity of macroeconomic regulation and control, the management system of real estate and housing system reform also have become issues. It was widely recognized that China should borrow the experience of developed countries and make a systematic study for real estate industry based on the concrete conditions of China.

1.2. Related Literature

The well-known American scholars M. Ball and T. Morrison (1995) have analyzed and

summarized the internal relationship between real estate development and national economic growth by doing researches on housing investment in many countries. They have come to the conclusion that there is an internal relation between housing investment and per capita GDP as a general rule: if per capita GDP is below 500 U.S. Dollars, the share of housing investment in GDP should be less than 2%; if per capita GDP reaches 2500 U.S. Dollars, the ratio is about 3-5%; If per capita GDP reaches or exceeds 5000 U.S. Dollars, the ratio can be up to 6-7%. The absolute value of housing investment hereafter increases as per capita GDP increases, but the ratio in GDP has a downward trend. This is the well-known inverted U curve.

Green (1997) tested the relationship between American real estate investment and economic growth for the period 1959 to 1992 under a wide variety of time-series specifications and concluded that residential investment causes, but is not caused by GDP.

Kim (2002) used a VAR model, based on data from 1970 to 2000 of Korea, to examine whether residential and non-residential investment cause GDP growth and whether GDP growth causes these types of investment. The result shows that non-residential investment has greater impact on national economic growth than residential investment.

Pi and Wu (2004) used Granger causality tests to examine the internal relationship between China's real estate investment in specific areas and economic growth of these areas for the period 1994 to 2002 and found that there was reciprocal causation between them. Gong and Chen (2006) did the test based on the same figures and obtained the same result, but they emphasized that their impacts on each other will be more significant and stable in the long-run. Shen and Liu (2004) examined the relationship between China's total completed real estate investment and GDP and concluded that national economic growth does Granger cause, but is not caused by real estate investment.

Yue and Sun (2006) made quantitative analysis on the co-integration relationship between China's real estate investment and national economic growth, based on the data for the period 1991-2004. They came to three conclusions: first, there was long-term co-integration

relationship between real estate investment and national economic growth; second, short-term fluctuation of real estate investment had positively significant impact on national economic growth; third, the causal relation between them would change from unidirectional to reciprocal in the short-run as the significance level increased.

Wang and Liu (2004) computed the driving impact of real estate industry on its related industries based on China's Input-output Table (2002). They obtained for the driving coefficient of real estate industry to its related industries a value of 1.42, which indicates that every 1 RMB of real estate investment would lead to 1.42 RMB of production in related industries. In 2006, a research group from the National Bureau of Statistics of China, led by Liu Shuixing, came to the result that every unit of output in the real estate industry can drive a demand of 2.15 units for other industry.

Yan and Feng (2007) use input-output tables of China (2002), the United States (2002) and Japan (2000) to compare the driving impact of real estate on other industries in these countries. They showed that the driving impact of real estate on national economy was weak in all of these countries and that real estate industry was marked as an industry with high added-value but low driving impact.

1.3. Problems in the Existing Literature

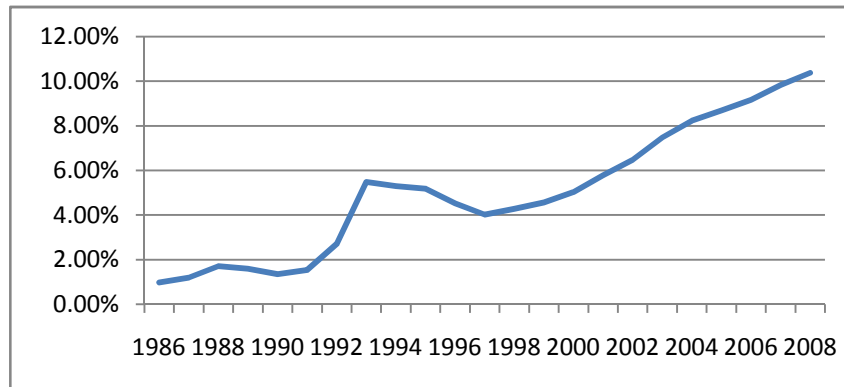
Compared with many developed countries, China's research on real estate industry was still in its infancy and did not provide uniform results concerning the contribution degree of real estate industry to national economic growth. Some scholars even confused the concept of real estate with construction industry intentionally and obtained a result that exaggerates the contribution of real estate industry to China's national economic growth (Yan, 2008). In the meanwhile, due to the short history of the development of China's real estate industry, figures used for research are insufficient. As the results of these existing studies vary, it is meaningful to examine the relationship between real estate investment and national economic growth again by using latest figures.

1.4. Structure

The first part of this paper gives a short overview to the incentive of this paper and lists some existing literatures on the relationship between China's real estate investment and economic growth. The second introduces the development process of China's real estate industry from 1986 to 2008 from an historical aspect. The third part introduces major factors that directly influence the real estate investment. The fourth part uses the Input-Output Model Analysis and quantitative analysis based on cointegration theory to examine the relationship between China's real estate investment and economic growth. In the fifth part, we list some problems existing in the real estate industry of China, particularly the issues of high housing prices and inefficient housing security system. We also make some recommendations based on former studies and conclude this paper in the sixth part.

2. The Development Process of Real Estate Investment in China

Figure 1: The ratio of real estate investment completed to GDP



Source: China Statistical Yearbook (2009)

Figure 1 shows the percentage of real estate investment completed in GDP, using sorted annual data (unit: percentage) from 1986 to 2008. The ratio of completed real estate investment denotes the completed investment cost of enterprises for real estate development (land and buildings), which is an indicator reflecting the scale of real estate investment and acts as guidance in the turn of the market. The figure shows the small ratio of real estate investment to GDP in the years of 1986 to 1991, not more than 2%. In this period, China started the urban housing system reform, at that time there is lack of active participation of both relevant units for selling and employees for buying houses. Besides, the imperfect rules and regulations on housing also lead to the small amount of real estate investment, corresponding to the small ratio to GDP of China.

The year of 1992 is a historical turning point of Chinese real estate development. Since 1992 when Deng Xiaoping made his Southern Tour¹ and reinvigorated the reform process, the real estate sector has been developing rapidly under advantageous circumstance for politic and economies. China turned to the period of rapid expansion in the real estate sector over the country. This expansion period lasts till 1993. Figure 1 shows that the real

¹China has experienced explosive growth in the last 25 years, which should be ascribed to the success of economic reforms and opening up. This process of gradual opening up has been characterized by many stages, most of which can be accredited to China's leader Deng Xiaoping. As China's then helmsman, Deng delivered several important speeches in his Southern Tour in 1992 that dismissed leftist ideology and conservative thinking and called for further economic reform boldly. His arguments and ideas would later triumph and pave the way for China's further development and success.

estate investment ratio to GDP of 1993 rises up to 5.5%, this to a certain extent has pushed the development of real estate sector. However, it has also resulted in a number of problems, such as excessive land supply, no reasonable structure of real estate investment, nonstandard market behavior, too large scale of real estate development, etc. Since July of 1993, the central government sets up its policy of macro regulation and control and Chinese real estate investment has entered into a new stage of adjustment. During the following years, the ratio of Chinese real estate investment to GDP was affected by macro regulation and suffered some contractions, decreasing to 4.02% in 1997.

In 1998, to protect Chinese economies against the impact of the Asian financial crisis, China adopted a policy of increasing investment in construction of residential houses and speeding up residential houses reform, leading to the rapid development of real estate investment. Since 1998, based on housing construction, China's real estate industry on one hand has accelerated economic growth and employment; on the other hand, it also has benefited from the sustained and rapid growth of national economics and residential income, as well as the quickening of the progress of urbanization.

By 2008, the completed real estate total investment reached 3120.32 billion Yuan, growing by 30.2% as compared to the previous year. The contribution rate of real estate industry in GDP growth was up to 23.39%.

These data show that the flourishing development of real estate industry might have provided a powerful guarantee for the growth of national economics and become one of the pillar industries in China. Besides, as one of pillar industries, real estate has long industry chain, high correlation degree and capability to drive the development of related industries, especially steel, building materials, metallurgical and textiles industries. At the same time, more jobs are created while China is confronting a severe challenge on issues of unemployment. Accordingly, the real estate industry has become more and more important in the national economy.

3. The status quo of China's Real Estate Investment

3.1. Subjects of China's Real Estate Investment

In the traditional planned economic system before reform, China used to develop her national economy in a completely planned manner. The state is the source of all economic investments, as in real estate industry. China used to allocate economic resources in society based on a planned socialist economy on a nationwide scale.

Although the real estate industry in the planned economic system once could satisfy the need of residents, however, from the view of industry development, the planned economic system has stifled the development of a real estate market. With the progress of history, the old system became inadaptable to the requirements of economic and social development.

Since China adopted the policy of reform of the urban housing system in 1992, enterprises and individuals also have become sources of real estate investment, promoting rapid and sustained development of real estate industry. At present, the main sources of real estate investment in China are the state, banks, enterprises, public institutions and individuals as well as foreign merchants.

3.2. Capital Sources of China's Real Estate Investment

Generally, investment funds of the real estate in China are raised through five channels: enterprises' own funds, credit funds, fund-raising, presale revenues and earnest money, foreign capital and financial funds.

Enterprises' own fund includes the self-accumulated funds, funds provided by relevant administrative departments and joint enterprises. According to the Law of Urban Housing and Land in China, the proportion of registered capital by real estate enterprises to their total investment shall be more than 30%. Credit funds refer to loans by real estate investors from banks and non-bank financial institutions and repaid with principal and interest when it's due.

Fund-raising refers to idle capitals collected by real estate investors from the society, e.g. the issuance of bond and stock by real estate enterprises, revenues from external units. Presale revenue denotes that real estate investors collect the sales revenues in advance before the real estate building project is completed, which could provide funds for later investment in real estate. Earnest money is partial payment paid by contractors in advance for the real estate project so that they can obtain the task of real estate construction.

Foreign capital refers to the capital invested by foreign governments, foreign consortia or foreign individuals, including joint venture, cooperation, equity, loans, bonds, direct investment and etc.

Financial funds for real estate investment in China are generally provided in the form of loans and are not allowed to use for other purposes. Both the principal and the interest are refunded after the use of financial funds. However, financial funds invested for some areas are used without compensation, such as for the purpose of national defense and scientific research as well as the construction of public houses.

Table 1: Sources of Funds of Enterprises for Real Estate Development (1997-2008)

Unit: billion RMB

Year	Total Funds This Year	Domestic Loans	Foreign Investment	Foreign Direct Investment	Self-raising Funds	Others
1997	379.97	91.12	46.09	32.79	97.29	145.48
1998	439.38	105.32	36.18	25.89	116.70	181.19
1999	477.60	111.16	25.66	18.05	134.46	206.32
2000	598.73	138.51	16.87	13.48	161.42	281.93
2001	768.24	169.22	13.57	10.61	218.40	367.06
2002	973.59	222.03	15.72	12.41	273.84	461.99
2003	1318.50	313.83	17.00	11.63	377.07	610.61
2004	1715.68	315.84	22.82	14.26	520.76	856.26
2005	2139.78	391.81	25.78	17.14	700.04	1022.16
2006	2713.56	535.70	40.02	30.30	859.71	1278.13
2007	3747.80	701.56	64.10	48.54	1177.25	1804.88
2008	3961.94	760.57	72.82	63.50	1531.21	1597.34

Source: China Statistical Yearbook (2009)

Table 1 shows different sources and amount of funds for real estate investment in the period of 1997 to 2008. Calculating the average annual growth rate of total funds for real estate investment and its individual types of capital source based on the figures form Table1, we find that the total funds of enterprises for China's real estate development had an averagely annual growth rate of 24.15%, domestic loans annually increased by 21.93%, foreign investment by 8.71%, foreign direct investment by 11.21%, self-raising funds by 28.72%, other kinds of sources by 25.24%.

Table 2: Sources of Funds of Enterprises for Real Estate Development (1997-2008) Unit: %

Year	Total Funds This Year	Domestic Loans	Foreign Investment	Foreign Direct Investment	Self-raising Funds	Others
1997	100	23.98	12.13	8.63	25.60	38.29
1998	100	23.97	8.23	5.89	26.56	41.24
1999	100	23.27	5.37	3.78	28.15	43.20
2000	100	23.13	2.82	2.25	26.96	47.09
2001	100	22.03	1.77	1.38	28.43	47.78
2002	100	22.81	1.61	1.27	28.13	47.45
2003	100	23.80	1.29	0.88	28.60	46.31
2004	100	18.41	1.33	0.83	30.35	49.91
2005	100	18.31	1.20	0.80	32.72	47.77
2006	100	19.74	1.47	1.12	31.68	47.10
2007	100	18.72	1.71	1.30	31.41	48.16
2008	100	19.20	1.84	1.60	38.65	40.32

Table 2 is the percentage of every single type of capital sources to the total funds in the year calculated based on figures from Table 1. The change of proportion indicates the development trend of capital structure. We find that from 1997 to 2008, domestic loans still act as an important part of sources of funds for real estate development, but decreased from a ratio of 23.98% in 1997 down to 19.2% in 2008; self-raising and other forms of capital sources all increased rapidly have become the key components of capital sources for China's real estate investment, they increased from 25.60% to 38.65% and from 38.29% to 40.32%, respectively.

However, a big part of self-raising fund and other forms of funds derives directly or indirectly from banks. In some areas, up to 80% of this capital comes from bank (Wang, 2007). In early 2010, the Central Bank admitted in a report that estate development depends too much on loans which lead to high risks of banks.

3.3. The Scale of China's Real Estate Investment

The scale of real estate investment is an important aspect to test the reasonability of real estate investment in a certain range, which is also an important criterion for determining whether a bubble exists in the real estate market. In order to understand the scale of investment in real estate more intuitively, we evaluations are made with following indicators: the total investment amount, the ratio of investment to GDP and growth rate of housing price.

3.3.1. Real Estate Investment Amount

The total amount of investment in real estate denotes the overall scale and level of investment in the sector. Table 3 shows completed investment from 1986 to 2007. Figure 2 is drawn according to the data from Table 3.

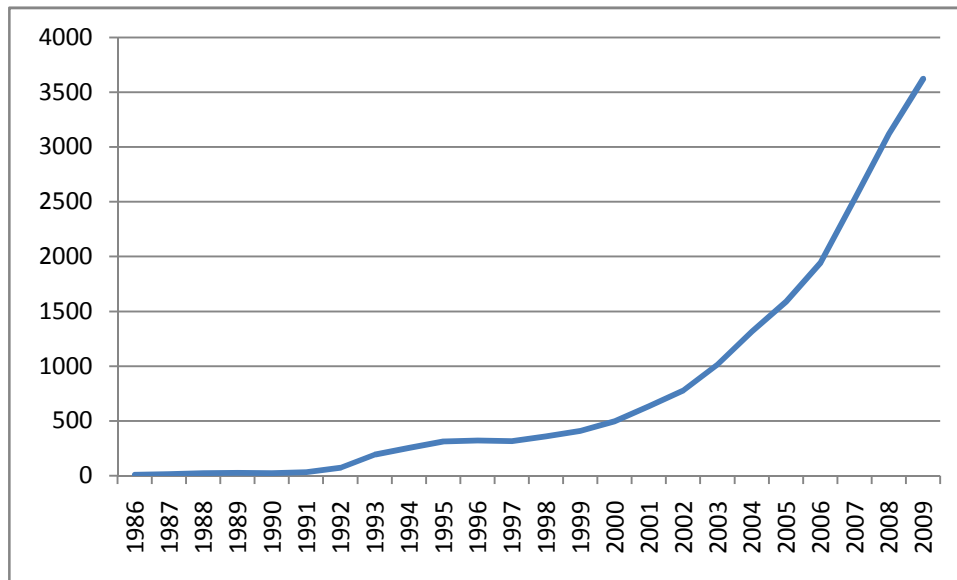
Table 3: China's investment in real estate (1988~ 2007) Unit: billion RMB

Year	Investment amount	Year	Investment amount
1986	10.1	1998	361.42
1987	14.99	1999	410.32
1988	25.72	2000	498.41
1989	27.23	2001	634.41
1990	25.33	2002	779.09
1991	33.62	2003	1015.38
1992	73.12	2004	1315.83
1993	193.75	2005	1590.92
1994	255.41	2006	1942.29
1995	314.90	2007	2528.88
1996	321.64	2008	3120.32
1997	317.84	2009	3623.20

Source: China Statistical Yearbook (2009)

Figure 2 shows that China's investment in real estate has gone through 2 time periods: slow development with small fluctuation from 1988 to 1997 and rapid increase from 1998 to 2009. Real estate's steady growth in the second period relates to the release of housing consumption after the urban housing system reform in 1992.

Figure 2: China's investment in real estate (1988~ 2008) unit: billion RMB



From Table 3, we see that the total amount of real estate investment in China has reached 3623.2 billion RMB in 2009, which increased by 14.2% compared to the previous year. Stable market growth in the future is possible, but there are still factors of uncertainty which might lead to short-term shocks, stagnation or recession, because the problem of bubbles in some cities is serious (Li, 2008).

3.3.2. The Investment Ratio of Real Estate to GDP

The ratio of real estate to fixed assets investment and to GDP is an indicator for judging the reasonability of the scale of real estate investment. According to Cao (2009), the ratio of real estate investment to GDP in European and American countries has an average value between 4% and 5%, which may be taken as reference for China. Table 4 shows that China's real estate investment accounts for less than 10% of gross fixed investment before 1993 and for less than 4% of total GDP; this proportion is relatively low, which indicates a shortage of real estate investment and real estate products supply. From 1993 to 1995,

investment in real estate accounts for more than 14% of gross fixed investment, for more than 5% of total GDP; the real estate market is marked by excess of supply over demand and serious housing vacancy rate.

Table 4: The ration of real estate investment to fixed assets investment and GDP (1999 -2008)
Unit: billion RMB

Year	Total Investment in Real Estate (1)	Total Investment in Fixed Assets (2)	GDP (3)	Ratio (1)/(2)	Ratio (1)/(3)
1990	25.33	451.7	1866.78	5.60%	1.36%
1991	33.62	559.45	2178.15	6.00%	1.54%
1992	73.12	808.01	2692.35	9.00%	2.72%
1993	193.75	1307.23	3533.39	14.80%	5.48%
1994	225.41	1704.21	4819.79	15.00%	5.30%
1995	314.9	2001.93	6079.37	15.70%	5.18%
1996	321.64	2291.35	7117.66	14.00%	4.52%
1997	317.84	3068.79	7897.3	13.71%	4.02%
1998	361.42	3432.1	8440.23	10.53%	4.28%
1999	410.32	2985.47	8967.71	13.74%	4.58%
2000	498.41	3291.77	9921.46	15.14%	5.05%
2001	634.41	3721.35	10965.52	17.05%	5.79%
2002	779.09	4349.99	12033.27	17.91%	6.47%
2003	1015.38	5556.66	13582.28	18.27%	7.48%
2004	1315.83	7047.74	15987.83	18.67%	8.23%
2005	1590.92	7507.82	18321.74	21.19%	8.68%
2006	1940.29	10999.82	21192.35	17.64%	9.16%
2007	2528.88	13732.39	25730.56	18.42%	9.83%
2008	3120.32	17282.84	30067	18.05%	10.38%

Source: China Statistical Yearbook (2009)

But after 1996, China's real estate turned to a period of relatively stable development while the government took the coordination between real estate investment and national economic development into account and embarked on regulation of real estate investment. In the period of 1996 to 1999, the share of real estate investment in GDP is between 10% and 14%, of gross fixed investment in GDP between 4% and 5%. Using reverse derivation of the housing vacancy rate, Luo (2005) believed that the investment ratio of real estate in this period was in its optimal range in the light of specific conditions in China and

experience of European and American countries.

Since 2000, the proportion of real estate investment in GDP exceeds 5% and in gross fixed investment more than 14%, indicating that China's real estate investment has exceeded the upper bound of the optimal interval. China's real estate investment has been running at a high level and its scale is bigger than normal.

3.3.3. Growth Rate of Housing Price

Housing price is an important determinant in the operation of real estate market, and it is also an indicator reflecting the rationality of real estate investment. According to the law of supply and demand, the relation of supply and demand depends on the market price of commodities. A rapid growth of housing prices usually denotes a shortage of supply. Although real estate industry has its own specific characteristics, it should also obey the supply and demand law.

Table 5 shows that the selling price of both commercialized and residential buildings have steady growth in the most recent decade. The average selling price of commercialized buildings in 2007 reached 3864 RMB, with a growth rate of 14.77%; the selling price of residential buildings reached 3645RMB, with a growth rate of 16.86%. The total selling price of commercialized buildings from 2003 to 2007 has doubled relative to the period of 1997 to 2003, while the selling price of residential buildings has tripled. In 2008, both selling prices have small decreases, reflecting that bubbles in some areas might have been squeezed out.

Table 5: Average selling price of commercialized and residential buildings (1997-2008)

Unit: RMB

Year	Average Selling Price of Commercialized Buildings per m ² (1)	Average Selling Price of Residential Buildings per m ² (2)	Growth Rate of (1)	Growth Rate of (2)
1997	1997	1790	10.85%	11.53%
1998	2063	1854	3.30%	3.58%
1999	2053	1857	-0.48%	0.16%
2000	2112	1948	2.87%	4.90%
2001	2170	2017	2.75%	3.54%
2002	2250	2092	3.69%	3.72%
2003	2359	2197	4.84%	5.02%
2004	2778	2608	17.76%	18.71%
2005	3168	2937	14.03%	12.61%
2006	3367	3119	6.29%	6.21%
2007	3864	3645	14.77%	16.86%
2008	3800	3576	-1.66%	-1.89%

Source: China Statistical Yearbook (2009)

As next step we use the House Price to Income Ratio as an indicator to determine the presence of housing price bubbles and the rationality of China's house price. The average ratio between housing price and income reflects the degree of housing affordability for the local population. The higher the ratio is, the lower is the ability to pay. Once the house price to income ratio keeps rising and there is no sign of market shrinkage, this indicates that there is a high degree of speculative investment and bubbles existing in the real estate market. We use the most common method to calculate the House Price to Income Ratio, which is the ratio of the average selling price of residential buildings to annual disposable income of urban households per capita. In a formula, this reads as follows:

$$R = P \cdot S / I$$

where

R.....ratio of house price to income

P..... average selling price of residential buildings per m²

S..... per capita floor space of residential building in urban areas

I..... per capita annual disposable income of urban households

Table 6 shows that the house price income ratios R in most years are higher than 6, higher than 7 since 2005. With regard to the critical value of the house price income ratios, there is no uniform standard in the world. Renaud (1989) reports:

“In developed countries, the price income ratio is between 1.8 and 5.5 to 1; in developing countries, the ratio is generally between 4 and 6 to 1, of course, there are exceptions....”

Thereafter, Renaud (1971) collected more information on house price and residential income from a large number of countries and discovered that some developing countries, especially countries with socialist economies, have house price to income ratio much higher than six-fold. Later, Renaud (1991) revised his views: the housing prices in developed and developing countries are in sharp contrast to the ratio of house price to income in socialist economies.

However, most Chinese economists believed in the existence of bubbles in China's real estate industry and pointed out that a critical value of 7.0 is reasonable for China's real estate industry. Table 5 shows that the House Price to Income Ratio is above 7.0 since 2005, indicating that there are bubbles in the real estate market and the growth rate of house price is much higher than income of urban households as a whole. The higher increase of house price lowers residents' capability to pay for houses.

Table 6: China's ratio of house price to income (1989-2008)

Unit: RMB, %

Year	Per Capita Annual Disposable Income of Urban Households	Average Selling Price of Residential Buildings (Yuan /m ²)	Per Capital Floor Space Of Residential Building In Urban Areas (sq.m)	R
1997	5160.3	1790	17.8	6.17
1998	5425.1	1854	18.7	6.38
1999	5854.0	1857	19.4	6.16
2000	6280.0	1948	20.3	6.28
2001	6859.6	2017	20.8	6.12
2002	7702.8	2092	22.8	6.19
2003	8472.2	2197	23.7	6.15
2004	9421.6	2608	25.0	6.92
2005	10493.0	2937	26.1	7.31
2006	11759.5	3119	27.1	7.19
2007	13785.8	3645	28.1	7.43
2008	15781.0	3576	29.8	7.05

Source: China Statistical Yearbook (2009)

3.4. The structure of Real Estate Investment

China's real estate investment structure has undergone significant changes since 1997 (Table 7). The proportion of residential housing investment to total completed investment increased from 48.43% in 1997 to 71.92% in 2008. Office building investment and others had an obvious decrease while the proportion of business use housing investment didn't change a lot. Generally, the proportion of investment in building Villas and luxury apartments was increasing. It reached its highest point of 8.16% in 2004 and after that fluctuated within a narrow range of 6.5% to 7.5%. Construction of affordable housing has been on a downward trend and fell to 3.11% in 2008, hitting an all-time low.

Table 7: The percentage of investment products to total completed investment (1997-2008)

Year	Completed Investment This Year	Completed Investment			Office Buildings	Houses for Business Use	Others
		Residential Buildings	Villas, High-grade Apartments	Economically Affordable Housing			
1997	100%	48.43%	4.92%	5.84%	12.24%	13.40%	25.93%
1998	100%	57.59%	5.03%	7.49%	12.00%	13.17%	17.24%
1999	100%	64.30%	4.35%	10.65%	8.25%	11.80%	15.64%
2000	100%	66.45%	5.42%	10.88%	5.98%	11.64%	15.94%
2001	100%	66.47%	5.83%	9.45%	4.85%	11.91%	16.77%
2002	100%	67.10%	6.64%	7.56%	4.89%	11.98%	16.03%
2003	100%	66.74%	6.23%	6.13%	5.01%	12.83%	15.43%
2004	100%	67.16%	8.16%	4.61%	4.96%	13.10%	14.78%
2005	100%	68.27%	6.60%	3.26%	4.80%	12.82%	14.12%
2006	100%	70.22%	7.44%	3.59%	4.78%	12.12%	12.88%
2007	100%	71.20%	7.15%	3.25%	4.09%	11.02%	13.69%
2008	100%	71.92%	6.51%	3.11%	3.74%	10.75%	13.59%

Source: Calculation according to China Statistical Yearbook (2009)

Overall, investment in residential buildings has become an absolute mainstay of China's real estate investment, which is more in line with governmental direction. However, many scholars claim that there is an obvious imbalance in the structure of commercialized housing supply. Zhang and Cheng (2008) believed that the proportion of villas and high-grade apartment investment is too high while that of economic affordable housing investment is too low compared to the living standards in China. They suggest limiting the land supply for high-grade flats strictly and focusing more on the development of affordable houses.

China's economy is objectively divided into three zones: eastern, central and western. The eastern region has been rapidly developed while the central and western regions are falling behind. In the past decade, the Chinese government committed to develop Central and Western China, with the purpose of narrowing the differences between regions, in order to achieve the relative balance of Chinese regional economic layout.

Table 8 is the local distribution of China's real estate investment from 1996 to 2008. The

proportion of real estate investment in the eastern region to the total amount is declining, but it is still a larger proportion, compared with central and western regions. Real estate investment in both western and central regions were increasing year by year, its growth in western is quicker than in central region since 2004.

Table 8: Local distribution of China's real estate investment (1996-2008) Unit: %

Year	Eastern	Central	Western	Total Amount
1996	76.15	12.65	11.2	100
1997	79.63	12.02	8.35	100
1998	78.56	12.09	9.34	100
2003	70.68	15.38	13.94	100
2004	72.37	12.54	15.09	100
2005	69.21	14.03	16.76	100
2006	63.9	18.2	17.9	100
2007	61.87	18.89	19.24	100
2008	59.92	20.56	19.52	100

Source: China Statistical Yearbook (2009)

4. The influence of China's Real Estate Development on National Economic Growth

Real estate industry, as a pillar industry, can directly or indirectly simulate the development of up and downstream industries, especially the growth of residential consumption, due to its long industry chain and high correlation degree. The development of real estate industry has also made important contribution to the expansion of domestic needs, promotion of the development of relevant industries, expansion of employment, acceleration of the national economic growth. However, the rapid development of real estate industry could also lead to an imbalance in the allocation of social resources and increase the financial risks or even influence the healthy development of national economy and its correlated industries indirectly.

4.1 The Input-Output Analysis of China's Real Estate

Input-Output Analysis was introduced by Wassily Leontief (1905-1999) in the 1930s, who was awarded the Nobel Memorial Prize in Economic Sciences for his development of this model in 1973. The method of Input-Output Analysis consists of two parts: the Input-Output Table and the Input-Output Model. The latter is a mathematical model built based on the former.

Based on the Input-Output Table of China (2002) published by the State Statistical Bureau of China, we calculate the economic impact of China's real estate industry on its associated industries by calculating the direct input-, cumulative input-, influence, and induction coefficients. An input-output table presents a detailed analysis of the process of production and the use of goods and services and the income generated in that production. This table shows, in quantitative terms, the inter-related and mutually dependent economic and technological relations among industries.

4.1.1. Direct Input Coefficients

The direct input coefficient reflects the basic characteristics of the production structure of

the Leontief model, which is the basis for calculating total consumption coefficients.

Direct Input Coefficients a_{ij} ($i, j=1, 2, \dots, n$), also called technical coefficients, refer to the volume of products and services of all sectors (i) consumed directly by a certain sectors productive units (j), which are needed for their total output. It represents the direct technical economic ties and direct interdependence between the sector and other sectors.

The method of calculating direct input coefficients is: the total consumption of production or service in production and operation of basic sector j directly from the non-basic sector i divided by total input of sector j . In a formula, the coefficients are expressed as

$$a_{ij}=x_{ij}/X_j \quad (i, j=1, 2, \dots, n)$$

The Direct Input Coefficient a_{ij} represents the degree of interrelation between sector i and sector j . The value of a_{ij} is between 0 and 1. The bigger a_{ij} , the higher is direct demand of China's real estate for other related sectors, and this yields more evidence of direct interrelation.

Table 9: Direct input coefficients of China's real estate (2002)

Significantly Driven Sectors	Direct Input Coefficients
Metal Products Manufacturing	0.17
Building Materials and other non-metallic Mineral	0.10
Construction	0.10
Banking and Insurance	0.10
Machinery and Equipment manufacturing	0.09
Real Estate and Services	0.05
Wholesale and Retail trades	0.05
Transportation, Posts and Telecommunications	0.05
Other Manufacturing Industries	0.04

Through Quantitative analysis on the Matrix of Direct Input Coefficients (42*42 sectors) of the Input-Output Table of China (2002), the results showed that there were 36 of 42 sectors directly relating to the real estate industry. From these 36 sectors, 10 of them have close relation to the real estate industry (Table 9): the Metal Products Manufacturing, Building Materials and other Non-metallic Mineral Manufacturing and Construction industries are the main direct consumption industries of China's real estate industry. At the same time, the estate industry has strong dependence on the banking and insurance industry because the real estate industry itself requires massive capital investment.

4.1.2. Cumulative Input Coefficients

Cumulative Input Coefficients b_{ij} ($i, j = 1, 2, \dots, n$) refer to the volume of products and services of all sectors (i) consumed directly and indirectly by a certain sector of productive units (j), which are needed for their total output. In a formula, these coefficients are expressed as

$$b_{ij} = a_{ij} + \sum_{k=1}^n a_{ik} a_{kj} + \sum_{s=1}^n \sum_{k=1}^n a_{is} a_{sk} a_{kj} + \sum_{t=1}^n \sum_{s=1}^n \sum_{k=1}^n a_{it} a_{ts} a_{sk} a_{kj} + \dots$$

$$(i, j=1, 2, \dots, n)$$

The first term of the equation above a_{ij} indicates the direct consumption of sector j for

sector i; the second term $\sum_{k=1}^n a_{ik} a_{kj}$ indicates the indirect consumption of sector j for sector i

in the first round; the third term of the equation $\sum_{s=1}^n \sum_{k=1}^n a_{is} a_{sk} a_{kj}$ indicates the indirect

consumption of sector j for sector i in the second round; the fourth term $\sum_{t=1}^n \sum_{s=1}^n \sum_{k=1}^n a_{it} a_{ts} a_{sk} a_{kj}$

indicates the indirect consumption in the third round, etc. By analogy, the $n+1$ term of the equation has the indirect consumption in the n round. As the equation shows, the Cumulative Input Coefficient is equal to the total amount of direct consumption and indirect consumption in certain rounds.

The Matrix of Cumulative Input Coefficient can be calculated based on the matrix of direct Input Coefficient, using a formula as follows:

$$B = (I - A)^{-1} - I$$

Here, A is the matrix of Direct Input Coefficients, I is for the identity matrix and B is for the matrix of Cumulative Input Coefficients.

The Cumulative Input Coefficients is more essential and comprehensive than the Direct Input Coefficients to reflect the technical relation between sectors, which is crucial for the accuracy of analyzing national economics and industrial structure. Based on the Direct Input Coefficients A and the Input-Output Table of China (2002) again and by using the above formula, we calculate the Cumulative Input Coefficients and obtain the values shown in Table 10.

Table 10: Cumulative input coefficients of China's real estate (2002)

Significantly Driven Sectors	Cumulative Input Coefficients
Metal Products Manufacturing	0.36
Machinery and Equipment manufacturing	0.29
Construction	0.23
Chemical Industry	0.18
Wholesale and Retail trades	0.14
Building Materials and other Non-metallic Mineral Manufacturing	0.14
Transportation, Posts and Telecommunications	0.12
Other Manufacturing Industries	0.11
Real Estate and Services	0.10

According to Table 10, the Metal Products Manufacturing is the most interrelated sectors to the real estate industry followed immediately by the industries of manufacturing and real estate and services. The night most interrelated industries amount to 1.66, which means that every 1 unit of real estate investment lead to 1.66 units output of the most interrelated industries.

4.1.3. Influence and Induction Coefficients

Influence Coefficient and induction coefficient are crucial indicators for evaluating the role of a given industry in the national economy. When an industry has relative bigger influence and induction coefficients, this means that this industry plays a decisive role in the development of the economy.

Influence coefficient reflects the degree that one additional unit used in a given sector affecting the production demand for other sectors in the national economy. It is usually denotes as F_j , calculated by the formula:

$$F_j = \frac{\sum_{i=1}^n b_{ij}}{\frac{1}{n} \sum_{j=1}^n \sum_{i=1}^n b_{ij}} \quad (j = 1, 2, \dots, n)$$

Here, b_{ij} is the cumulative input coefficient of sector j to sector i . $\sum_{i=1}^n b_{ij}$ is the sum of columns in the cumulative input coefficients matrix which reflects impact of real estate industry on other sectors, the influence coefficient. $\frac{1}{n} \sum_{j=1}^n \sum_{i=1}^n b_{ij}$ is the average value of the sum of rows in the cumulative input coefficients matrix. The influence is marked by the pulling capacity of real estate investment (j) to national economic development.

If $F_j > 1$, the impact of sector j to other sectors is higher than the average impact of all of the sectors to other sectors in the entire economy; if $F_j = 1$, the impact of sector j to other sectors is at the average level of impact of all of the sectors to other sectors in the entire economy; if $F_j < 1$, the impact of sector j to other sectors is under the average level of impact of all of the sectors to other sectors in the entire economy. The bigger the impact coefficient is, the bigger the pulling capacity of sector j to economic growth.

Induction coefficient reflects the induction level of demand for a given sector (the output provided by a given sector for other sectors' production) while increasing use of an additional unit in all sectors in the national economy. It is usually denoted as E_i , calculated by the formula

$$E_i = \frac{\sum_{j=1}^n b_{ij}}{\frac{1}{n} \sum_{i=1}^n \sum_{j=1}^n b_{ij}} (i = 1, 2, \dots, n)$$

Here, b_{ij} is the cumulative input coefficient of sector j to sector i . $\sum_{j=1}^n b_{ij}$ is the sum of rows in the complete partition coefficient matrix which reflects the degree of sector i felt the effects of other sectors, the induction coefficient. $\frac{1}{n} \sum_{i=1}^n \sum_{j=1}^n b_{ij}$ is the average value of the sum of rows in the complete partition coefficient matrix. Induction coefficient is marked by the pushing capacity of sector i to the national economic development.

If $E_i > 1$, the induction degree of other sectors from sector i is higher than the average level of all of the sectors from other sectors in the entire economy; if $E_i = 1$, the induction degree of other sectors from sector i is at the average level of all of the sectors from other sectors in the entire economy; if $E_i < 1$, the induction degree of other sectors from sector i is under the average level of all of the sectors from other sectors in the entire economy; the bigger the induction coefficient, the bigger is the pushing capacity of sector to national economic development.

After the calculation and analysis of impact and induction degree of China's real estate industry by using the Input-Output Table of China (2002) again, we find that the pull- and push effects are below the average level when compared to other 41 sectors. The influence coefficient in simple form is 0.66 in the 41st place of 42 sectors and in weighted form is 1.27 in the 11th place; the induction coefficient in simple form is 0.62 in the 28th place and in weighted form is 1.03 in the 16th place. The total driving effects amounted to 1.28 in simple form and 2.3 in weighted form.

4.1.4. Conclusions

The backward pull, forward push and indirect effects extend the industrial chain of the real estate industry and enlarge the attack surface of the national economy. In general, the pulling function of the real estate industry to other industries is greater than the push function, which indicates that the growth model of real estate development is pulling

oriented in China. However, its ability to pull and push the national economy is not very powerful, because by the method calculated in simple form, the driving effect together has the sum of 1.28. This shows that the driving effect of China's real estate industry is below the average level compared to other 43 sectors. If we consider its added value in construction industry and calculate it in weighted form, the driving effect of real estate industry has the sum of 2.3, placing a relatively higher position in the rankings.

Structurally, about half of industries interrelated with the real estate industry in the national economy have a higher degree than the intermediate level and most of them are both forward and backward interrelated. Computing results show that there are 20 industries significantly interrelated with real estate industry, in which 12 industries have both forward and backward relation with the real estate industry. Banking and insurance industry has the closest interrelation with the real estate industry, forward and backward synchronously, which shows the high degree of their mutual influence and interdependence and the real estate development is inseparable from the support of the banking and insurance industry, but plays a role in promoting the further prosperity of the latter.

4.2. Quantitative Analysis of Real Estate Investment and Economic Growth based on Co-integration Theory

4.2.1. Basic Data

To examine the economic effects of investment in real estate development, we choose the GDP as a representative indicator for a country's goods and services. Because the Chinese real estate industry started only recently, we can only select the new real estate development and investment data to represent the characteristics of China's stage of the real estate industry, with a time series span of 1986 to 2008. We denote the real estate development and investment as "REINV" and the GDP as "GDP". The data used here are from China Statistical Yearbook (2009), using the CPI index and GDP deflator to modify the data. At the same time, we logarithmize the data, LNREINV and LNGDP, to eliminate the impact of heteroscedasticity.

Table 11: China's GDP and real estate completed investment (REINV)
unit: billion RMB

Year	REINV	GDP	CPI	GDP Deflator
1986	10.1	1027.52	1.065	1.047
1987	14.99	1250.86	1.073	1.052
1988	25.72	1504.28	1.188	1.121
1989	27.23	1699.23	1.18	1.085
1990	25.33	1866.78	1.031	1.058
1991	33.62	2178.15	1.034	1.068
1992	73.12	2692.35	1.064	1.082
1993	193.75	3533.39	1.147	1.151
1994	255.41	4819.79	1.241	1.206
1995	314.9	6079.37	1.171	1.137
1996	321.64	7117.66	1.083	1.064
1997	317.84	7897.3	1.028	1.015
1998	361.42	8440.23	0.992	0.991
1999	410.32	8967.71	0.986	0.987
2000	498.41	9921.46	1.004	1.021
2001	634.411	10965.52	1.007	1.021
2002	779.092	12033.27	0.992	1.006
2003	1015.38	13582.28	1.012	1.026
2004	1315.83	15987.83	1.039	1.069
2005	1590.92	18308.48	1.018	1.038
2006	1942.292	21192.35	1.015	1.036
2007	2528.884	25730.56	1.048	1.074
2008	3120.319	30067	1.059	1.072

Source: China Statistical Yearbook (1986- 2009)

4.2.2. Unit Root Test

If the two variables, LNGDP and LNREINV, are non-stationary time series, spurious regression may exist. Hence, unit-root tests are needed to find out whether the variables are stationary.

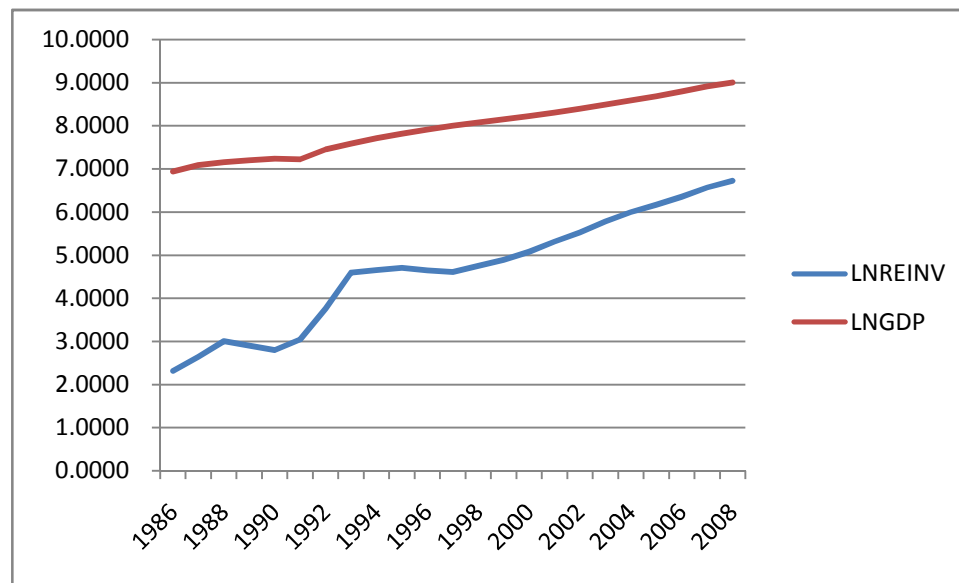
Table 12: China's GDP and real estate completed investment after CPI, GDP-deflator modification and logarithm

Year	REINV (1986 as basis)	GDP (1986 as basis)	LNREINV	LNGDP
1986	10.1	1027.52	2.3125	6.9349
1987	13.97	1189.03	2.6369	7.0809
1988	20.17	1275.58	3.0042	7.1512
1989	18.11	1328.01	2.8965	7.1914
1990	16.33	1378.97	2.7930	7.2291
1991	20.96	1358.35	3.0426	7.2140
1992	42.86	1721.06	3.7579	7.4507
1993	99	1962.37	4.5951	7.5819
1994	105.2	2219.58	4.6559	7.7051
1995	110.76	2462.30	4.7074	7.8088
1996	104.46	2709.43	4.6488	7.9045
1997	100.42	2961.78	4.6094	7.9935
1998	115.1	3194.14	4.7458	8.0691
1999	132.53	3438.47	4.8868	8.1428
2000	160.36	3725.92	5.0774	8.2231
2001	202.69	4033.30	5.3117	8.3023
2002	251	4399.64	5.5255	8.3893
2003	323.16	4840.15	5.7781	8.4847
2004	403.01	5329.64	5.9990	8.5810
2005	478.62	5879.81	6.1709	8.6793
2006	575.58	6569.47	6.3554	8.7902
2007	715.09	7426.71	6.5724	8.9128
2008	833.17	8095.48	6.7252	8.9991

Source: China Statistical Yearbook (1986- 2009)

Figure 3 is a time plot of LNREINV and LNGDP. Both variables have upward trends over time. Therefore we choose the test type of Augmented Dickey–Fuller (ADF) and include the options of intercept terms and trend. The results are summarized in Table 13:

Figure 3: Timing diagram of LNREINV and LNGDP



In Table 13, c, t, p stands respectively for intercept items, trend and length of lags. In general, if the time series is fluctuating around the mean value of 0, intercept (c) and trend (t) should not be considered in the test equation; if the series don't have the mean value of 0 and without time trend, only intercept (c) is considered in the test equation; if the series moves up and down over time, the intercept term (c) and trend (t) should be elected. The (p) values are determined based on AIC (Akaike Info Criterion), SC (Schwarz Criterion) and HQ (Hannan-Quinn criteria), by searching for smallest value of them. "0" stands for no trend or no lags, " Δ " stands for the first differentiation of time series, here for first difference.

Table 13: Unit root test results

Variable	LNREINV	LN GDP	Δ LN REINV	Δ LN GDP
ADF T-Statistics	-2.279894	-2.941972	-3.627344	-4.331728
Critical Value (5%)	-3.673616	-3.644963	-3.02997	-3.012363
AIC	-0.664498	-3.402905	-0.475159	-3.152719
SC	-0.366254	-3.203948	-0.276330	-3.053241
HQ	-0.614023	-3.359726	-0.441509	-3.131130
Test Forms (c,t,p)	(c,t,3)	(c,t,1)	(c,0,2)	(c,0,0)
Results	non-stationary	non-stationary	stationary	stationary

As the results in the table show, the time series LNREINV and LNGDP are both non stationary but their first difference Δ LNREINV and Δ LNGDP have become stationary (the t-statistic is smaller than the critical value at 5% significance level), which indicates that both time series are first order integrated I (1). This fulfilled the premise of co-integration test and we go to a further step of testing whether there is a long-run equilibrium relationship between real estate investment and GDP growth.

4.2.3. Co-integration Test (Johansen)

In order to examine whether there was co-integration relationship between China's real estate investment and GDP, it is meaningful to conduct a co-integration test such as Johansen Co-integration Test. Both time series of LNREINV and LNGDP are first-order integrated, satisfying the premise of doing Johansen Co-integration Test for them. The test results are shown in Table 14.

Table 14: Cointegration Test Result

Date: 03/06/12 Time: 12:03

Sample (adjusted): 1990 2008

Included observations: 19 after adjustments

Trend assumption: Linear deterministic trend

Series: LNGDP LNREINV

Lags interval (in first differences): 1 to 3

Unrestricted Cointegration Rank Test (Trace)

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None *	0.586315	16.87517	15.49471	0.0308
At most 1	0.005502	0.104819	3.841466	0.7461

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**

None *	0.586315	16.77035	14.26460	0.0197
At most 1	0.005502	0.104819	3.841466	0.7461

Max-eigenvalue test indicates 1 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegrating Coefficients (normalized by b'S11*b=I):

LNGDP	LNREINV
-29.08467	15.09400
5.952956	-1.962995

Unrestricted Adjustment Coefficients (alpha):

D(LNGDP)	0.018872	-0.000219
D(LNREINV)	0.020903	-0.004986

1 Cointegrating Equation(s): Log likelihood 77.07036

Normalized cointegrating coefficients (standard error in parentheses)

LNGDP	LNREINV
1.000000	-0.518968
	(0.00961)

Adjustment coefficients (standard error in parentheses)

D(LNGDP)	-0.548882
	(0.14141)
D(LNREINV)	-0.607945
	(0.60922)

The results in Table 14 suggest that there is one cointegrating equation between the real estate industry and GDP. Based on this finding, we continue our analysis to seek for the dynamic relations between the two variables in the short and long term by using the Vector Error Correction Model.

4.2.4. VEC (Vector Errors Correction) Model

Engle and Granger (1987) point out that a linear combination of two or more non stationary series may be stationary. The stationary combination may be interpreted as a co-integration

relationship between the variables. A VEC model is based on VAR model and is a model that restricts the long run behavior of the endogenous variables to converge to their long-term equilibrium relationships and allow short-term dynamics.

Consider the relationship between real estate investment (LNREINV) and GDP (LNGDP) in a simple VEC model

$$\Delta LNREINV_t = \theta_1(LNREINV_{t-1} - \lambda LNGDP_{t-1}) + \mu_{1t}, \theta_1 > 0$$

$$\Delta LNGDP_t = -\theta_2(LNREINV_{t-1} - \lambda LNGDP_{t-1}) + \mu_{2t}, \theta_2 > 0,$$

where μ_{1t} and μ_{2t} are stationary terms, but usually not white noise disturbances. θ_1 and θ_2 denote the speed of adjustment parameters. θ_1 and θ_2 are positive parameters, λ is also positive in this application. The co-integrating term $LNREINV_{t-1} - \lambda LNGDP_{t-1}$ is the error correction term, which corrects the deviation from long run equilibrium gradually through short run adjustments. LNREINV and LNGDP are the two endogenous variables.

Based on VEC Model, we implement the Vector Error Correction Estimates by using 1 to 3 as lags interval for D (Endogenous), in order to test long-run reaction of both variables. The obtained results are shown in Table 15.

Table 15: Results of VEC Estimates

Vector Error Correction Estimates
Date: 03/06/12 Time: 12:47
Sample (adjusted): 1990 2008
Included observations: 19 after adjustments
Standard errors in () & t-statistics in []

Cointegrating Eq:	CointEq1
LNGDP(-1)	1.000000
LNREINV(-1)	-0.518968 (0.00961) [-54.0071]
C	-5.517965

Error Correction:	D(LNGDP)	D(LNREINV)
CointEq1	-0.548882 (0.14141) [-3.88159]	-0.607945 (0.60922) [-0.99790]
D(LNGDP(-1))	-0.983415 (0.16717) [-5.88259]	-1.721228 (0.72024) [-2.38980]
D(LNGDP(-2))	-0.767555 (0.26406) [-2.90675]	-4.338927 (1.13765) [-3.81393]
D(LNGDP(-3))	0.534561 (0.39721) [1.34577]	0.833382 (1.71133) [0.48698]
D(LNREINV(-1))	0.171301 (0.11029) [1.55313]	0.854330 (0.47518) [1.79790]
D(LNREINV(-2))	-0.094744 (0.05204) [-1.82070]	-0.212225 (0.22419) [-0.94662]
D(LNREINV(-3))	-0.088836 (0.03319) [-2.67630]	-0.075892 (0.14301) [-0.53068]
C	0.210706 (0.06889) [3.05845]	0.571429 (0.29681) [1.92521]
R-squared	0.876998	0.903212
Adj. R-squared	0.798723	0.841620
Sum sq. resids	0.004940	0.091700
S.E. equation	0.021192	0.091304
F-statistic	11.20417	14.66434
Log likelihood	51.46043	23.71003
Akaike AIC	-4.574782	-1.653687
Schwarz SC	-4.177123	-1.256028
Mean dependent	0.095142	0.201511
S.D. dependent	0.047237	0.229424

Determinant resid covariance (dof adj.)	3.07E-06
Determinant resid covariance	1.03E-06
Log likelihood	77.07036
Akaike information criterion	-6.217933
Schwarz criterion	-5.323201

The VECM uses 3 lags. The second part is the estimated coefficient value of VEC model, where CointEq1 stands for error correction term. Besides, Eviews also gives corresponding standard deviation and t-statistics of every variable.

$$e = \text{LNGDP} - 0.52\text{LNREINV} - 5.52$$

$$\text{LNGDP} = 0.52\text{LNREINV} + 5.52 + e$$

In the long-run, 1 unit of real estate investment causes a 0.52 units change of economic growth, indicating a significant effect of real estate investment on economic growth, which is equivalent to the results of other former studies that we mentioned.

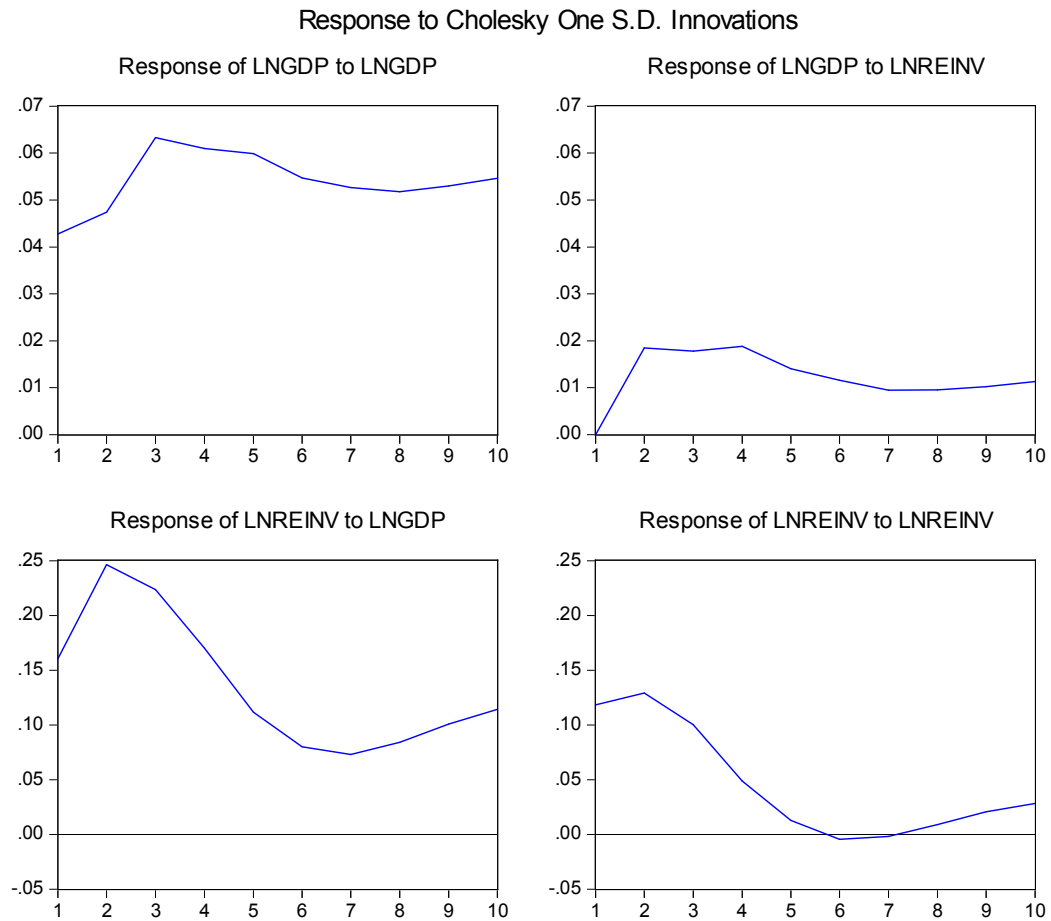
In the short-run, real estate investment lagged in one period has a positive effect on economic growth and real estate investment lagged in two periods has negative effect on economic growth. But, the t-statistics for both are not significant, which are 1.56 and -1.82 respectively. (The t-statistic is not significant when the t-value is between -1.95 to 1.95). Real estate investment lagged in three periods has negative effects on economic growth and it is significant.

In Table 15, the first row in the second part shows that the t-statistics for LNGDP is significant, which means that this variable can make the whole system go back to the equilibrium when deviation of the equilibrium happens.

4.2.5. Impulse Response Analysis

Figure 4 shows that gross domestic product reacts to its own shocks rapidly, increasing by more than 0.04 standard deviations. In the third period, the value climbs to about 0.065. Thereafter, it starts to decrease, and the reaction becomes weaker and has a light increase again from the eighth period.

Figure 4: Impulse Response of Real Estate Investment to GDP



A unit real estate investment shock can lead to 0.018 increase of economic growth in the first period. In the following three periods, the effect is stable. After that, it follows a downward trend till the seventh period and has again a slight increase since the seventh period.

The effect of real estate on economic growth is significant after a delay of two time periods. In the long term, the effect is weaker and stable.

4.2.6. Conclusions

The test results of VEC Model shows a significant effect of real estate investment and economic growth in the long-run and every 1 unit of real estate investment causes a 0.52

units change of economic growth. But in the short-run, the influence of real estate investment on national economy is not powerful, which is clearly showed in the results of the impulse response analysis.

5. Problems Exist in China's Real Estate Industry

The rapid development of China's real estate industry, which is still in its growth stage, has become more and more important to the national economy, social development and also the interests of the masses. There is no doubt that large-scale housing construction has significantly improved the housing conditions but also promoted social harmony, social stability and social unity.

However, the development of China's real estate industry is confronted with many problems, due to the limitation of policy implementing system and aberration of policy implementing. The non-equilibrium status in China's real estate market can severely affect the healthy development of a harmonious society. Hence, problems need to be found and solved immediately.

5.1. Flaws in Land Policy: Local Governments Dominate the Real Estate Market

Before analyzing the Chinese land policy, it is necessary to have a brief introduction about the land ownership in China. The basic land ownership system in China is very different from that of most western countries. In western countries, most of the urban land is privately owned. The state-owned land is mainly in the range of protected land and the land owned by the city government is more in the form of urban public space. However, all of the urban land in China is owned by the state. When the urban land is transacted, land transfer tax, or called land cost, should be paid to the state. According to the different uses of land, the government levies a rent for the use of the land for 50 years or 70 years one time, which represents about 30 percent of housing price. As external income, the land transfer revenue has become the main source of the local government budget.

Due to factors such as high land price, huge construction costs of supporting facilities, various charges including apportioned charges and incentive of real estate developers have made the commercial housing price rise much faster than the price index, representing an

annual growth rate of more than 20%. In China, real estate industry is openly acknowledged with a profit of 15%, but insiders said it is absolutely exceeding 30% (Wang, 2006). The high housing prices in China are rooted in the local government-led real estate market, which is a deficiency of national land policy.

Land, as the primary market of real estate, is monopolized by the state and is the source of real estate supply in China. From the regular pattern of long-term house pricing, land can indeed be considered as the only deciding factor. The poor health in the land market cannot avoid the phenomenon of hoarding land and perform an effective land supply, eventually leading to distortions in the real estate supply and demand.

Local governments do not only dominate the layout, element distribution, the total supply, preferential policies and transaction costs of real estate market, but also the public opinion, policy changes and rules of the game. Because of the ideological land nationalization, the local government imposes land resumption on urban residents and on farmers at a low price and sells the land at a higher price, thereby reaping huge spreads. According to the Contract of State-owned Land Use Right Transfer, local governments share land revenue with the central government on a “70/30” split basis and this revenue can be used at the current period. Land transaction of local governments are poorly managed by governments at a higher level due to the deficiencies of the management system and also because governments of higher levels are driven by interest. These factors set incentives to local governments to push up house prices greatly.

Most of the land revenue in the secondary market falls to real estate developers, which gives the developers great incentives to participate in land enclosure, hoarding or speculation. Furthermore, house prices are increasing continuously in the process of speculation. As local governments are responsible for planning the layout of the property including land development patterns, building density and other aspects of control, some developers have tried every means to amend the Government planning by bribing local governments.

The relevant government departments and individuals cannot resist the temptation of enormous benefits brought by developers and thus modify the pre-planning. Both sides tend to get their interests in the real estate development, so that the real estate industry has become the most corrupted industry in China's economic system, which is already acknowledged.

5.2. Interest Groups Resist Regulatory Policies of Central Government

Aimed at the characteristics of high house prices and fast growth, the state and local government also proposed control measures.

Between 2003 and 2004, macro measures aimed to curb over-heated investment in the real estate industry. In 2005, the State Council put forward “Eight Control Measures” to stabilize the housing price; in 2006, it issued a "National Six Policy" to regulate the structure of housing supply. In 2007, the Bank of China and the Banking Commission adjusted the credit policy of the commercial housing and stipulated that when one purchased the second set (or more) of house, the down payment loan should not be less than 40%. In 2008, the State Council issued a notice on dealing with idle land to increase land supply from the source. In 2009, the government introduced a series of notices and requirements to rectify the market order, to prevent the bubbles from expanding and to inhibit the rapid growth of housing price. In 2010, the State Council stipulated the prohibition of purchase a third set of house in the cities with high housing prices. In 2011, the “New Eight Control Measures” increased the down payment loan up to 60% for the second set of house and generally prohibited the purchase of a third set. A series of control measures were implemented for the whole country and also for individual provinces or cities.

However, all those controls were unsuccessful in solving the problem and the inflation in housing prices is still drastic, a concern of ordinary people. Figures from the National Bureau of Statistics show that the housing sales price in 70 large and medium cities in China in December 2009 rose by 7.8% over the same period of the previous year,

exceeding the highest level since the implementation of monthly statistics on house prices in June 2007.

Despite numerous control measures, the problems of high housing prices, market disorder, land hoarding, the creation of land shortage by developers, reselling and connivance of government departments in some areas remained serious.

In my opinion, one fundamental reason for the ineffective implementation of central policies is that the objective of local governments and the central government is often not consistent:

For central government, housing price reduction is a political issue and macroeconomic regulation on real estate market is based on the people's interests. But for local governments, especially local officials, their performance is evaluated by central government through the yielded GDP. Any measures that can enhance economic growth and GDP naturally become the local governments' options for policy. In this regard, pushing up housing prices is relatively easier than promoting the development of industry and agriculture. That's why local officials inevitably will lead to lower effectiveness of central policies' implementation.

Another fundamental reason comes from the real estate market. The pattern of competing interests is between real estate developers and home buyers groups. It is clear that real estate developers wish the house prices continue to rise and bring them huge wealth while home buyers have also a clear, common objective that is to purchase houses at an affordable price. In this game, home buyers are in an inferior position because on the one hand developers unite interest groups to lobby the government, on the other hand developers' interest and the interest of local government is relatively consistent. Although home buyers are the majority, their interest demand cannot get a valid expression and the government cannot feel pressure from them.

5.3. Flawed Housing Security System

From the experience of developed countries, low-rent public housing, economic and suitable houses or other affordable houses are possible ways to solve the housing problem of the low-income population. However, in the current housing supply system of China, the main supply channel is the commercial housing supply system. The policies of low-rent public houses and economic and suitable houses in fact are not implemented radically in China, which leads to the phenomenon that people with high or low income alike must purchase commercial houses at an exceptionally high price to meet their housing needs.

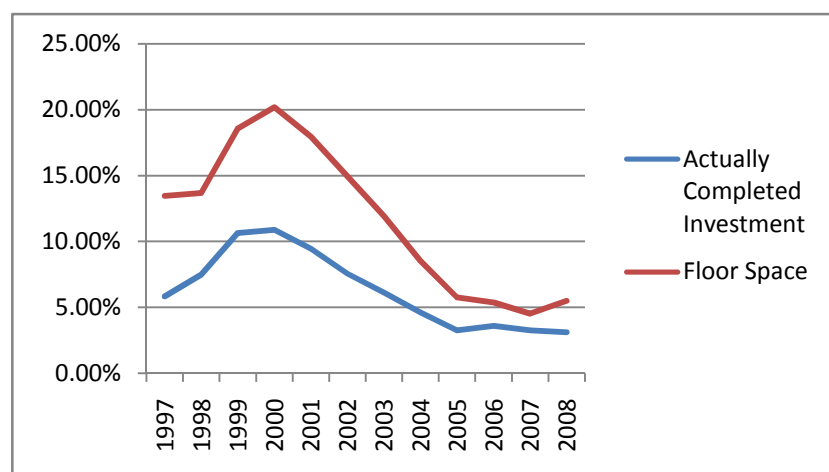
China focuses too much on the "sale-based" housing policies, which directly leads to small quantity and slow growth of low-rent housing and economic and suitable houses construction. In terms of performance and financial returns, the development and construction of them doesn't benefit the local governments much. Moreover, the development of low-rent public houses is a costly and long-period project, especially its characteristic as social welfare supply, reducing the enthusiasm for local governments to investment. In short, the local governments are afraid of that their own interests would be impaired by developing low-rent and economic and affordable houses, because tax and fee income from regular commercial houses development is an important part of their financial revenue.

According to the Ministry of Housing and Urban-Rural Development of China, by the end of 2006, 78% of the nation's total of 657 cities in China has established a low-rent housing system. However, only 2% of Chinese families had benefited from the low-cost housing system which indicates that the implementation of low-cost housing policy is slow and deficient. Capital shortage was the major reason of the inefficient implement of low-rent housing construction plan. Figures from the Housing Security Plan of China (2009) showed that 2.34 billion RMB was invested in 2006, 5.1 billion RMB in 2007 and 6.8 billion RMB in 2008. There was at least 65 billion RMB needed for house construction from 2009 to 2011 to solve housing problem of more than 7.47 million low-income households.

In addition, on July 14, 2006, the government has put forth a policy to arrange a certain proportion of net income from land transaction to invest in the low-rent housing construction, but the policy hasn't been effectively implemented. In the cities where it was implemented, capital used for low-rent housing construction accounted 5% to 10% of the local governments' revenue from land transaction (Li, 2008), which was significantly small when compared to the 70% distribution of local governments from land transaction revenue.

Building economic and suitable houses is another policy adopted by the Chinese government and started in 1998. Unlike the low-rent houses which are rented and not sold, the economic and suitable houses refer to the commercial houses sold with meager profits for the low-income population. From 1999 to 2001, they reached their peak period of construction, the proportion of investment allocated to this type of housing to investment in commercial housing reached 19% on average (Figure 5). It even reached more than 50% in some cities, playing an important role in solving the housing problem for low-income families (Li, 2008). However, there were also still underlying problems with the economic and suitable houses supply:

Figure 5: The growth of economic and suitable houses investment unit: %



Source: China Statistical Yearbook (2009)

Since 2001, China's economic and suitable houses investment experienced negative growth. The ratio of economic and suitable housing investment to the nation's total investment for

residential houses dropped from 9.45% in 2001 to 3.11% in 2008; the floor space of economic and suitable houses sold declined from 17.94% in 2001 down to 5.5% in 2008 (Figure 5).

The major reason for the small total supply is that the government emphasized too much on market-based instruments to solve the housing problem and their initiative in allotting special land for affordable houses construction was low. The lack of strict examination on the qualification of the beneficiaries led to the participation of high-income groups to invest in economic and affordable houses, which not only harmed the interest of low-income families but also hinders the further development of economic and affordable houses. In addition, the way of construction dominated by real estate developers seriously infected the implement of the policy because the center of gravity moved to benefit maximization which was realized by lowering construction and building standards, increasing prices of economic and affordable houses or lowering the entry qualification for house buyers.

As a result of the problems stated above, the serious flaw of housing security system make urban residents squeezing onto the single plank bridge of the house market, which is also one reason why Chinese housing price increases so fast.

5.4. The Property Tax System Suffers from Drawbacks

There are two large drawbacks existing in China's current property tax system: the large amount of tax for the real estate development and circulation but little tax in the possession stage (Song et al, 2006) On one side, the high tax burden of real estate developers one major cause to the high housing prices; the little tax burden in the tenure phase lowers the cost of property speculation on the other side.

The tax burden of real estate industry is higher than any other industries. In 2006, the tax burden of real estate enterprises (the proportion of total tax amount to business income) is 13.4%, much higher than 6.5%, the average tax burden level of all industries (An and Wang, 2007). Compared to some countries with high taxation on real estate industry, such as the USA (6%), Canada (11%), China's property tax is relatively very high (Liu, 2009).

In China's property tax system, there is unreasonable setting of tax categories. According to An and Wang (2007), real estate enterprises have to pay from 60 to 180 taxes and fees for real estate construction, varying across cities. During land acquisition, there are 22 taxes and fees, including leasehold charge, which alone represents about 30 percent of housing price, land management fee, land title tax, city infrastructure fee, relocation compensation and business tax. During the construction of houses, at least 20 taxes and fees are levied, including city maintenance and construction tax, business tax, education tax and other fees and charges for facility in the community. There are also many other fees, which are not required by the law, charged by governments at different levels. More than 200 types of taxes and fees are charged in some cities but most taxes and fees are not relevant to housing (Song et al, 2006). It was estimated that about one third of all fee revenue collected from real estate industry in 1998 are not relevant to housing (An and Wang, 2007).

According to "China Real Estate Industry Research Report 2005", real estate developers' payment for land plus tax and fee accounts for more than 50 percent of housing price compared to 30 to 40 percent of construction cost and 15 to 20 percent of profit.

In the possession stage of house, home owners don't need to pay any property tax, which to some extents increases the incentive of speculators to hoard houses. Because the cost of holding a property is almost zero, there is rare risk for speculators when considering the rapid and high appreciation of house value. As a result, a high vacancy rate is observed in many large cities of China. Taking the example in Beijing, according to "2004 China Real Estate Finance Report" issued by the People Bank of China, 17 percent of residential houses purchased in Beijing is aimed at investment and the vacancy rate there even reached 48 percent of the total number of constructed residential houses. There is no doubt that speculation directly leads to the increase of housing prices and harm the interest of ordinary residents while zero cost of housing possession has contributed to these problems.

5.5. Shortcomings in the Assessing System for Local Governments' Performance

The reform of the housing system in 1998 makes land a most valuable resource for local governments, tax revenues from land automatically has become the best way to make up for the financial gap. According to statistics, land cost, fees and tax from housing construction and transaction accounted for half of fiscal revenues and half of the housing price in some areas (Yi, 2005). Such attractive, huge profits make local governments being fascinated by land transaction and houses construction.

The assessment of local governments' performance is based on their created GDP, which leads to a distortion of land management by local governments. Higher-level governments frequently evaluate and punish lower-level officials regarding their performance in GDP, tax revenue growth, employment etc. Under the pressure, lower-level government conceals information to higher-level government by using the advantage of long information delivery chain (Li, 2008). Local governments are keen to concentrate on projects that are observable and easy to be observed by higher-level governments, such as building high-standard municipal construction or large industrial projects. In addition, by adding the factor of term of office (3 or 5 years), the distortion of local governments' behavior is intensified. Because the performance assessment on local governments is aimed at the current term of office and land cost is one-time charged for 50 or 70 years use, it is apt to cause strong "performance impulse" and myopic behavior.

Hence, the prices of land and houses directly influence the tax revenue of local governments, in other words, the performance of local governments in the assessment system. This increases the incentive of local governments to force up land prices and to "operate the city" (Yi, 2005).

5.6. Real Estate Developers Operate Property Market

With regard to the land resources available for real estate development, information on real estate development costs was not provided by relevant functional government departments but by developers and their interest groups (Tao and Peng, 2006). Such one-sided information didn't reflect the real costs and is caused by a lack of authentic information on the real estate market. Real estate developers manipulate the housing price information in three main dimensions:

First, real estate developers exaggerate the consequences of regulatory policies to property market. Since 2004, in order to meet the country's macro-control objective, land tightening is a fact. However, relevant functional government departments failed to explain the community whether land supply shortage was normal or was just a temporary status during the time of macro regulations. Besides, the size of gap between total land supply and demand was not explained to the community, creating opportunities for developers to make false propaganda. Real estate developers fully use the land tightening policy as a big fuss, advocating that the tightening policy will inevitably lead to a shortage of housing supply or even the shortage of land for constructing residential houses. Suddenly, the entire market is in expectation of rapid rise of housing price, non-rational housing consumption and speculative housing demand occur.

Second, real estate developers and interest groups together manipulate the housing price. Since 2000, the trend of continuous heating up of real estate industry bring lots of benefits to the newspaper media, about one third to an half of whose advertising revenue comes from real estate industry (Niu, 2012). In the common interest, real estate developers and the media together manipulate the market and mislead the public's expectation: developers employ so-called industry experts and market analysts, usually also government officials, to come up with messages that housing price will continue to rise. Their statements, including market expectation, will be intensified and exaggerated by newspapers while depression of market and statement on housing price decline are lightly mentioned, which has misled the public's expectation.

Real estate developers within a region used to work together to create the phenomenon of shortage of houses and largely increase the prices but without appropriate supervision of the governments. For example, real estate developers in the main city of Chongqing municipality jointly increased the house prices by 500 RMB per square meter (+20%) on the first day of the Chinese New Year of 2004 (Li, 2008). The sudden increase of house prices not only further strengthened the expectation of continuously rising prices and led to the explosive growth of real estate sales in Chongqing in the first half of 2004. Many real estate developers had no more houses to sell and regretted selling the houses at a low price before.

There are plenty of ways used by property developers to fabricate false information and hoodwink the public, such as false housing cost report, hiding excessive profits, non-disclosures on the amount of housing sales, and creating the phenomenon of borrowed property. Hoarding of unsold houses makes a market with supply shortage, while home buyers suffer from asymmetric market information and can do nothing against the random price markup.

6. Strategies and Recommendations

6.1. Suggestions on the Formation of the Distribution System of Land Transfer Revenue

As an important step, many scholars and experts are of the opinion to readjust the current mechanism of land interest distribution among local governments and central governments, in order to establish an effective interest mechanism in both short-term and long-term periods. Tao and Peng (2006) suggest that local governments are allowed to take up not more than 50% from the land transfer revenues to increase the degree of concentration of central finance and curb the impulse of local governments to push up land prices substantially. Meanwhile, value added of real estate developers after tax from the secondary land market should not be more than 30%, which is aimed to reduce land scarcity, land hoarding and speculative land investment. (Gao, 2009).

The second step is to bring land transfer revenue and expenditure into transparent, open and long-term oriented controls. Land transfer fees should be incorporated into local government budgets and expenditure management, which will not only increase constraints on the use of land transfer fees but also increase the transparency of use. Particularly if the current land transfer fees can't be used for current term, it will greatly reduce the excessive impulse of local governments for land selling.

A reform of the distribution system should also consider helping the evacuees to settle down by arranging adequate land compensation fees, resettlement fees and compensation for attachments to green crops on the land. Gao (2009) suggests that land compensation fees should consist of two parts, one-off and persistent compensations. One-off land compensation fees should be about 20 times of average land output value and persistent compensation fees include new skill training cost and endowment insurance money for the evacuees, which are paid one-time in the land expropriation according to specific criteria in different regions. Zhao (2006) even suggests that, during the land expropriation, part of the

land (for example, 10%) should be reserved for villages' use. Landless farmers can together use the compensation fees and resettlement fees as a development fund for these 10% reserved land, gradually strengthen the collective economy and then achieve the sustainable economic development at the village level.

6.2. Reform of the Housing Security System

From a policy standpoint, the housing security system is based on three models: embryonic, social and comprehensive model (Donnison 1967, Doling 1999). Donnison believes that the housing security system with the development of economics will transfer from embryonic to social, eventually become comprehensive.

Housing policy based on the embryonic model is considered as a kind of social consumption, instead of production or investment, to meet the demand and need of low-income households. This model was mainly implemented by developing countries such as Brazil, Mexico, Thailand and India when Donnison advanced this theory. Provisional housing measures taken by these countries, however, lack systematic and effective policies or implementation capacity.

The United Kingdom, the United States, Canada, Switzerland and most Western European countries intervene into the real estate market for the purposes of social development and social welfare; therefore classified as the community-based (*social* model) housing policy. Governments have to care for the low-income households, particularly the unemployed, single parents and migrant workers, because their living is not satisfied by the real estate market due to the non-affordability. Middle- and high-income households are satisfied by the real estate market while governments play a role as regulator and controller.

In both embryonic and social models, governments start to play a role only when housing demand cannot be satisfied by the market. In countries like the Netherlands, Germany, Sweden and Singapore, governments intervene and control the real estate market in all aspects. Donnison categorized these countries as representatives of “comprehensive” in terms of their housing systems. Taking the Netherlands as an example, government's policy

is to establish a housing system which not only guarantees the right to housing for low-income residents but also protects them from social exclusion without concentration of housing construction in certain areas of discrimination; housing policies are set through more comprehensive subsidies so that households with different incomes can live in the same community. Singapore planned to build massive public houses and rental projects by forcing 30% to 40% of the resident's wage taxed to the statutory provident fund scheme, which has made more than 80% of Singaporeans home owners (Shi, 2005).

In developed countries, the percentage of housing supply from real estate developers of the overall housing supply system is about 25% on average, while the proportion of low-income housing or housing with security features is very high. In some countries, the proportion of public houses has reached over half of the total housing supply: the United States (80%), Singapore (85%), Germany (60%) and the Netherlands (46%). However, 90% of housing demands in China were satisfied by property developers (Tian and Zhang, 2012).

Based on the current situation, (Tian and Zhang, 2012) suggest that the future choice of housing security system for China will be a combination of economic affordable housing-, low-rent housing-, common commercial housing and high-grade commercial housing-policy, corresponding to different income groups. Common commercial housing supply should still be in the dominant position in the housing supply system but the proportion of houses at medium and low prices need to be increased. For middle- and high income households, their housing demands are satisfied by the market while the government acts with regulation and control. At the same time, governments should implement policies of economic affordable housing and low-rent housing construction, in order to solve the basic housing problem for low-income families.

However, many problems occur in the implementation process of economically affordable housing and low-rent housing policy in recent years, such as unclear definition of recipients, enterprise-based security housing construction, small scale of government-subsidized houses construction and inadequate location. It needs to be improved and innovated

through following aspects:

First step is to define the recipients for economically affordable housing and low-rent housing. Theoretically, the recipients of government subsidized houses are middle and low income households who are unable to enter the market for housing purchasing or renting. But how to define low-income and middle-income families is a difficult problem. Since China has not yet built files of individual incomes declaration and credit, it is difficult to find out family income accurately. (Tian and Zhang, 2012) suggests that the recipients can be defined by scientific classification of household income levels though quantitative analysis of actual income in different regions and establishment of a strict examination, registration and consulting system to increase transparency.

Second step is to adjust the current affordable housing policy. China's current affordable housing policy requires the protection for low- and middle income families. However, the vast majority of families in China belong to this category, accounting for 2/3 of the total number of urban households (An and Wang, 2007). Expanding the housing security into such a large range is uneconomic, especially not practical for a developing country. This explains one of the causes of the huge gap between affordable housing demand and housing supply. Therefore, Families at middle and upper income level have their housing needs met by the market (An and Wang, 2007).

Besides, affordable housing construction should be restricted by small apartment orientation, which makes recipients easier to buy affordable houses and increases the efficiency on utilizing limited housing resources.

Currently, governmental subsidies on affordable housing provided by the state in terms of land allocation, tax relief and other means of support to the housing developers. Some unavoidable flaws occur unavoidably in such a way of subsidy, such as the inefficiency of the state's welfare distribution because the developers are hard to monitor by the government due to high monitoring costs. Therefore, experts suggested that governments on the one hand should distribute financial subsidies directly to low-income individuals and

provide discount government loans, loan guarantee and other housing subsidies to encourage low-income families to enter the real estate market on the other hand (Li, 2008).

6.3. Adjustment of the Property Taxation System

The current property tax system focuses mainly on increasing the burden of real estate developers aiming to force the housing price to keep in a reasonable range. However, developers could easily switch the increased burden to home buyers and indirectly lead to the increase of housing prices. Tax increase in the phase of housing development is not propitious for sustainable development of the real estate industry. On the contrary, tax collection in the links of housing consumption, tenure and trade can curb speculative investment in the real estate market and reduce the high housing prices. (An and Wang 2007).

In the consumption link, preferential policies such as tax relief of real estate tax or personal income tax should be made for residents' consumer housing demand but not for investment demand. In the links of housing tenure, standardized housing property tax should be introduced and levied on the basis of the estimated value of real estate as times goes on and the tax rate should be set at a relatively high level for the tenure of a second property so that the tax burden becomes a factor needs to be considered for real estate investors. To improve the situation of high vacancy rate of land and houses, future land transfer contracts must include clear conditions and time requirement for the start and completion of housing construction while the introduction of a vacancy tax on land transfer and a mechanism to revoke land use right after a certain period of vacancy is necessary (Liu, 2002).

For speculative investment in real estate, transaction costs should be substantially increased by raising transaction tax rate, business tax rate and income tax rate, which helps to significantly reduce investors' earnings.

Li (2008) suggests establishing an annual rent system for land to replace the existing one-time charge for six or seven decades of land-leasing. This is believed to significantly reduce the proportion of land price to the housing cost, thereby reduce the price of

commercial houses. Cities such as Qingdao of Shandong province and Kunshan of Jiangsu province have achieved remarkable results on the first trial of annual land rent system.

6.4. Improvement of Statistical Methods

Vacancy rate is the most important indicator for judging the existence of bubbles in the real estate industry. China's vacancy rate of commercial housing is obtained by the ratio of reported total floor space of vacant commercial house to the total commercial housing supply of the past three years. This way of vacancy rate calculation can only reflect an increment of vacant houses, but not objectively the total amount of existing commercial houses.

Hence, China's housing vacancy rate calculation should draw on the common computing formula of most developing countries: housing vacancy rate is the percentage of total floor space of vacant commercial house to the total floor space of all existing houses; the total floor space of vacant houses include houses that are unrented for more than one year or houses that are unsold for more than 2 years after their complement (Li, 1999). It is also necessary to add up basic data of vacant houses such as types, unit, price, location, environment and etc. This statistical information should be released to the public regularly.

The growth of real income and disposable income per capita are basic data to determine the trend of housing price. However, income data provided by statistical department mostly include only the wage of workers but do not include subsidies, bonus and housing accumulation funds, which is not an accurate response to real income (Bao, 1999). Therefore, it will be difficult to make scientific judgment for the trend of urban housing price if residents' real income is not transparent.

6.5. Establishment of Mandatory Information Disclosure System

In China, home buyers have no direct access to the information on land supply and land price fluctuation because of the lack of the disclosure system. Some real estate developers disclose false information to hide their profits and even work with their interest groups to

manipulate the real estate system.

To solve the problem of asymmetric information distribution for home buyers and help them to purchase houses rationally, Xiao (2005) recommended that local government should give access to their plans of land supply to the public monthly including actual trading volume, structure, space layout, different selling price and other information on land supply. The scope of mandatory information disclosure system should also include plot ratio, rate of green coverage, construction and installation costs, costs of green coverage facilities, various taxes and fees, profit margins and so on, in order to achieve the objectives of open and transparent market operation.

Besides, the establishment of an effective criminal and civil compensation system is urgently needed, which should clearly define judicial procedures for different violations and should form an effective accountability and disciplinary mechanisms, legally obliging developers to disclose information. Media that help real estate developers to disclose false information shall be prosecuted for their joint and several liability and civil liability, suppressing the collusion of the media and developers to manipulate the market. The formulation of laws and regulations alone cannot assure the transparency of information disclosure in the real estate market, they must be executed with absolute strictness. Not only the government should monitor their execution effectively, but also self-regulatory organizations in the real estate industry and social forces should play a necessary and complementary role (Li, 2008).

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