LUND UNIVERSITY
School of Economics and Management

Master programme in Economic Growth, Innovation and Spatial Dynamics

A historical view of China's Real Estate Industry

Empirical study of the relationship between housing investment and economic growth in China

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Abstract: *This study starts from the historical view of China's real estate industry formation and development. It is evidenced that there were no real estate industry nor real estate market in China's long past history. China's real estate industry was firstly emerging since the early 1980s; its development to a large extent should be attributed to the national Housing System Reform. During the 30 years development, real estate industry has become a very important part of national economy. In the empirical research, we investigate the relationship between housing investment and the economic growth of China by using the yearly data from 1986 to 2010. The recent developed Co-integration, Error Correction Model, and Granger Causality test is employed. Our result supports of the long-term and bidirectional relationship between housing investment and economic growth. For the short term, we found only housing investment has significant impact on economic growth. At last, we conclude that we should not over rely on housing investment and arbitrarily use it to pull GDP growth of China, whereas to stimulate consumption by using housing investment seems appropriate in short period.*

Key words: Economic Growth, Housing Investment, Granger Causality

CONTENTS

1. Introduction

Since the opening up and reform in 1979, Chinese economy has been enlarged by a great deal. Until 2010, Chinese economy has overtaken Japan and become the second biggest one after United States in terms of Nominal GDP. The recent development of China seems to be overwhelming, as we know the Chinese economy has been developing rapidly for decades, even in such a time of global recession. By the end of 2009, the China's economic growth rate is 9.2% (National Statistical Bureau of China, 2010) making China one among the few economies which maintain high growth rate.

Since 2008, a series of real estate bubble burst in many economies in a short time right after the subprime mortgage crisis (SMC) took place in Untied States, as opposed to those economies, Chinese real estate industrial looks quite exuberant. However, Chinese economy has also been hit hard by the crisis as some other countries and regions; the key problem for china at that time is how to stimulate the domestic consumption in order to ease the imbalance between the internal market and the exports. Like the rest Asian countries, China has very high saving rate, but in this crisis period, people would not like to save money in case of inflation and the devaluation of the currency, and the willingness of consuming has been greatly constrained. As response, 4000 billion US Dollar stimulus package had been launched whereby Public infrastructure spending increased quickly taxes were lowered, the government put incentives to boost purchases of consumer durables, and pensions, social transfers, healthcare and education spending were all raised. At the same time, interest rates and reserve requirements were lowered and limits on credit growth were removed (IMF, 2010).

Among all industries in China, Real Estate Industry is one of few sustained with large growth in terms of investments and also consumptions, this is partly due to the Chinese tradition that people consider having a house for their own is of overriding importance, but most importantly because of to purchase durable goods seems to be less risky rather than to keep money in bank account or investing in other businesses in the crisis. Thereby, the real estate industry is considered as one important growth point in this period, for Chinese government, there is no other way better than supporting the housing investment.

However, in most of the early economic studies, the housing investment should at best play a secondary role in development planning. The former economists believed that better housing was a social expenditure, a consequence not an agent of growth, Harris and Arku said (2006). Nevertheless, comparing to other industries, the contribution of real estate industry to GDP is always neglected or under estimated by governments, especially the LDCs, since the real estate industry seems to produce much lower returns. As matter of fact, this is basically true that developed countries have more mature and prosperous real estate market with intensive investment in housing, while most of the developing economies engaged in manufacturing and other infrastructure investment, like China in 1980s. Yet, in recent economic development in world-wide, housing investment's impacts, including the real estate investment, on economy was evidenced being huge which leads to several negative consequences such as the Japanese economic collapse in 1990s and so the American subprime mortgage crisis since 2008.

Up to present, housing investment as the one major part of real estate industry plays more important role to national economy, which normally accounts for between 4% and 10% of the national incomes of the economies (Ball and Morrison, 2000). To look at fixed assets, housing investment accounts for the biggest share about 40% among three principal categories[1] of total fixed assets investment in many western countries in the 'golden age' (Ball, Morrison and Wood, 1995). As we know, real estate industry has become one of the pillar industries of China (State Council of the People's Republic of China, Document 18, 2003) after deepening the housing system reform since 1998. In recent years, the growth of real estate industry is quite obvious, according to the data from the National Statistical Bureau of China (NSBC), real estate industry has maintained at very high growth rate around 33% annually in the past decade, and the aggregate output has been enlarged by nearly 100 times in the period for 1991 to 2008.

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[1] As Ball, Morrison and Wood (1995) defined, total investment consists of the investments in Dwellings, Non-housing structures and Equipment.

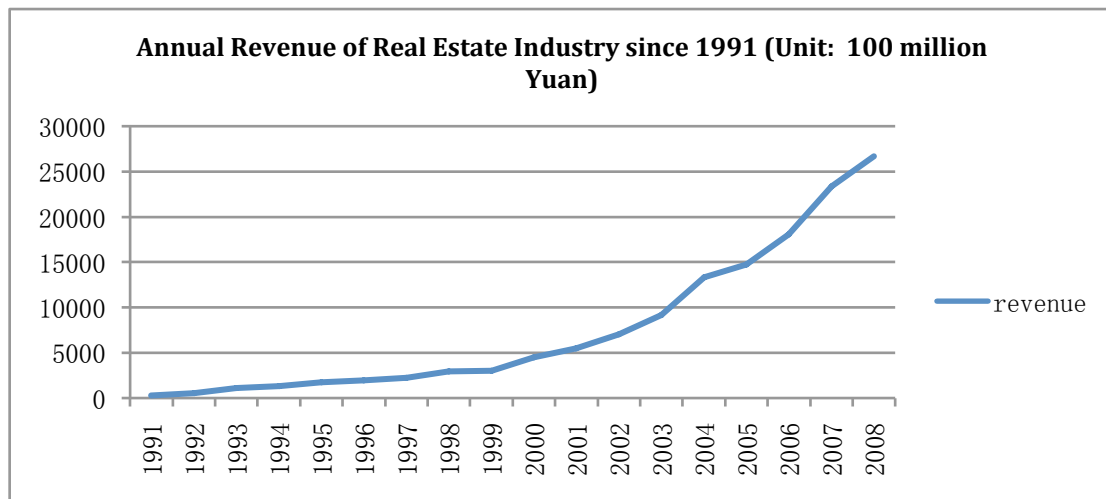**Annual Revenue of Real Estate Industry since 1991 (Unit: 100 million Yuan)**

Figure 1, compiled by author from China National Statistical Bureau, 2008, Note: this data set only includes the revenue of real estate developer. Other kinds of real estate enterprises are not covered.

However, as some news reported recently, Chinese housing price is already too high than people could afford, especially in those first class cities, like Beijing and Shanghai, the average housing price is ca 20000 RMB per square meter[2] in contrast with relatively low income. The real estate bubble has reached an unprecedented size[3] for extremely high Housing Prince to Income ratio (HPI) which generates the concern whether Chinese government should further support housing investment to maintain the growth rate, wherefore it became a dilemma to economic control and adjustment.

Here, we decided to have a study for China's real estate industry and market by providing a historical view of its development process. For the empirical study, we will investigate the relationship between housing investment and China's economic growth in the period of 1986 to 2010 by employing the Granger causality, Error Correcting Model aiming at finding the long-run and short-run effects from one to another, whereby, we could see whether housing investment as representative of real estate industry plays a role as engine of or a drag on economic growth. We also try to apply the investment and growth theories into this study for a qualitative and dialectical analysis.

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[2] " the ranking list of Chinese real estate price per square meter of cities" (in Chinese language) by Jan 2010,to link to the original web-article:
http://www.elivecity.cn/html/chengshifangjia/fangjiapaixing/118.Html
[3] Yan et al, (2006) has investigated the real estate bubble on land among different regions of China, their findings indicated severe bubble existed in Shanghai and Shenyang regions.

1. The previous studies

Numbers of economists have devoted to the study of the interaction of economic growth and housing investment. Most of them have evidenced the significant impacts of housing investment on economic growth. Such as, Michael Ball and Andrew Wood (1997) carries out a study on tests for co-integration and Granger Causality between equipment and structures investment and aggregate productivity based on the long-term annual data of UK. Their results evidence strong relationship of co-integration between productivity levels and fixed investments in both equipment and structures. While, between equipment and structure investments, only structure investment seems to be the long-term drag on economic growth in UK. Michael and Andrew's result of Granger causality test indicates complex two-way relationships between the components of investment and aggregate productivity.

Brito and Perreira A.M. (2002) develop an endogenous model in which housing plays a role as investment as well as consumption goods for households and input to production for the production sector with the aim at revealing the effects of housing related parameters on long term growth in United States. They found that housing investment and non-housing investment have a long run effect on economic growth where the long-term growth rate depends critically on the share parameter in construction activities, the share of nonresidential housing in the production of human capital, and the productivity parameter in the housing construction sector. However their results also show that for reasonable parameter values the responsiveness of the long term growth rate to shocks to construction is greater than its responsiveness to shocks in manufacturing.

Liu HongYu, Yuan W.Park and Zheng SiQi (2002) unfold a quantitative study that investigate the short-run and the long-run dynamic relationships between housing investment and economic growth as well as those between non-housing investment and economic growth based on the data from through 1981 to 2000. By implementing Co-integration and Granger causality tests they find housing investment influences the short-run national economic growth in China, whereas the non-housing investment failed to give strong evidences for the effect on China's national economic growth in short–run. And in the long-run, GDP is evidenced that guides the long-term housing investment and the same effect is also found between GDP and non-housing

investment. Finally they came up with the conclusion that housing construction is a more important driving force of the national economy than non-housing investment during the study period.

Chen and Zhu (2008) have also performed a study in which investigate the long-run and short-run relationship between housing investment and economic growth in China using the quarterly province-level panel data for the period 1999 to 2007. In this study, they employed the econometric techniques for panel unit root testing and heterogeneous panel co-integration analysis. Their empirical results have shown clear support of a stable long-run relationship between housing investment, non-housing investment and GDP in China at the whole country level. Based on that, they further estimated the long-run elasticity of GDP with respect to housing investment for the whole country as well as three sub regions whereby they found that there is bidirectional Granger causality between housing investment and growth in both short-run and long- run for the economy, but the impacts of housing investment on growth are seen to be very different in the three sub-regions of China, of which the reason as they discussed should be attributed to the divergence of economic development and urbanization.

Green (1997) studies the effects of investments of diversity on the business cycle, in which the Granger causality between GDP and housing and non-housing investment has been tested. As results, he shows that the one-way direction of causality that housing investment causes the growth of GDP, at the opposite, non-housing investment does not cause the growth of GDP but caused by GDP growth by using the quarterly time-series data of United States for the period 1959 to 1992. He also finds that housing investment leads to other types of investment lag the business cycle. As response he suggests that policies should be designed cautiously to avoid leading capital away from housing into plant and equipment sectors which might results in immediate and severe short run dislocations.

Richard Barras (2001) has unfolded a study of economic factors to economic growth in United Kingdom, he found that during the nineteenth century commercial buildings and infrastructures were the dominant components of capital investment, both quantitatively and as carriers of the new technologies. However, during the twentieth

century, faster rates of technical progress in the manufacture of equipment compared to buildings ensured that its share of capital investment has increased, while its growing dominance as the engine of growth has been reinforced by taking over as the main carrier of new technologies. From his study, we can observe that investments in commercial buildings and infrastructures have significant effect on economic growth, from 1855 to 1924, the annual contribution of construction investments to GDP is averaged at 2%, but after 1965, as the shift of governmental investment orientation, the effects is diminishing.

Harris and Arku (2006) start a research of the effects of housing investment on economic growth, through its impact on employment, savings, total investment, and labor productivity. This study starts with a contradictory acknowledge of the importance of housing investment to economic growth, that in the early post-war decades most writers viewed housing as a social expenditure and a drag on growth. But since the 1970s, housing has increasingly come to be seen as a contributor to growth, not only because house building is a major employer with large multiplier effects but also because housing is seen to have social consequences with diverse economic effects. Harris and Arku's study have basically evidenced how opinion has changed raises questions as to why it has changed.

2. **Limitation**

Here, we define the housing investment as the investment in real estate development which refers to investment activities of constructing house on the authorized land (using right obtained) on the purpose to sell and make profit, that is to say the housing investment includes the investment in purchasing land and construction, but excludes the real estate investment made by individuals or private investors. Thus the investments in public construction, private investment in housing as well as the solely land trade will not be covered. Besides, according to the category of industries of China, Real Estate is explicitly included in the national fixed assets and separated as one sub-industry. Based on the annual statistics from NSBC, we can obtain the data of yearly and quarterly completed investment in real estate development in which the investment in purchasing land is contained.

***Housing investment = Investment in Real Estate Development = Construction Investment +
Investment in Purchasing Land*** (housing investment will be used in writing for short)

However, since the expenditure of land is included, we should consider the depreciation rate in data modification. But because of the short period (normally 1-3 years) of construction during which most of the unfinished new residential have been sold out, it is hard for us to evaluate the depreciation and remove it from our data, thus in this study, we will employ the yearly completed housing investment without considering the depreciation on land, which might lead to the slight inaccuracy to our results.

Moreover, the shortage of data is one of the biggest limitations. Because of short history of Chinese real estate industry, the most complete national annual data we can achieve is from 1986 to 2010, whereas the reported GDP data can be traced back to 1950s. The inconsistence in both data sets limited us to make a longer time series study. Our study period, from 1986 to 2010, with only 25 samples in time series to some extent affect the accuracy of our results. Despite, we can obtain the accumulated quarterly data for both housing investment and GDP, but after the data deduction, we found the discontinuity of data from year to year that is the q4 data of the former year is always much bigger than the q1 data of the latter, making the time series consists many sub-period series of each year. Statistically, from the plot graph, we observe the very stationary time series with obvious trend which is considered as unnatural with strong seasonal effect by us. Due to our inadequate experience of quarterly data processing, we have to use the less sampled yearly data instead.

However, policy's effects on housing investment and so on economic growth will be discussed in a general form, for which we will not study the effect from a statistical and quantitative perspective, whereas our study will focus on revealing the relationships between economic growth and housing investment. Based on what we found in this research, we will give some suggestions to policy making, but the importance in quantity then cannot be seen in this paper. To reveal the effects of policy on housing investment as well as economic growth, we suggest that it is worthy another specific study.

This thesis only studies the relationship between housing investment and economic growth in China. Of course other investments such as household investment in real estate, government spending in infrastructure, and a series of sub-categorized investments would also affect economic growth which will not be covered in this paper. Moreover, Chen and Zhu (2008) have studied the relationship between housing investment and economic growth in China at provincial level where they found significantly different impacts of real estate impacts on growth in three parts of China (west, south and east), whereas our study uses the aggregate data and we look at the impacts on growth as a whole. The inequality in regional economic development is in consistence with China's unequal urbanization process, we found it difficult to evidence in which regions housing investment is more sufficient than other for overall economic growth. This remained but interesting issue might be considered more in line with geographical economics theories (Lu, 2002).

3. **Theory**

To study the relationship between housing investments and economic growth, we feel a preview of the investment theories as well as the growth theories is necessary.

3.1 **The theory of investment**

Multiplier and Accelerator theory are both important investment theories in economics, which explains the relation between investment and aggregate growth. While multiplier theory was firstly mentioned in by John Maynard Keynes's book (1936)[4], for simplicity, it refers to measuring the degree of the influence on changes of national income by the changes of aggregate demand caused by changes in public investment or government spending. According to Keynes, without full employment and full production capacity, if the investment increase, the effective demand will inevitably increase, therefore cause the national income to increase. The Multiplier Theory is a based on the large scale production background, which centralized on the connections among different social departments of production, precisely describes the norm of economic phenomenon. It could be understood as an infinite recursive chain reaction process among various industries. For instance, the housing investment will not only cause the increase of itself but also the demand of construction, material production and transportation etc, and ultimately cause the economy to grow as a

[4] Refer to John Maynard Keynes, 1936, The General Theory of Employment, Interest, and Money.

whole. However, Keynesian multiplier has two implications for its effect, positively, if investment increase by which the increase of income will be much larger than the increase of investment, likewise, if investment decrease, the caused decrease of income will be larger than the decrease of investment.

On the other hand, Accelerator Theory refers to the positive effect on investment (normally fixed investment) of economic growth. Because, when economy grows, which will stimulate consumption, and this growth of consumption will further cause the increase of production, therefore the relevant investment is required in response. The same, when economic growth slowdown, the investment will subsequently decrease. And because of the multiplier principle, when investment increases, the increase of national income will be multiplied which will further accelerate the increase of investment. The other way around, when investment decrease, the decrease of the national income will also be multiplied thus it will further accelerate the decrease of investment.

However, if we look into the equation, we can find, in the Multiplier Theory, the change (increase or decrease) of investment is considered as independent variable and the economic growth (increase or decrease) is the dependent variable, which explains the effect of investment on national income, whereas in the Accelerator Theory, the change of growth is seen as the independent variable and investment is the dependent variable, which explains the effect of national income on investment. As the simple model shows:

$$\triangle Y = K * \triangle I$$

In the Multiplier theory, K represents the Multiplier, $\triangle Y$ presents the growth, and $\triangle I$ presents the change of investment. And the simple model of accelerator can be written as:

$$\triangle I = K * \triangle Y$$

Where K denotes the capital output ratio (accelerator coefficient), $\triangle Y$ denotes the growth, and $\triangle I$ presents the change of investment.

In economics, the combination of these two theories and their interaction describes the internal function of cyclical fluctuation of national income, which is the most

influential theory of endogenous economic cycles. Investment, national income (GDP), and consumption are always interacting and mutually adjusting one another, if government spending is constant, in another word, under the circumstance that government does not intervene in the economy, there is led to be an economic cycle based on the economy's self-regulating. However, investment is the most crucial factor in the self-regulation of economy, since the economic growth to a certain extent depends on the amount of investment. One on hand, investment has the effect on supply reflected in improving technology and enhancing quality of human resource so that improve the productivity, which normally cannot be seen in a short time. On the other hand the effect of investment on demand is mainly reflected in its contribution to current growth, which is just the process of applying multiplier principle. Comparatively, the effect on supply is more important than on demand due to increasing the productivity, as we know, is determinant for sustainable economic growth, but because of the transfer from investment to production, the effect on supply always lag behind the effect on demand. Therefore, when we use investment to promote economic growth, we should not only focus on the effect on demand at present, but also the effect on supply after a few periods in order to avoid the severe economic fluctuation caused by imbalanced economic structure.

3.2 The theory of economic growth

Theories of economic growth concentrate in exploring the causes, internal mechanism and approach, of growth. The study of economic growth has been lasting for centuries, in the early time, economists such as Adam Smith (1776)[5] and David Ricardo (1817)[6] both carried out research on economic growth. But at that time, there was no system of economic study, most of the economic studies aimed at solving the contemporary problems. One influential economic growth theory appeared in 1948 when Sir Roy Forbes Harrod and Evsey David Domar proposed their Harrod-Domar Growth Model which is the precursor of exogenous model. Based on Keynes' economics theory, they had carried on a long-term and dynamic analysis and pointed out the necessary conditions for stable economic growth and the causes of economic fluctuation. Furthermore, this model seems superior to Keynes' because this model

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[5] Refer to Adam Smith, 1776, An Inquiry into the Nature and Causes of the Wealth of Nations.
[6] Refer to David Ricardo, 1817, On the Principles of Political Economy and Taxation,

reveals the effect not only on demand and income, but also the supply (productive capacity), as Domar (1946, pp139) put out, "investment in Keynesian system is merely an instrument for generating income, the system doesn't take into account that ……Investment also increases productive capacity".

The Harrod-Domar model assume, first there are two kinds of productive factors, which are labor and capital, and both cannot replace one another, second, the return to scale is constant, third, no advancement in technology, and fourth, the marginal propensity to save unchanged. Thus, economic growth is a function of capital-output ratio and saving rate or investment. The simple model can be written as below:

$$\Delta Y/Y = S * \Delta Y/\Delta K$$

Y is output, ΔY is the change of output, so $\Delta Y/Y$ means growth rate; S denotes the saving rate; ΔK is the change of K (capital stock), then $\Delta Y/\Delta K$ means the correspondent increase of output when increase one unit of capital. Therefore, the conclusion derived from the model can be interpreted as growth rate will increase when saving rate increase, but will decrease when capital output ratio decrease. So, the accumulation of capital is very important to economic growth, and the higher saving rate could facilitate the economy maintaining in fast growing. In the same time, this model also indicated the endogeneity of economic instability, which cannot find full employment and stable growth rate so that the proper government's intervention is needed. Really, this model has lots of defects and latter economists have put their criticisms, such as Solow (1956, pp65) stated, "The characteristic and powerful conclusion of the Harrod – Domar line of thought is even for long run the economic system is at the beat balanced on a knife-edge of equilibrium growth. ……the consequence would be either growing unemployment or prolonged inflation". But to some extent, it has a referential value especially for those LDCs which have high saving rate and dominative political power.

Because of the defects of Harrod-Domar model, in 1950s, Robert Merton Solow and Trevor Winchester Swan developed new growth model by adding labor as one production factor, and introducing the Cobb-Douglas production function and allowing natural technological changes into the modeling which saved the problem in Harrod-Domar model that economic growth and population growth cannot be equal to

each other spontaneously. This model is also known as the Neo-Classical Growth Model or Exogenous Growth Model.

In Solow's theory, economic growth is depended on three factors, which are K(t) (capital stock), L(t) (labor) and t (natural technological changes). As the extension of Harrod-Domar model, this model studies the perfect competition market, based on assumption of constant of return to scale and diminishing returns to each factor (K and L), "…devoted to a model of long-run growth which accepts all the Harrod-Domar assumptions except that of fixed proportions" Solow (1956, pp66) said.The simple production function can be written as:

$$Y = F (K, L)$$

Where Y is the actual output or actual national income that is net output after making good and depreciation of capital (Solow, 1956), t equals to time since the technology is varying as time vary. However, the further derivation of this model is somewhat complicated and it is not necessary for us to discuss here, for reader's interest can refer to Solow's work in 1956. [7] The great finding in this model is, under the same condition of exogenous variables, Saving rate, population growth rate and technological progress rate, the less developed economies in terms of less capital per capita will have higher growth in capital and the less developed economies in terms of less income per capita is assumed to have higher economic growth. Nevertheless, the driving force of output per capita (Y/L) is the capital capacity per capita and the technological progresses, in which only the technological progresses can lead to the infinite growth in output per capita.

Indeed, Solow model also has some defects; the major critique indicated that this model did not explain the real causes of economic growth in long-run, because technological progress and population growth is exogenously determined without the explanation for the occurrence, so that the model is to explain the growth based on the assumed growth, which led people to further thinking from the endogenous growth perspective. Besides, the theoretical predictions does not fit the reality, that is if the capital returns reflect its contribution to output, then changes in physical capital

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[7] Robert M. Solow (1956), A Contribution to the Theory of Economic Growth, The Quarterly Journal of Economics, Vol. 70, No. 1. (Feb., 1956), pp. 65-94.

accumulation cannot explain the income divergence between less developed and developed economies very well.

Not a coincidence, as response to the defect of Solow model, in 1980s the endogenous growth theory was developed by economists such as Paul Michael Romer, Robert Emerson Lucas and Elhanan Helpman in order to explain the technological change by applying mathematical and micro analysis. For endogenous growth theory, the endogenously determined technological progress is the core, the technological changes or development is essential for economic growth, like Romer (1990, pp71) put forward, "growth is driven by technological change that arises from intentional investment decisions made by profit-maximizing agents….. Human capital determines the rate of growth". Endogenous growth theory endoginizes the knowledge and human capital into the growth pattern, considering that as other economic activities invest in equipments for manufacturing, the knowledge and technology's progress also requires the investment in human capital (e.g. professional training, education and so forth), this is why as opposed to exogenous growth theory, the technological change is considered as an exogenous variable in the models of endogenous growth theory. Also, from the political perspective, the endogenous growth theory emphasizes on the impact of policy measures to economic growth, comparing to the Neo-classical growth theory that the fiscal policy tends to have very weak effect on growth only for short term due to marginal diminishing returns to physical capital, endogenous growth theory has the assumption of constant marginal returns which makes the sustainable long-run growth possible, therefore government can either directly invest in human capital or issue more policies to rise the quality of human capital and promote technological development in order to promote growth Ickes (1996). Although endogenous growth theory does not provide better answer than neo-classical theory does in terms of explaining the income divergence between different economies.

Nowadays, for most of the economies, the main finding of endogenous growth theory has become the theoretical basis to promote economic growth by relying on knowledge, technology and human capital's accumulation. However, this theory is not perfectly applied in China as China is engaged in manufacturing industry, the

R&D driven economic growth is merely to be seen, which is also relatively true that most of the LDCs have rather low TFP. In the initial stage of development, to a large extent economic growth is relying on massive fixed investment, so Chinese real estate industry plays a very important role at least before the economic transformation. Through the multiplier and accelerator principle, investment will profoundly affect economic growth in a positive or negative way. As we mentioned previously, over investment might cause the big economic fluctuation, and this kind of growing pattern relying on massive investment will obviously not last for long-run. In this period of time, Chinese real estate market and housing investment whether can save Chinese economy or lead to serious and vicious circle has been questioned. But before we go to the further study, it is necessary for us to have the idea of the developing history of this young industry of this old country.

4. **Chinese Real Estate Formation**

In any period of history, land is one of the most fundamental resources for a country; the establishment of private ownership (property right) of land of China could be traced back over 2200 years to Qin Dynasty which is the first unification of ancient China. But for different state systems along history, the land has been given different interpretations. In the ancient time, land was the basis of personal and national wealth and the most necessary factor of production in agricultural society, but not as one common commercial good of trade as it has been today. In the past, house as one appendage of land was not taxed separately in China, of which the implication is quite explicit that house was not separated from land and the house is bundled to land for sale. However, there might be some house trade in the ancient time of China, but in an economy of agriculture dominance, house as the separate good of demand was not significant. Indeed, the theoretical real estate market as we defined today has never been seen in the old time, but property trade was existed, which even had more pure meaning than it is today, because the current real estate trade in China is the trade of the using right instead of the private possession. The house trade, of course, mostly emerged in cities like it is elsewhere in other countries today, but as it is not the specified market, house maintained its original implication as to reside rather than to trade. Therefore, the first generation of the house owners, most of which built houses on their own, so that the second or the third generation of house owners probably inherited from the formers, otherwise, they bought the houses which are "second

hand". In this case, the commercial housing construction was rarely to be seen and most of the housing purchase was based on the properties which were already existed.

Due to the dominance of agriculture and the ideology biases of tradition on merchants, the demand and supply of house as specified good of trade is relatively very small, even in the Manchu Dynasty. As Zhou (2009) stated, there was no professional real estate investor in ancient China, the first presence of real estate market in Chinese history was after the founding of Republic of China. Reasons are plenty, but one of the most convincing reasons is as it was stated above, since the Han dynasty, China has the tradition of restraining commerce, and for those who built a house solely to make money, will be looked down upon in the society. Moreover, housing investment always required massive money to buy land and materials, hire labors as well as settle relations with government. In particular, when there was no "bank" which could provide large amounts of loan and most of the banks are generally small scale at that period of time, which constrained the occurrence of real estate investors. However, the most detrimental factor for real estate development in ancient China is the strict policy on land which limited merchants to purchase the land at large. For instance, in Tang Dynasty, there was such a land policy: "one acre of land should be given to those civilized family which has no more than three family members and plus one acre per family for another three people…..one acre of land should be given to those dalit family with five people and plus one acre per family which has another five people …..And it is not allowed to buy extra land exceeding the system", Zhou (2009)[8]. It is clear that the governmental allocation of land for housing is depended on the family level and family size, people could also buy land, but the purchase of area is limited, not exceeding the prescribed target. Theoretically, a family of merchant which has five people would be given one acre of land by the government (merchant was classified to the dalit group in most of the periods in Chinese history), and one more acre of land could be purchased only when every another five population increased in the family. According to the policy, the maximum area of land can be purchased by a merchant family with one hundred population is twenty acres, with which it is obviously impossible to engage in real

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[8] In Chinese: "应给园宅地者，良口三口以下给一亩，每三口加一亩，贱口五口给一亩，每五口加一亩，……诸买地者不得过本制" originated from "Tang Lv Shu Yi(唐律疏议)" volume 13, Tang Dynasty 652.

estate business. Therefore it is not surprising that real estate market never formed until the Republic of China era, in which foreign banks began to have operations in China and developers could acquire massive loan.

In the Republic of China era (1912 – 1949), Chinese economy was still under dominance of agriculture which accounted for the biggest share of Chinese GDP and labor input, that was 59% of the total GDP and 79% of the total labor force by the end of the year 1933 (Fairbank, 1982). At the opposite end, in 1933 modern factories produced only 2% of the GDP and employed 0.4% of the china's labor force despite of the rapid growth rate of industry sector at about 8% -9% as Naughton (2006) noted. Foreign direct investment was also small, as Fairbank (1982, p116) put out, "Foreign trade and investment played a relatively small role in the Chinese Economy…..most of the Chinese economy remained beyond the reach of the foreigner". The total FDI was only 2681 million USD (6.5 billion Yuan in 1957 price) in the year 1931 and accounted for 10.5% of total GDP (ca 62 billion Yuan in 1957 price), but it is not insignificant, if considering its impact from technology perspective and contribution to Chinese modern industries. As the Graph given below, the biggest share of foreign investment attributes to the transport sector which is 31.5% of the total FDI, whereas the investment in property is relatively small with 9.9% share, but in terms of the growth, it is obviously vigorous and the fastest growing sector in the period from 1914 to 1931. However, there was not enough evidence found that most of the money had been put into private housing, but the absolute figure, to a certain extent, revealed a picture of the formed real estate industry we never seen in the past of Chinese history.

	1914	1931	1936
Import-export trade	142.6 (13.4)	483.7 (19.4)	450.2 (16.8)
Banking and finance	6.3 (0.6)	214.7 (8.6)	548.7 (20.5)
Transport (railways and shipping)	336.3 (31.5)	592.4 (23.8)	669.5 (25.0)
Manufacturing	110.6 (10.4)	372.4 (14.9)	526.6 (19.6)
Mining	34.1 (3.2)	108.9 (4.4)	41.9 (1.6)
Communications and public utilities	23.4 (2.2)	99.0 (4.0)	138.4 (5.1)
Property	105.5 (9.9)	339.2 (13.6)	241.1 (9.0)
Miscellaneous	308.2 (28.9)	282.9 (11.3)	65.3 (2.4)
Total	1,067.0(100.0)	2,493.2(100.0)	2,681.7(100.0)

Table 1, John K, Fairbank (1982), Foreign direct investments in China by industry (U.S.$ million; in parentbeses) Source: The Cambridge History of China, Volume 12, Republican China 1912 – 1949, Part 1, p119, 1983,

In the context of real estate, the housing market was almost centralized in urban area like the city of Shanghai in which 34.5% of the total foreign capital has been invested (Fairbank, 1982) and in the much boarder rural area the traditional land trade maintained its dominance that is landlords engaged in the agriculture sector and the major income basically depended on the land leasing. The development of housing market should be attributed to the success of foreign banks in China and the forming of new norm of Chinese banks. As Fairbank (1982, p111, p268) noted, on one hand, "128 new banks were established from 1928 to 1937, and in 1937 China had 164 modern banks with 1,597 branches, these were overwhelmingly concentrated in the major cities of the coastal provinces", on the other hand, "there were approximately 27 foreign banks with branches in China commanded three or four times the capital of 199 Chinese banks in the republican period", but due to the strict law of land, few of foreign banks could make direct investment of land out of the concession area, as result, foreign banks virtually monopolized the lucrative foreign exchange and foreign trade markets and provided massive loans to local bankers and capitalists. Therefore, to a large extent, the land as well as housing business was only carried out by Chinese bankers and capitalist.

For some historical reasons, it is not possible to find the complete and precise data of real estate industry in the period of the Republic of China, which limits the statistical study in this paper. However, because of WWI and the Civil War and several social revolts, the whole economy was order-less for some time, the discontinuity and unreliability of data should be taken into the consideration. Before the Japanese invasion, despite of fast industrialization, the short period (known as "Nanjing decade") of development of modern industry limited the urbanization process and therefore, the real estate market was not fully formed due to the insignificant demand of housing over China, Zhou (2009).

From 1937 onwards, Chinese economy was crippled by the war, the whole infrastructure as well as the fundamental industries needed to be reestablished after the communist victory. But because of the change of political regime, the whole economic institution had been changed during the recovery process. Obviously, the most profound change was the change in property rights. This change was seen

differently in urban and rural area, as Naughton (2006, p114) illustrated, in the urban area, "every business and productive enterprise was converted to public ownership and became subject to direct or indirect government control" and in the rural area, "the private land was eliminated in 1955, and the land in every village was pooled together and became the property of the village as a whole" that is the so called collective ownership. Hence, during the overall nationalization process, the private property and resources was relatively equally redistributed, but the public or collective ownership are essentially different which led to, not only, the divide between urban and rural society, but also the barriers to mobility from village to city which is the basic form of Chinese "HuKou"[9] system. That is to say, government intended to develop the urban region as developing in heavy industry, whereas the agriculture sector lagged behind, where the inequality of living standards and income in rural and urban regions had been greatly enlarged, as results, none of the agricultural identity inhabitants could move to cities. This strict policy, to a certain extent, caused the non-urbanization and even the de-urbanization from the end of 1950s to 1978 (Naughton, 2006, p126).

However, Chinese economic development was prospering for a certain period in urban area, which should be attributed to the Big Push Industrialization (overwhelming priority channel the maximum feasible investment into heavy industry, Naughton, 2006). The overall investment was very substantial, according to the figure below, the investment rates were assumed to be over 25% of GDP, and it was even peaked at 43% in the end of 1950s.

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[9] Known as the Chinese identity system, people are identified as agricultural cannot migrate to cities, vice versa, which is extremely strict in the period of Mao's governance. It is also known as the "HuKou" system nowadays.

Figure 2, Investment as share of GDP, Source: Naughton, 2006, The Chinese Economy, Transition and Growth, p 57, The MIT Press.

As matter of fact, almost all of the investment was governmental in that time. Urban inhabitants were identified by and belonged to their working unit, and so were their own families. None of the housing investment was solely existed on purpose to trade. The houses or apartments given to those families to live in were appendages of manufacture investment, and there was no real estate market.

The real emergency of real estate market we can find in Chinese history was after the "Opening Up and Reform", marked by the establishment of the Beijing Urban Development Corporation, in year of 1980. As Lee (1988) found, by 1978, the problem of housing shortage is widely existed in all Chinese urban regions, about 35.8% of urban households had insufficient floor space, in some cities as Guangzhou, the per capita floor space is only 2 square meter. After the Mao's Cultural Revolution, more and more "Educated Youth" came back to their cities from agricultural regions. The big surge of return and sudden increase of house demand in 1979 exacerbated the situation of housing shortage and forced the government to implement the "Housing System Reform. Basically, the Housing System Reform is an important part of China's overall economic reform and the development of China's Real Estate Industry is in the track of China's modern economic development. As Du and Sheng (2001) states, housing reform has been a key component in China's economic revitalization program initiated by the late paramount leader Deng Xiaoping since 1978. There were four important stages up to complete formation of real estate market

and abolition of housing allocation regime. In 1978-1985, which is the period government started the pilot housing selling, that is the government built up houses and sold to public. The second stage from 1986 to 1990, the government started another policy as providing subsidy to those who rent houses. The third stage was from 1991 to 1993, in which Chinese government launched a series of house sales incentives, and China underwent the real estate bubble bursting in Hainan province for the first time as Miyazaki (2010). From 1994 to 1997, China has entered the period of comprehensive marketed-oriented housing reform. In 1998, the Chinese State Council issued the "Circular on further deepening the urban housing system reform and speeding up housing construction" (1998, State Council of the People's Republic of China, Document 23), which is the milestone of Chinese real estate development, from 1998 onwards, China has terminated its old housing regime; the housing allocation regime has been replaced by the housing provident fund system in state hold enterprises, and the whole real estate industry has been completely commercialized and socialized. (Du and Sheng, 2001)

It should be said, deepening urban housing system reform is in line with promoting market-oriented economic reform and followed the market's overall requirements, but there is a special background and intrinsic motivation. At that time, under the old housing system, low rent housing was unable to maintain normal housing maintenance and all of the maintenance fare had to be taken by the government, which was a heavy financial burden. By reforming the welfare housing system, the Chinese government aims at the removal of a burden (i.e., welfare housing) from state finance, as Du and Sheng (2001). Besides, in response to the Asian financial crisis in 1997, China started to implement a proactive fiscal adjustment and income distribution policies in order to increase and stimulate aggregate demand, while housing monetization and commercialization somehow met the needs, which was considered to be the best way to stimulate domestic demand and consumption for pulling economic growth and improving the economic structure.

Chinese real estate industry, since the beginning of China's Housing System Reform, seems to be given a role as economic savior. According to SG Cross Asset Research, 2011, Chinese economic achievement should be attributed to gross capital formation, since 1980s, investment was always considered as one of the most important factor to

Chinese economic growth. Housing investment as one essential part of the gross capital formation, the significant rise of this industry, to a large extent, contributed to the GDP growth. As we know, investment can not only create demand, but also enlarge the productivity. To invest in real estate, from one aspect, definitely will drive up the growth, but in China, the positive effect seems to be over emphasized, whereas the possible serious fluctuation resulted from intensive housing investment is ignored or at least not mentioned by Chinese government.

In another circular, "The Circular of Promoting Healthy Development of Real Estate Market" (2003, State Council of the People's Republic of China, Document 18) has clearly pointed out that Real Estate is a pillar industry of national economy. Since then, "real estate as a pillar industry of national economy" was pushed to the extreme by the local governments, and the economy evolved into an abnormal growth pattern. Local governments were very enthusiastic in leasing land, even the agricultural land was expropriated for large-scale real estate development and construction. Relying on housing investments, the local economic development was greatly accelerated so that the local governments' revenue had been increased at large and directly been filled by the land leasing earns and property taxes. For local governments, the land had become an important weapon to increase revenue, Zhou (2009).

Moreover, city image projects was vigorously carried out in many places of China, which caused the blind expansion of large scale of demolition, man-made demand, and also driving up the prices of real estate. Local governments were good at speculation in land, for instance local governments acquired land (agricultural land or old land of overdue using right) from publics at low price and sell to enterprises or real estate developers at high price. Some governments even instigated the real estate investor to bid up land prices and build more high-end residential, because the high land price will directly lead to the high prices of houses, and for them, the high prices of houses were a good sign of economic development. Thus, under the policy and such interest-oriented mechanism, the housing investment overwhelmingly increased throughout China.

In recent years, the house prices have undergone a non-stop increase process, in four major Chinese cities, Beijing, Shanghai, Guangzhou and Shenzhen, a new normal

residential for a three population family to live costs at least 2million Yuan. Considering the relative low average income[10] (4500 Yuan per month in four cities), one family, if both parents have a job, has to work for about 38 years to clear the full loan, without considering the interest, by paying 50% percent of a family's salary every month. Besides, the using right of property is just 70 years in China, this 38 years seems to be a huge burden to normal Chinese people. According to Hawtry (2009), households who pay more than 30 percent of their pre-tax income on housing costs, whether renting or buying, are said to be in housing stress, which is a widely accepted benchmark for the problem of affordability. Belsky et al (2005) also put, households spending more than 30 percent are labeled cost burdened and those spending more than 50 percent are labeled severely cost burdened. Apparently, in most of the urban regions of China, city inhabitants are in the situation facing the severe affordability problem.

If we look into the Housing-Price-to-income Ratio (HPI), China is among the highest countries of that. According to the Global Property Guide's calculation (2011), China's HPI is 209.09[11], in comparison Japan is at 35.93, USA is at 28.66, UK is at 49.87 and Sweden is at only 11.2, which means one Chinese people work for one year, can hardly afford even one square meter of a residential. However, the average housing price used by GPG is of the apartments located in the major cities and the housing price is supposed to be much higher than other places in China. We should not so rely on HPI, since China's situation is most complicated, where a certain amount of the houses were allocated by the government or purchased at very low price before the housing system fully transformed. Besides, lots of Chinese state own companies still have their own subsidy housing system for their employees. This system is normally running in two different ways, on one hand, the state own companies can purchase land from the local government at relatively cheaper price, and constructed apartments on their own, then sells them to the employees at cost or

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[10] According to NSBC (2010): average salary in 2009 (Chinese Yuan) of Shanghai, Beijing, Guangzhou and Shenzhen is in tandem: 58336, 57779, 49215, and 51156.

[11] The formula is: (Price per square meter / GDP per capita)*100. The house price to income ratios published by the Global Property Guide are based on the Global Property Guides own proprietary in-house research and the IMFs GDP per capita figures. 10 years period from 1997 to 2007. http://www.globalpropertyguide.com/Asia/China/price-gdp-per-cap.

at huge discount. On the other, state own companies purchase a huge amount of commercial residential from real estate developer at the negotiated price, and then allocate or sell to their employees at low price. However, these residential which bought at very low price can be sold at high market price to make profit or to purchase new residential. Therefore, the average market price cannot really reflect the reality. Moreover, in most of the developed economies, the housing price tends to be three to five times of income per capita, whereas five to seven times seems to be ordinary in Asia. According to the ratio published by NSBC, it is always around nine at the national level, which is high but not certainly dangerous. As many argues, high HPI in China, is reasonable, if we consider the Chinese culture and outlook of value, to purchase house is very important which turns out to be very high demand of housing and enlarge the difference between housing price and income.

As matter of fact, China's economic growth is paralleled with its urbanization, as demand keeps growing and as agricultural population are still large, the increase of housing price will unlikely to slow down. The housing price as it mentioned above is already somewhere around 30 times of annual income in four major Chinese cities, considering the importance of big cities to GDP, extremely high housing price has become a serious problem to Chinese sustainable economic growth. At least, for younger generations after 80s and 90s as well as the newly immigrants to the big cities, house is certainly a huge burden to them and to the country.

In all, Chinese real estate industry was formed in a very short time, the rapid increase of investment is not surprising especially when the property right has newly come into people's sights and the market is just commercialized. But considering the over fast growing investment and rocket riding housing price, no wonder we concerns its influence to the whole economy. The whole real estate industry has experienced an even faster growth than China's GDP in a shorter time. After last two decades development, Chinese housing price is already too high for people to afford. Real estate as one of the pillar industry has very important meaning to the whole economy. But if we over depend on this industry and push the housing investment to extreme, we might face very serious and unexpected consequences in the future.

5. **Housing investment, GDP and policy**

Investment is one of the most crucial factors for Chinese economy, because Chinese economic achievement, to a large extent, is attributed to gross capital formation. This is basically accepted as investment led growth pattern for developing countries. Housing investment as part of the gross capital formation, of course is assumed to have certain contribution to GDP growth of China. As we know, Chinese growth rate has been few of the best in the world for 30 years. However, if we have look into details of China's industry, we would be more surprised by its constant and high growth rate in many industries. Real estate is just one of the most surprising growing industries for the constant and almost two times growth of GDP. Based on data from NSBC (referring to Figure 2 below), we can see the annual investment in real estate was growing rapidly, the growth rate was 21.5% in 2000, 30.3% in 2003, and 29.6% in 2004.
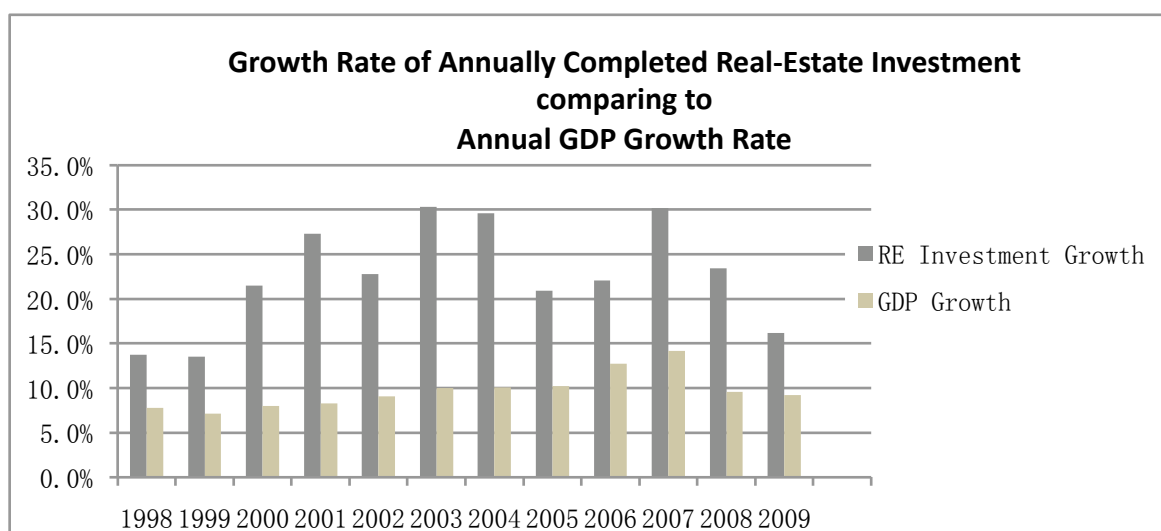

Figure 3, compiled by author from China National Statistics Bureau, 1999-2010 Investment in real estate development, from IMF Executive Board Concludes, 1997-2011.

Nevertheless, housing investment as the proportion of fixed assets investment illustrates a significant pattern. As figure 4 shows, from 1997 onwards, the proportion kept growing and maintained the proportion around 18% after 2001. However, Chinese economic regime determines that a major part of the infrastructure spending is governmental, most of the infrastructure investments are made directly by government or state-own enterprises. Among the fixed assets investments, housing investment as one of few kinds of economic activities which are highly commercialized and market oriented. According to the data from NSBC, by the end of

2007, the total amount of real estate companies was 62518, in which state-own ones are only 3617. To some extent we can assume that this over 94% private or collective real estate enterprises dominances about 15% of the fixed assets investment of China. In this situation, real estate industry is supposed to be more self regulated and can reflect the over economic circumstance.
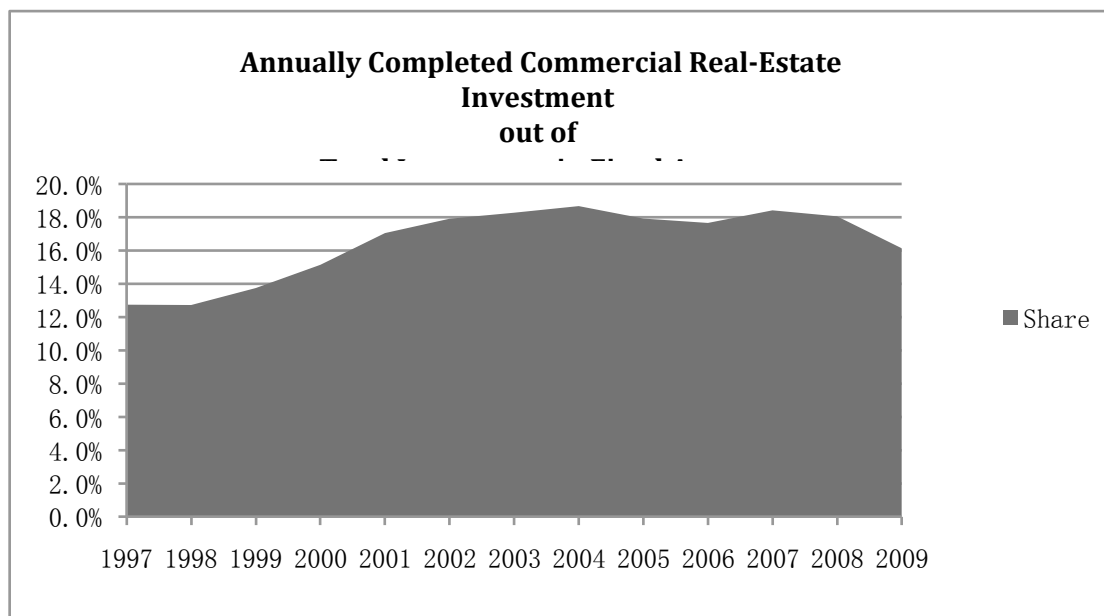

Figure 4, compiled by author from NSBC, 1999-2010

On one hand, housing markets are widely regarded as among the most volatile sectors of developed economies, about five times as volatile as GDP (Nguyen, 2009, for OECD), and the focus of government intervention, as Ball and Morrison (2000) put, "there have been two regulatory routes. The first is direct demand and supply interventions using country-specific mixes of tax breaks and subsidies, specialist-regulated financial institutions, land-use planning controls and social housing programs. The second route has been via macroeconomic policy, where housing is expected to be particularly sensitive to interest rates and public expenditure levels." On the other hand, housing investment could be used as a good mean for the government to adjustment the market, that is housing investment in China can directly create instant demand. Not a coincidence, China's real estate industry development in the past decades and now fits the saying very well. Chinese government has realized the severe situation for which a series of policies has been announced in the early 2010.

The Share of housing investment as a percentage of total output (SHTO ratio) is a widely used indicator since Burns and Grebler's research in 1976. We see that the share of housing investment of GDP has reached 8.3% in 2004 and kept increasing in the next years (refer to figure 4). The international experiences illustrate the housing investment contribute to GDP normally at 5 to 8% in developed economies and 3 to 5% in less developed economies (Turin 1969, 1973). Moreover, according to Burns and Grebler (1976), normally the proportion of housing investment of GDP should be controlled by 5% in order to avoid unpredictable economic fluctuation. However, as we mentioned in previous contexts, because of the multiplier effect, the housing investment will have extensive effects on demands both in upstream and downstream industries, therefore, the real contribution to GDP must be greater in China. As Liu, et al,.(2002) point out, of the GDP growth rate of 7.3% in 2001, 1.3 percent was directly contributed by the real estate sector and 1.9-2.5% was directly or indirectly contributed by the real estate sector. This implies that the real estate sector accounted for 30% of the GDP growth rate in 2001. But generally speaking, the impact of housing investment on economic growth still remained in controversy; indeed, the housing investment has the effect on creating short term demands in the market as well as improving the landscape for living and working environment in a certain region, and attracts economic activities and investment from other regions. But at the aggregate level, there are other factors which are paralleled, some of which might be caused by housing investment and some of which might be not caused by cause it. So it is hard to identify the net effect and to what degree it can affect economic growth. In another word, we could say, it might be necessary but not sufficient.

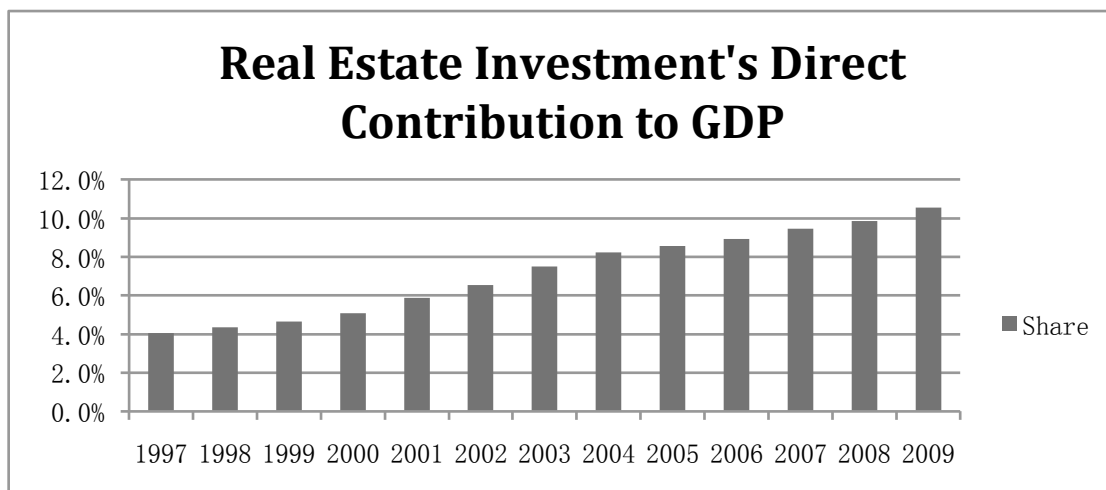**Real Estate Investment's Direct Contribution to GDP**

Figure 5, compiled by author from China National Statistics Bureau, 1999-2010

To reveal the effects on demand and so on the economy, it is necessary for us to look into the relation between revenue and disposable income. Real estate revenue is an important indicator which can reflect the change of direct demands created by investment, and to compare the status of revenue and disposable income, we can obtain a pattern of affordability. According to Figure 5, we can observe a almost stable growth of disposable income which is in line with China's GDP growth, whereas the real estate revenue growth is seen to have a unsteady and up-down floating pattern, but in most of the years we can see that growth of revenue is much more vigorous than the growth of disposable income.

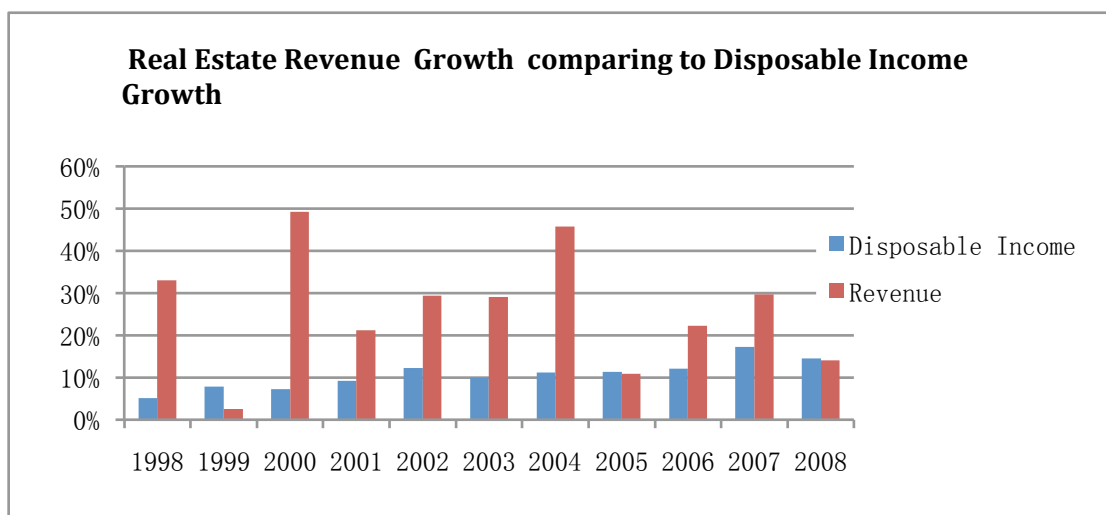**Real Estate Revenue Growth comparing to Disposable Income Growth**

Figure 6, compiled by author from China National Statistics Bureau, 1999-2010, Note: the urban disposable income is used in graphing.

Consumer as the ultimate undertaker of all consumptions, the increase of revenue of real state means the increase of their expenses in housing, which will lead to squeeze

out other consumptions of them. If we put the rural data into account, the growth rate might not change but in the absolute figure, the overall disposable income will be largely dragged down, because the rural areas' average disposable income is less than 1/3 of that in urban areas (NSBC, 1998-2010). At least, the high inequality between growth of real estate revenue and disposable income will become a huge barrier for the future city inhabitants. The inconsistent growth pattern of revenue and disposable income has revealed the unhealthy Chinese economy. The implication of bubble to economic growth at least can be found in two facets; first, bubble may lead to the more serious problem of affordability because of the growing housing price, thereby ultimate consequence can be assumed to be that few consumers would buy residential in the end which might result in the termination of housing investment by real estate developer. As we mentioned, the through the accelerator and multiplier effects investment will have direct effects on demand, thus the termination of housing investment might have large and negative effects in various fields of economy and further cause the serious fluctuation. Second, the bubble would have the negative effect on urbanization process, which might limit the labor supply of other industries. Because, high housing price will to a large extent block out large number of the migrants especially when disposable income in rural area is just 1/3 of that in cities. In all, expanding bubble might cause serious problem to Chinese economic growth by having the potential effect on demand as well as the labor supply.

What is more, according to NSBC, China's housing investment for real estate developers highly depends on the bank loans, the private financing to loan financing ratio is at almost 1:1[12]since 1998 as data we can observe. On the other hand, the current inequality between housing price and disposable income compels large part of private housing consumers to seek loan finance from banks. In China, among kinds of housing loans, mortgage loan is the most popular and widely implemented one. As we know, normally banks absorb the family savings of short term and utilize these savings to provide the long term mortgage loans. In order to make profit, the deposit interest rate must be lower than the loan interest rate for both housing consumer and real estate developer. According to NSBC's records, historical deposit interest rates of the People's Bank of China (central bank), has kept declining from 3.15 to 0.36 for

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[12] Other sources of funds are categorized as foreign investment and other funds, which proximately accounted for 50% of total sources of funds, where foreign investment accounts for only 8.1%.

the period 1993 to 2008, comparatively the interest rate of long term loans (over five years loan) was also decreasing from 12.24 to 7.47 for the same period. However, as we can see, in terms of degree, deposit interest rate was decreasing farther stronger than loan interest which is attributed to Chinese overall stimulus strategy of consumption. Especially in the crisis period, this 0.36 is an unprecedented low rate which discourages the savings but encourages the investment or purchase in durables as residential.

The loan interest rates for housing consumer and real estate developer are different that is the housing consumer, in most cases, requires longer term loan whereas the real estate developer's requirements for loan normally aims at cover its cost for construction and land purchasing. As long as the new buildings have been sold, they can pay back the loan and apply for new loan for other housing investment. This period is normally 1 to 3 years relying on current Chinese real estate market. Therefore, for banks, the risk is mainly due to the long term loan for the ultimate housing consumer. Since high housing price and low disposable income might bring risk as the huge amount of bad debit to banks. Once the mortgaged residential could not be auctioned off by banks in a certain time. Its effect could soon lead to the bad debit of real estate developer, so affect the whole real estate industry and economy.

Banks plays not only the role as intermediate for investment financing, but a good agent for the government to execute the macro control and adjustment. Since 2010, Chinese government has put out a series of policies which limited the housing investment as whole. As Ministry of Finance of China (2010) introduced the new norm of taxation for private housing selling with the aim at suppressing housing speculation, to sell the residential within five years since the purchasing date will be taxed 5.6% of the total value of the residential, besides if there are more than one residential owned by one person, to sell the extra residential the personal income tax at 20% of the profits will be added. Moreover, another policy issued by the National Council (2010) seems to be more profound for suppressing overheated real estate market, it indicated that to purchase the first residential over 90 square meters the initial installments has to be paid at 30% of the total loan for a family (normally three members), and for second residential, the installments is specified to be 50% of the total loan, and the loan interest rate has to be no less than 1.1 times of the benchmark

interest rate of loan determined by central bank for any situation. For the third residential, mortgage loan as the financing method of purchasing will not be allowed in major cities. As matter of fact, these policies seem to be not so efficient, according to the annual statistical report (NSBC, 2011), in 2010, the average growth rate of housing price is 13.67% which is even higher than that in 2009[13]. However, the explanation could be found from two aspects, first, we speculated that the normal housing consumer who purchase only one residential on purpose to live will not be highly affected by these polices, for those who engage in private housing investment, the effect on which cannot be seen in a short period since as housing price keep increasing investment would be profitable, besides the real private investors do not really rely on bank loan that much, unless the normal housing consumer reacts. Second, we consider the impacts on real estate developer, as those policies does not essentially constrain the housing investment in building new residential, the housing investment will remain on the same level as before. Therefore, to efficiently alleviate the extreme fluctuation in housing market activities, the government should at least rise up the interest rate of long term loan and limit the bank for providing too much loans to real estate developers. Moreover, we consider a strict top-down control of land trade could be essential for limiting housing investment.

Overall, Chinese economic growth is basically in consistence with housing investment growth and housing investment is viewed as contributing a large share of GDP despite of other potential and paralleled driving factors. Through the multiplier effect, housing investment may have stronger effect on creating instant demands in the market as well as lead to vigorous real estate investment by private investor. Nevertheless, Chinese real estate market is also evidenced quite unhealthy due to the high inequality between housing price to income results in the real estate bubble is at the edge of bursting. To alleviate the fluctuation to the economy, we suggest Chinese government should put more efforts on controlling housing investment of real estate developers.

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[13] The annual growth rate of housing price in 2009 reported by NSBC is only 1.5% which is widely suspected of data faking in society, whereas another figure provided by Ministry of Land and Resources of China (2010) is 25.2%, which is almost 17 times bigger. To link to the report: http://www.mlr.gov.cn/tdsc/djxx/djjc/201004/t20100401_713692.htm

7. **Empirical Study**

Based on the study above, we can conclude that housing investment has very tight relationship with economic growth, but to confirm the relationship and to better understand the causality and degree of effect, we would like to carry on with an analytical study by borrowing the Co-Integration test, Error Correction Model, Granger Causality test.

Model Introduction

The traditional econometric method which is to directly use the level value of variable to study the equilibrium relationship between series, could easily lead to wrong conclusions since economic time series variables are often non-stationary. The usual procedure is to run OLS regressions on time series data which has been differenced in advance, which is generally correct only when samples are large, because taking difference of limited length data could cause the problem of losing important information. However, the recent developed Co-Integration analysis has made considerable progress in dealing with times series data for variables stationarity. Co-Integration holds the simple meaning that although the time series variables are individually non-stationary, but their linear combinations might be smooth. That is to say if two time series variables are co-integrated there must be a long term equilibrium relationship in-between. Therefore, Co-Integration method is aiming at finding the long term equilibrium relationship between non-stationary time series variables and revealing the intrinsic connections. In practice, we normally test the stationarity of the time series variables and the first-order difference variables first, and then test the co-integration relationship between variables. When the co-integration relationship is found, we can establish the ECM (Error Correction Model) for short term effects.

Test for Stationarity

Before we perform Co-integration test, we should find out whether the series are stationary or not for the reason that only series of identical integration order can employ the Co-integration test. Generally we make use of Unit Root Test to exam stationarity. And there are mainly three kind of Unit Root Test namely Augment

Dickey-Fuller (ADF) test, Phillips-Perron (PP) test, Kwiatkowski–Phillips–Schmidt–Shin (KPSS) test, respectively. However we should first have a look the definition of a stationary series, that is,

A stochastic process having a finite mean and variance (covariance) is stationary if for all t and t-k, more specifically

$$E(y) = A$$
$$\sigma^2 = B$$
$$Cov(y_t, y_{t-k}) = C$$

where A,B,C are all constants.

Judging the stationarity of series can either plot the graph or perform Unit Root Test. And I consider econometric tests are much reliable and scientific. Here I am going to conduct Augment Dickey-Fuller (ADF) test to exam stationarity of each series.

ADF test

Dickey and Fuller (1979) developed so-called DF test, the basic idea of DF test is to test null hypotheses that the Game equals one in.

$$y_t = \gamma \, y_{t-1} + u_t \qquad (1)$$

against one-sided alternative that Gama smaller than one. The latter implies the series is not stationary and the latter proves the stationarity of the series. But in practice for the convenience of calculation and interpretation the re-arrangement of above equation

$$\Delta y_t = \psi \, y_{t-1} + u_t \qquad (2)$$

is employed. Testing for the null hypothesis of zero coefficient of one-period lagged y is equivalent to test Game that equals one in the previous model. In the meantime DF test is carried out allowing for a constant, a constant and trend, or even though neither. However for some of the situation the disturbance term is no longer a white noise process, which would contribute to the inaccurate inference when performing the DF test. In order to solute this problem augmenting the test using p lags of the dependent variable is a better way out. The model has become

$$\Delta y_t = \psi \, y_{t-1} + \sum_{i=1}^{p} \alpha_i \Delta y_{t-i} + u_t \qquad (3)$$

This is the basic structure of ADF test equation, however we can alter the above equation by adding a constant or a constant with a trend according to the characteristics of the series.

Co-integration test

Cointegration means that although many things can cause permanent changes between two variables y_t and x_t, however the linear combination says

$$\alpha_1 y_t + \alpha_2 x_t$$

reflects some long-run relationship between the two variables. In order to find the long-run relationship between two variables we first use the OLS estimation to build up the model and then we check the stationarity of disturbance term. If the residual is turned out to be stationary then we could conclude that two variables have long-run relationship. If residual is not stationary then we can say that they don't have such long-run relationship.

Error Correction Model

Even though we discover the long-run relationship by using co-integration test, we cannot neglect the short-run effect due to the fact of incomplete adjustment. Therefore we need to build a so-called Error Correction Model to see the short-run dynamics. A simple dynamic short-run adjustment model is given

$$y_t = \alpha_0 + x_0 x_t + x_1 x_{t-1} + \alpha_1 y_{t-1} + u_t \qquad (4)$$

If we rearrange it, we will achieve

$$\Delta y_t = \alpha_0 + x_0 \Delta x_t + (\alpha_1 - 1)[y_{t-1} - \beta_0 - \beta_1 x_{t-1}] + u_t \qquad (5)$$

Where
$$\beta_0 = \frac{\alpha_0}{1 - \alpha_1}$$

The model explains how short-run fluctuation of y, which is also known as Δy_t, is determined. On one hand it is affected by the dependent variable short-run deviation Δx_t. And on the other hand the long-run relationship between y and x also exert influence on Δy_t. That is, the disequilibrium at time t-1 affects Δy_t through the

coefficient, $\alpha_1 - 1$ that is also known as the speed of adjustment, it measures how the variable, Δy_t, changes in relation to disequilibrium.

Data selection and treatment

Data selection

We choose GDP as the assessment of the market value of all final goods and service produced in a certain period as the indicator for economic growth, and we choose the housing investment as exogenous variable to exam its effects on GDP. All data are available and obtained from NSBC. Although, the available data of GDP date from the beginning of founding of PRC, because of the short history of Chinese real estate industry and inequality of regional development, we can only obtain the data of housing investment from 1986 to 2010, therefore we chose the time period from 1986 to 2010 for both variables.

Data treatment

We notice that the GDP and housing investment were calculated in the market value in the corresponding years. Unfortunately we are unable to find the suitable deflator, therefore we employ the raw data in the modeling and we believe this will not affect the results since the real GDP growth rate recently are far more beyond the inflation rate and other factors. We take the logarithm form of GDP and housing investment for the reason that it not only removes the heteroscedasticity of the series but also doesn't influence the short-run and long-run relationship between the series. What is more, for most of economic variables their logarithm is normally distributed, this is a desirable property for estimation. The logarithm form of GDP and housing (Real Estate) investment are denoted as lngdp and lnre respectively

Figure 7 lngdp and lnre
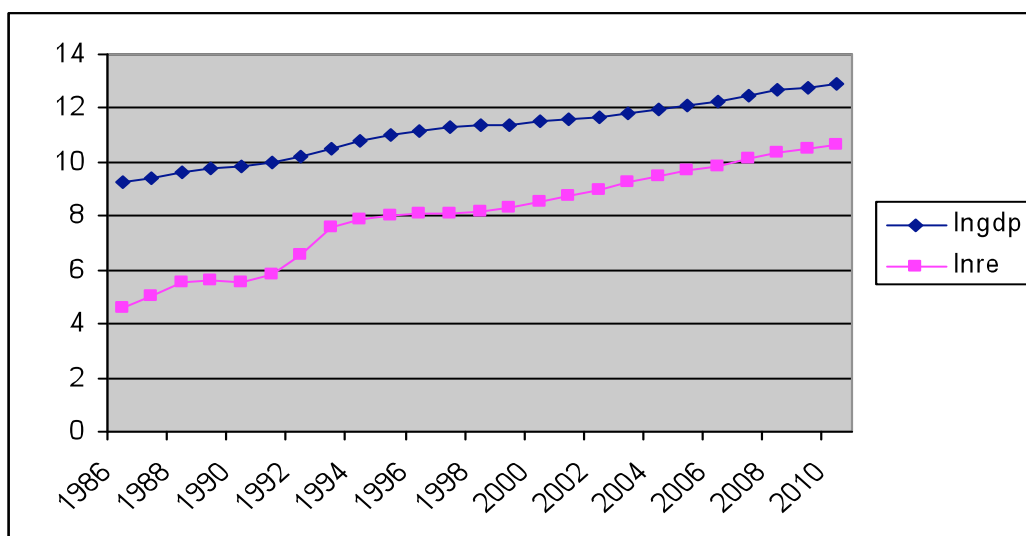
As it can be seen from the graph, both lngdp and lnre have an upward trend during the investigated period and intuitively they are not stationary. However from a logic angle we should perform scientific test to prove they both have unit roots.

Results

Test for Stationarity of the series

In order to see whether the logarithm of GDP and the logarithm of housing investment are co-integrated we first need to make sure they are integrated of same order. Therefore we test for the number of unit root embedded in each of two series. Here we employ the Augment Dickey Fuller test to find the unit root. After we take the logarithm form of each of two indicators the two series seem showing an obvious trend and constant therefore we include constant and deterministic trend in the test. As for the number of lags using in the ADF test equation the econometric software, Eviews, will automatically choose the appropriate lags for the equation. The table below demonstrates the results of ADF test

Table 2 ADF test for growth rate of GDP and Real estate

	Test statistics	P-values
Ln(GDP)	-2.796218	0.2123
Ln(real estate)	-2.846029	0.1965

As can be seen from the table the p-value of the two series are much greater than 5% therefore we cannot reject the null hypothesis of Augment Dickey Fuller test that the

series has a unit root, that is to say, neither of the two series is stationary. Accordingly we take the first difference of two series and then test for unit root. The table below exhibits the results of ADF test after taking the first difference of the series

Table 3 ADF test for growth rate of GDP and Real estate after taking first difference

	Test statistics	P-values
D[Ln(GDP)]	-3.820264	0.0105
D[Ln(real estate)]	-4.199720	0.0039

The p-values are less than 5% significance level, which indicates the null hypothesis of a unit root is rejected. Therefore we lead to the conclusion that both series are integrated of order one. The next step is constructing a long-run model of two series.

Test for Co-integration

We utilize Engle-Granger two steps method to test for co-integration. The first step is to estimate the long-run relationship equation using ordinary least squared method.

$$\ln gdp_t = 6.34 + 0.60 \ln re_t + \varepsilon_t \qquad (6)$$

P-value   0.0000   0.0000

R^2=0.9852   Prob(F-statistics)=0.0000

The model has a relatively high goodness of fit and it explains 98.52% deviations of the dependent variables. Meanwhile the coefficient of independent variable is significantly different from zero since the p-value is much smaller than 5% significance level, and this is also the case for the constant term since the p-value is less than 5% significance level, moreover the constant and coefficient are not jointly equal to zero for the p-value of F test also equals zero.

The second step is to exam the unit root in the residual series. Again the residual series doesn't include obvious constant and deterministic trend, therefore we perform the ADF test without any trend or constant. The Engle-Granger test statistics is -3.716, however the critical value doesn't follow the τ distribution any longer, therefore the p-value provided by econometric software, Eviews, is not reliable. Some textbooks have critical value of Engel-Granger test attached at the end of the book, we consult the book written by Brock (2007).

Table 4 Critical Value for Engle Granger Test at the sample length of fifty

Number of Variables in system	Sample Size T	0.01 significance level	0.05 significance level	0.10 significance level
2	50	-4.32	-3.67	-3.28

The sample length of 50 can be an approximation to the sample length of 25 in our model. The Engel-Granger test statistics is -3.716 which is much greater than the critical value at 5% significance level, however to be on the safe side we should manually calculate the critical value for the sample size of 25 through the following equation

$$C(p) = \phi_{\infty} + \phi_1 \frac{1}{T} + \phi_2 \frac{1}{T^2} \qquad (7)$$

Where all the coefficients can be obtained by looking up into the response surface estimates of critical value at the back of the textbook complied by Harris and Sollis (2003). The critical value for 25 sample length with no trend is -3.591 under 5% significance level, which is smaller than test statistic -3.716. Therefore the null hypothesis of a unit root is rejected, which implies the lngdp and lnre are co-integrated with each other, thus they have a long-run relationship. Equation six is the description of such long-run relationship, and we can read from the equation that the GDP will increase approximately by 0.6% if housing investment increases by 1%. Thus we can say that the contribution of real estate investment to GDP is very significant in China.

Error Correction Model

To estimate the short-run dynamics we build a simple short-run model

$$\Delta \ln gdp_t = 0.105 + 0.1808 \, \Delta \ln re_t - 0.2946 \, \varepsilon_{t-1} + u_t \qquad (8)$$

P-value   0.0000   0.0000   0.0000

R^2=0.7515   Prob(F-statistic)=0.0000   DW=1.222 Jb=1.2956 (p=0.523)

Where $\varepsilon_{t-1} = \ln gdp_{t-1} - 6.34 - 0.60 \ln re_{t-1} \qquad (9)$

From regression fitted graph in the appendix we can see that the modeled fitted values are very close to the actual values. The residual graph does not include a trend. Meanwhile the goodness of fit is relatively high with the value of 75.15% that means the model explains 75.15% deviation of short-run changes of GDP. The F-Statistics is significant, indicating the explanatory variables are not jointly equal to zero. Moreover the residual of regression is stationary through ADF test, implying there is no serial correlation in the series. We also perform the JB test where we cannot reject the null hypothesis that the sample is drawn from the normally distributed population since the p-value of JB test is much bigger than 5% significance. Therefore the model is well constructed. And 0.1808 is the short-run dynamic coefficient while 0.60 is the coefficient for the short-term disequilibrium. When there exists disequilibrium the error correction term, ε_{t-1}, does not equal to zero. Then the coefficient of this term represents the speed of adjustment to the present year in relation to the disequilibrium happened in the consecutively previous year. That is, -0.2946 means the 29.46% of disequilibrium in the previous year, t-1, would come to reduce the changes of lnGDP in the present year to ensure the establishment of long-run relationship between logarithm form of GDP and housing investment.

The Error Correction Model not only models the long-run relationship between housing investment and GDP but also describes the short-run interactive dynamics of both variables. Furthermore we can see from the equation 9 and equation 10 that the error correction term exerts a negative effects on the changes of logarithm GDP if

$$\ln gdp_{t-1} > 6.34 + 0.60 \ln re_{t-1}$$

while the error correction term exerts a positive effects on the changes of logarithm GDP if

$$\ln gdp_{t-1} < 6.34 + 0.60 \ln re_{t-1}$$

Test for Granger Causality

Though now we understand there is a long-term relationship between the two variables, we don't know the principal worked behind the two variables. We want explore the whether the amount of GDP and the housing investment are mutually

caused each other, we conduct the granger causality test for the series of lngdp and lnre as well as $\Delta \ln gdp$ and $\Delta \ln re$

Table 5 Granger Causality Output

Null Hypothesis	lags	F-statistics	Probabilities
Lnre doesn't granger cause lngdp	2	3.521	0.05
Lngdp doesn't granger cause lnre	2	4.102	0.03
Δ lnre doesn't granger cause Δ lngdp	1	8.405	0.01
Δ lngdp doesn't granger cause Δ lnre	1	1.301	0.27

From a long-run perspective we reject the null hypothesis of lnre doesn't granger cause lngdp and the null hypothesis of lngdp doesn't granger cause lnre under 5% significance level, which means the volume of housing investment and the GDP are mutually caused by each other. In the short-run we cannot reject the null hypothesis the growth of GDP doesn't granger cause growth of housing investment, however the growth of housing investment do granger cause the growth of GDP under 95% confidence level. And we consider the growth of housing investment is responsible for the growth of GDP in the short run.

We should point out that the outcomes of granger causality test are subject to the sample length and the reliability of the data. Even though granger causality statistically exists, it doesn't mean such kind of relationship certainly exists in the reality. Anyhow the granger causality results are very valuable for reference.

Summary

We observe that the housing investment in China and economic growth are co-integrated with each other that are also known as the long-run equilibrium relationship. Such kind of relationship is realized through short-run dynamic adjustments.

Secondly through long-run equation we know the housing investment elasticity of GDP growth is 0.6, specifically, GDP will increase by 0.6% if housing investment increase by 1%. Therefore housing investment and GDP are positively related. The

recent nominal GDP growth rate per annum of China hovered around 16% while the annual growth rate of housing investment was around 18%, thus the role that real estate investment played in promoting GDP growth is very significant.

Thirdly from the Error Correction Model we see that the coefficient of $\Delta \ln re_t$ is 0.1808, indicating housing investment leads the GDP to move to the same direction. And the error correction term shows the growth of GDP in the present year absorbs the 26.49% disequilibrium in the previous year.

Last Granger causality demonstrates that both factors are mutually influenced with each other, that is, the scale of housing investment facility the growth of GDP while the growth of GDP also accelerates the scale of housing investment. Furthermore the growth of housing investment stimulates the growth of GDP, the housing investment contributes to the growth of GDP in China are very significant in the short term. But the other way around is not the case.

8. Conclusion

This thesis study starts from the historical view of China's real estate industry development, where we found in the ancient time, China was evidenced that there existed property trade. But the real housing investment on purpose to make profit has merely been seen in the past in which China maintained its agriculture dominant economic growth pattern until the early 1980s. However, the reasons why real estate market did not occur in earlier historical period of China are explained by China's strict policy on land as well as the serious hierarchy system in the society. In this study, we observed that Chinese real estate industry and market formation and development, to a large extent, should be attributed to the governmental Housing System Reform aiming at alleviate the financial burden comes from the old housing allocation system by building the market-oriented housing market. Real estate industry or housing investment has been playing an important role in Chinese economic development since 1990s. It has been used well as good method to stimulate domestic consumption, and indeed, contributed to saving Chinese economy from the crisis. However, the arbitrary usage of housing investment by local

government is common in China. Based on different wills, the housing investment has been over used as the method for driving the regional growth, but ignoring the internal mechanism and the negative effects come along in a long term.

More statistical studies we have also made in this paper, from the Figure 3,4,5,6, we discussed the housing investment with its effect on GDP. Where we observed, in terms of the growth rate, housing investment is growing far faster than GDP, and the comparative ratio of which is almost at 2:1. Another surprising figure we have seen is about the housing investment's share of total fixed assets investment. According to recent NSBC's data, we roughly conclude that over 94% private or collective real estate development enterprises dominances about 15% of the fixed assets investment of China. In this situation, real estate industry is supposed to be more self-regulated and can reflect the economic circumstance, which is in consistence with the consequence of China's overall Housing System Reform. Hence, these figures also tell the explicit truth that housing investment plays a too important role in the national economy in terms of its share and rapid growth, where the appropriate governmental control and adjustment seems to be key important for preventing the extreme fluctuation due to the multiplier effects of housing investment. Really, from our findings, Chinese HPI is one of the highest in the world which is roughly 6 times higher of that of Japan, 7 times higher of United States, 4 times higher of UK and most surprisingly 18 times higher of Sweden despite of the general consensus that developing countries are supposed to have higher HPI than developed ones. Moreover, form our figure of housing price to disposable income we could also view the high inequality that Chinese real estate market is now at the situation with large bubble. In the beginning of 2010, Chinese government seems have realized the severe situation, not coincidently, a set of fiscal and financial policies, with focus on mortgage loan, have been issued in order to alleviate the possible fluctuation. However, by the end of 2010, we did not see very oblivious effects of policies that make real estate and housing investments of cool down. We simply put our assumptions, first, the policies is not efficient for the ultimate normal consumer, in contrast, the private speculator do not highly rely on bank loans as their major financing source. Second, the current policies are not efficient on dragging down the housing investment of real estate developers. Therefore, we suggest that the future

polices should focus on rising up the interest rate of loan for real estate developers, as well as limited the national land trade.

To unfold the relationship between housing investment and economic growth, we further carry out the quantitative study by borrowing the Co-Integration test, Granger Causality test. From our results of co-integration, we confirm that housing investment and GDP have a long-run relationship where the GDP will increase approximately by 0.6% if housing investment increases by 1%. Thus we can say that the contribution of housing investment to GDP is very significant in China. This finding is in consistence with the results of Brito and Perreira (2002), Liu et al (2002), and Chen and Zhu (2008). That is to say, housing investment in different time period or in different countries within these studies is proved to have significant effect on boosting economic growth. In addition, from the Error Correcting Model, we observe a short term dynamic relationship which indicates the previous disequilibrium (t-1) at 29.46% would come to reduce the changes of lnGDP in the present year to ensure the establishment of long-run relationship between logarithm form of GDP and housing investment. Finally, Granger Causality test shows, at 5% significance level, there is a bidirectional relationship between housing investment and GDP in the long run, whereas in the short run, the growth of GDP does not Granger causes the growth of housing investment which is contrasting to the growth of housing investment do Granger causes the growth of GDP. This finding is fitting the investment theory of multiplier that investment will have instant effect on creating demand. Chen and Zhu's (2008) finding also proves the unidirectional causality of housing investment to GDP in China.

In the past decades, we have observed the exuberant growth of Chinese real estate industry and the constant increase of housing investment. We also find that the growth of housing investment is far stronger than that of GDP, which results in fostering the drastic rising of housing price and enlarging the inequality of housing price and GDP per capita. Obviously, the inequality is not possible to be infinitely expanded when the housing price reaches the edge where consumer cannot afford at all. As result, the consequences are supposed to be serious and unpredictable. Indeed, Chinese government notices that the housing price cannot be further raised and series of polices has been issued in a short period, which possibly will lead to the slow-down of

housing investment in response. Therefore, despite of the significance of housing investment to Chinese economic growth in the long period, we should not over rely on it and arbitrarily use it to pull GDP growth, whereas to stimulate consumption by using housing investment seems appropriate in a short period. We also believe that housing investment is not the solution to Chinese sustainable economic growth in the long run.

At last, this is the first personal research on the postgraduate level; there might be some defects and immature ideas in this thesis. Your corrections are welcome.

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Appendix:
The actual vs. Fitted Value and Residual of Error Correction Model