

How does the Macro Policy work in Housing Market of China?

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Abstract. China's housing industry is booming, but it is in its start-up stage, which, together with the complexity of the real estate market, has led to various problems in the real estate market, seriously affecting the sustainable, stable and health development of the real estate market. This study starts from defining the connotation of the health of real estate market, using quantitative analysis tools such as ITS regression analysis, referring to existing research results, and taking into account the characteristics of the domestic real estate market, to establish the concept of the health of real estate market, and to study the correlation between the health of real estate market and various macroeconomic influencing factors. The empirical results find that only housing policy and financial policy have substantial effects on housing prices in the short term. In the long run, none of the four major policies in the empirical results has a long-run effect on the selected dependent variable. Finally, policy recommendations are proposed for the government.

Keywords: Real Estate Market; ITS Regression Analysis; The Health of Real Estate Market; Housing price; Correlation.

1. Introduction

Since the reform and opening up, China's real-estate market has gradually become market-oriented, and real estate companies have been on the market stage since 1980. Up to now, the development of China's real estate market is mainly divided into four stages:

Before 2004, the domestic real estate market was during this period. The domestic real estate market was still a virgin land that had not yet been cultivated. There was no precedent for real estate development. Most of the projects that have been awarded are mainly transferred by agreement, and the top 100 real estate companies emerging in the market mainly show the pattern of “taking the mountain as the king” in each region. For example, Forte and Greentown from Shanghai, Longhu from Yu, R&F and Country Garden from Guangdong represent the regional style of real estate companies in the process of national expansion due to regional integration.

Between 2004 and 2008, the real estate market entered a golden period of development, and the domestic housing market early warning research started relatively late, mainly focusing on the establishment of early warning indicator systems and the selection of early warning methods. Early warning method is the core of early warning system. The key to play is to adopt scientific and reasonable early warning method. Greentown is based on the quality strategy and adopts an aggressive expansion strategy: strengthening the base market in Zhejiang.

From 2009 to 2014, after the financial crisis, the international quantitative easing policy and the domestic 4 trillion stimulus plan made the overall monetary environment loose, the property of real estate assets was further strengthened, the speculative investment demand was strong, and the housing price trended upward. The government's regulatory policies have been introduced intensively, and the game with the market has become more frequent.

From 2015 to the present, my country's real estate market has entered a silver age. The “destocking” policy has injected a warm current into the real estate market. The credit crunch and the expansion of the “four restrictions” have been comprehensively upgraded. The real estate market has entered a

silver age with declining profit margins, saturated structural demand and intensified differentiation. Real estate enterprises are facing fierce competition and must take the initiative to seek. In order to achieve long-term sustainable development, we must develop towards structural opportunities and seek benefits from refined management.

Over the past 15 years, house prices have been increasing. The main groups of houses are rigid demand groups, improvement groups, and investment groups. The market is dominated by confidence markets (immovable stock markets) cyclical markets and regional markets. The housing industry is also the most important component of the real estate industry. In the 10 years from 2003 to 2013, the investment in the housing industry accounted for 66.3% of the total investment in the real estate industry. The relationship between the national macro-economy and the real estate industry mainly refers to the relationship between it and the housing industry. The administrative control policies of the public sector for the real estate industry also mostly affect the real estate market.

In terms of real estate, the state has introduced a series of macro-related policies to intervene in the real estate market. From 1993 to 2010, in order to maintain the healthy development of the real estate industry, national policies will also change accordingly.

Since the reform of the housing system in 1998, my country's housing industry has developed vigorously, and the output and prices of the real estate market have increased rapidly, becoming the key engine driving economic growth. Compared with developed countries such as the United Kingdom and the United States, the real estate market has a much shorter development history. In its infancy, coupled with the complexity of the real estate market, there are various problems in the real estate market, which seriously affect the sustainable, stable and healthy development of the real estate market. The lack of systematic research on the fundamental question of what is a healthy real estate market has become one of the main reasons for the poor effect of macro-control on housing. The expansion of the real estate market is accompanied by a sharp rise in housing prices and an imbalance in the structure of housing supply and demand, which has caused a large number of social problems and affected the prosperity and stability of the country. Therefore, we choose to study the correlation analysis between China's real estate market and macro policies.

This study starts from defining the connotation of real estate market health, based on economic theory and real estate economics theory, etc., using quantitative analysis tools such as breakpoint regression analysis, referring to existing research results at home and abroad, and combining the characteristics of domestic real estate market, strive to establish a set of evaluation methods for evaluating the health of macro policies of China's real estate market, and analyzes typical policies of macro-control of China's real estate market. The analysis results formed can be used as a quantitative analysis tool for macro-control of real estate, in order to promote the continuous health of the real estate market. develop.

The research object of this paper is the commercial housing sales market. Because the real estate industry or real estate market has several classifications. If divided according to the type of ownership, the real estate market can be divided into real estate sales market, real estate leasing market, real estate mortgage market, etc.; if divided according to real estate functions, it can be divided into housing market, commercial real estate market, industrial real estate market, pension real estate market, etc.; According to social functions, it can be divided into commercial housing market, affordable real estate market, and social housing market. According to the above classification, our research object is limited to an "intersection", that is, the commercial housing sales market.

The research area of this paper is intended to be the comprehensive situation of the real estate market in 35 large and medium-sized cities in China. This research aims to abstract the concept of market "health" on the basis of various evaluation studies on the real estate market in the past, and combined with the actual situation of China's real estate market, from the internal health of the real estate market, the external health of the real estate market and the health of the policy support system. A real estate market health evaluation system is constructed from each dimension, and an empirical test is carried out based on this system. The data used in this research are "China Statistical Yearbook",

“China Urban Statistical Yearbook”, “China Real Estate Statistical Yearbook” and official data from the National Bureau of Statistics of China, which are highly credible.

The main research contents are divided into two aspects. On the one hand, there is the concept of “establishing a comprehensive evaluation system for the health of the real estate market”. This study starts from defining the connotation of real estate will resist, based on the relevant theories of economics and management, and uses a multi-attribute comprehensive evaluation method to establish an evaluation system for the health of the real estate market. Another aspect is to study the relationship between the health of the real estate market and various macroeconomic factors. Based on 10-year panel data of 35 large and medium-sized cities, a fixed-effect or random-effects model was established to test the functional relationship between real estate and macroeconomics, which is one of the dimensions that determine the health of the real estate market, and to deeply analyze various factors that affect the health of the housing market.

Based on the review and summary of the evolution of the concept and policy of “health” in China's real estate in the past 40 years, this research constructs the concept of “health” applicable to the conditions of China's real estate market. From the specific technical means of the research, the index system is set in the first part of the research to analyze and evaluate the internal health of the real estate market from the theoretical level; the second part of the research is the empirical analysis part, which will use the ITS breakpoint regression model to analyze the fourth. The impact of each policy on real estate market indicators and test the assumptions made.

2. Literature review

What kind of real estate market is a healthy market? Different scholars have defined the connotation of real estate market health from different angles. Ni Pengfei (2008) believes that a so-called healthy real estate market is a state in which the operation of the real estate market and the overall urban economy adapt and promote each other in terms of scale, structure, speed and price [1]. Chen Hongyan (2013) synthesized the real estate bubble and real estate early warning theory, believes that the health of the real estate market should be a good state of development in all aspects, and the connotative characteristics include the stability of reflecting the growth state of internal indicators and the coordination of reflecting the coordination between the market and the external environment [2]. Li Dongye (2010), on the basis of previous studies, believed that the healthy development of the real estate market should be the balanced and sustainable development of the real estate and the society, and it should be the relationship between the real estate market and the overall economic level of the city in terms of structure, scale and price. Coordinated development with the natural environment. Its connotation features are low foam, high efficiency and sustainability [3].

The above viewpoints reflect the health status of the real estate market from different aspects, from economic factors to the consideration of comprehensive factors such as economy, society and ecological environment. Based on the above viewpoints, the health of the real estate market should at least include the following meanings:

(1) The internal operation of the real estate market is stable, and the relationship between supply and demand tends to be balanced.

(2) The outside of the real estate market should maintain harmony with the macro economy, people's lives, and the ecological environment. Only by maintaining the internal and external environment of the real estate market.

Coordinated development can truly realize the healthy development of the real estate market.

(3) The policy system has a coordinated development relationship with the cyclical changes.

It is generally believed that a real estate bubble refers to a phenomenon in which real estate prices continue to rise apart from the market base value due to factors such as real estate speculation, forming a false prosperity. It is mainly divided into two aspects. Real estate itself is an asset. Therefore, the real estate bubble theory originated from asset bubbles. Zhang Ruoxue said that the real estate bubble is the pain of the “market spirit” experienced by all countries in the development of the real estate

market at a certain stage [4]. In addition, related research is a very important part of the “real estate health” research, which provides a technical basis for the evaluation of “real estate health” and the extension of the concept of real estate market health in terms of variable selection and measurement of “health degree” measured by bubbles. The empirical research from a more mature research perspective confirms the existence of the bubble phenomenon in the real estate market, and also provides evidence and theoretical support for the public policy to intervene in the macro-control of the real estate market.

From the perspective of the core issues of real estate bubble research, it mainly focuses on three aspects: the reasons for the formation of real estate bubbles, the detection of real estate bubbles, and the prevention and control of real estate bubbles. The reasons for the formation of real estate bubbles mainly include the rapid expansion of speculative demand due to “incomplete information”, “excessive risk-taking or speculative expectations”, “irrational” psychological factors. Monetary policy and the failure of government-led institutional changes [5], such as changes in land property rights [6]. In the specific context of China's real estate market, some scholars believe that credit expansion, “land finance” and the real estate pre-sale system are the causes of the real estate bubble [7]. Regarding the detection of real estate bubbles, the detection methods mainly include comprehensive index method, index method [4,7], measurement method [6] and so on. For the prevention and control of real estate bubbles, prevention and control measures are mainly given in terms of expectations, reasonable investment, finance, system construction and government regulation based on the causes of the bubbles and the actual situation of the region.

Real estate market health research is a further epistemological deepening of the development of the real estate market. It continues to generalize the pure price-level research (such as bubbles) and the limited-dimensional evaluation of the internal conditions of the real estate market (early warning research), and expands it to a more comprehensive evaluation space. Several relatively complete cognitions have been formed in China, including four aspects.

(1) The theory of “national strategy-personal ability to pay-price stability-policy improvement”. This health theory believes that the connotation of “real estate health” should include four dimensions: First, whether the healthy development of the real estate industry is in harmony with the country's long-term economic strategy, and the prosperity of the industry may not be consistent with the long-term stability of the national economy. , but the long-term stability of the national economy is the premise of the prosperity of the industry, so it is necessary to take the long-term economic stability of the country as the first criterion for the healthy development of the real estate market; secondly, it is to have the development concept of the real estate market that “everyone should enjoy adequate housing”, and The real estate development path that is not “a house that everyone can afford”; thirdly, the housing price is in a reasonable range, including the housing price level is not too high, the price level is relatively stable, the price-to-interest ratio and the price-to-income ratio are in the normal range, etc.; finally, the real estate market The regulatory policy system should be complete and the policy effective.

(2) The theory of coordination between sub-markets and macro-markets. The real estate market and the urban economy coordinate with each other, which is embodied in the four dimensions of real estate market size, structure, speed and price [1]. This point of view hits the key point that the real estate market needs to coordinate with the macroeconomic operation, and believes that a healthy real estate market needs to adapt to the macroeconomic scale from the market size, and from the market structure to the city's economic structure, population structure and income structure. In terms of market development speed, it should be adapted to the development speed of urban economy, and in terms of price, it should be adapted to the income level of residents.

(3) The theory of internal stability and external coordination. The health of the real estate market should be a good state of development in all aspects, and the connotative characteristics include the stability of reflecting the growth of internal indicators and the coordination of reflecting the coordination between the market and the external environment [2]. This view holds that the health of the real estate market is the unity of external coordination and internal stability. The external

coordination includes the price coordination between housing prices and macroeconomic fundamentals and the coordination between real estate supply and residents' income structure. Internal stability mainly Refers to the stability of the internal development speed of the real estate market.

(4) Real estate-society-nature harmony theory. The healthy development of the real estate market should be a balanced and sustainable development of the real estate-society-nature trinity, which is embodied in the three dimensions of structure, scale and price. Its indicators are characterized by low bubbles, high efficiency, and sustainability [3]. The difference between this view and the previous two views is that the coordination with the environment is included in the concept of “real estate health”.

The research on “housing health” in China stems from the “market failure” and “government failure” caused by the release of market forces after the “1998 housing reform”, which is essentially the process of market deepening and the state's attempt to maintain the long-term real estate market from the macro-control level. The specific manifestations are: the long-term equilibrium level of the real estate market is maintained, the market supply and demand structure is reasonable, the market growth rate is stable, and the distribution structure is reasonable. The main research on “housing health” focuses on the measurement of the “health” of the real estate market, the evaluation of indicators, or the use of a single indicator to carry out quantitative tests or systematic simulations on the relationship between the real estate market and macroeconomic variables and the impact of public policy variables on the housing system. Often constructed on “not discussed” qualifications. These qualifications also define the boundaries or depth of Housing Health Research. Its more prominent limitations are as follows:

First, there is insufficient discussion on the nature of “housing products”. The real estate market health problem needs to be constructed on its basic research unit - the essential attributes of housing products.

Second, the investigation on the basic conditions and constituent elements of the “real estate market” is not comprehensive, which limits the connotation of the concept of “housing health”. The interaction between the real estate market and the public policy system and policy effects should also be included in the “housing health” Housing Health” issue.

Third, the dynamically evolving nature of the “health” of the real estate market is often overlooked. It is necessary in theory and practice to expand “real estate health” from “single market” research to “system” research.

In view of the above, it is very necessary for the real estate market “health research” to evolve from a single-dimensional evaluation (indicator system or correlation, etc.) to the “real estate health system” research. The real “real estate health” should at least cover the research of “inside the real estate market - macroeconomic and policy linkage”, and form an organic and unified whole.

3. A model of Real Estate Market and Macro Policy

3.1 Theoretical basis

The rise of neoliberalism is based on the emergence of the phenomenon of “stagflation”. The emergence of this phenomenon has led to a great challenge to the Keynesian economics, which advocated state intervention. Neoliberalism contains two basic views: one is the monetarist school, and the other is the supply school. The Monetary School believes that the government only needs to manage the currency and leave the rest to individuals and the market, while the Supply School strongly advocates stimulating production and focusing on supply.

To sum up, the basic ideas of neoliberalism can be summarized as marketization, liberalization, and privatization.

Keynesianism has had a predominant position in the field of Western macroeconomics for a long time. However, from the late 1960s to the early 1970s, scholars of liberal economics criticized Keynesianism, claiming that it could not explain stagflation, which led to Keynesianism's gradual decline.

However, in the 1980s, a new school emerged in mainstream Western economics, which was represented by Harvard University professor Gregory Mankiw and Stanford University professor Joseph Stiglitz: New Keynesianism (NK).

New Keynesianism is often regarded by scholars as a new synthesis, which contains two meanings: First, New Keynesianism inherits the tradition of Keynesianism and absorbs the useful results of neoclassical macroeconomics. Second, New Keynesianism seeks the micro-foundations of price and wage stickiness, which puts the Keynesian unemployment and disequilibrium theories on the basis of a series of micro-analyses.

New Keynesianism inherits the tradition of Keynesianism: Neo-Keynesians accept the Keynesian statement that “unemployment and non-market clearing are the norm in the economy”; that the role of money in the economic system is important and that money is non-neutral; that the classical dichotomy is ineffective. It also emphasizes short-term analysis, highlights market imperfection, and views government intervention in economic activity as crucial. However, New Keynesianism strives to absorb the useful results of monetarism and neoclassical macroeconomics to repair the defects of Keynesianism: Neo-Keynesians accept the analytical framework of monetarism, especially in the analysis of long-term problems; recognize the rational-expectations-hypothesis; acknowledge the principle of maximization of interests; focus on explaining macroeconomic phenomena such as unemployment and economic fluctuations at the micro level. According to American scholars James K. Galbraith and W. Darity Jr, neoclassicism has three basic assumptions: monetarism, rational expectations, and market clearing (price and wage have full elasticity), so Neo-Keynesian accepts two thirds of the neoclassicism value, which is monetarism and rational-expectations-hypothesis.”

In the past 40 years of China's real estate market reform pilot, especially the 20-year development since the “second housing reform”, the mainstream theories had undergone changes. To summarize, it went from neoliberalism to approximately marketized; then it underwent neo-Keynesianism, and finally transformed into government's implementation of administrative intervention.

3.1.1 The “Real Estate Economy” Guided by Neoliberal Theories

Neoliberal economists believe that any market can continue to develop according to its “spontaneous evolutionary order”, and that any short-term market volatility can also correct itself within the framework of the “spontaneous evolutionary order” [8]. Continuing the internal logic of the development of neoliberal economics - the market mechanism plays a decisive role in reaching the equilibrium of resource allocation at both supply and demand ends. Judging from the overall development of the country's real estate market (in which the real estate market is connoted), during the period of “market development” and “the first wave of rapid growth”, the real estate investment was still in a stage of slow growth. From 1986 to 1998, the real estate investment grew by only 351.3 billion (see Figure 1). After the 1998 real estate monetization reform, the real estate investment grew rapidly: 9142.16 billion yuan invested from 1998 to 2014, which was 34.8 times the original. Based on general understanding, any industry whose added value is greater than or equal to 5% of the GDP should be counted as a pillar industry [9]. In 2003, the real estate investment had accounted for 5.72% of the GDP and had exceeded 1 trillion yuan. The real estate industry had become a pillar industry of the country's national economy and had formed a close connection with other industrial sectors of the national economy.

From the perspective of the supply end, there are significant linkages between the real estate market and over 100 industry sectors of the national economy. The health of the real estate market and macroeconomic conditions have formed an inseparable “binding” relationship. Therefore, when examining the health of the real estate market, the traditional approach of static assessment in isolation from the macro economy was unable to fully describe, analyze, evaluate, and predict the health of the real estate market. We need to consider macroeconomic variables such as national economic growth in the overall analytical framework for the healthy development of real estate.

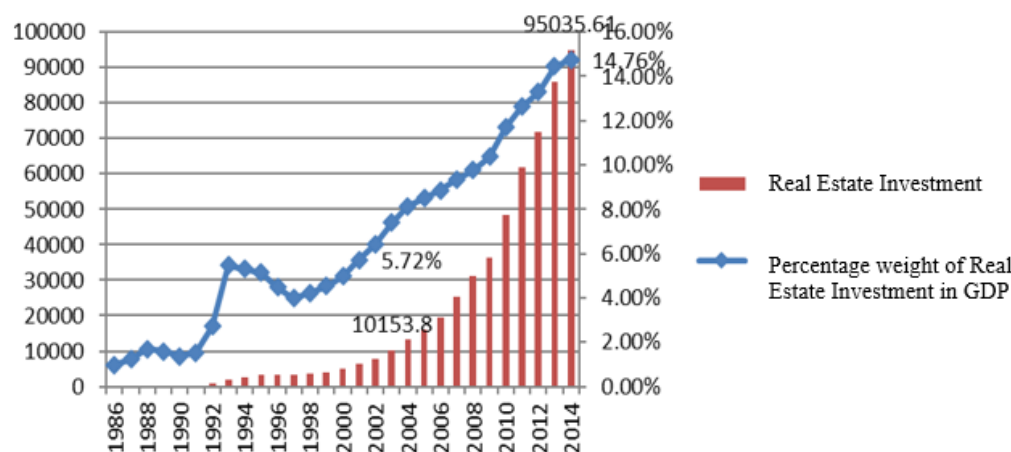


Fig 1. Real estate investment as a percentage of GDP

From the perspective of demand, the development of the real estate market had profoundly affected the wealth distribution pattern of all citizens, especially residents in urban areas. Vice versa, the growth of wealth of residents in urban areas had also played a role in promoting the further development of the real estate market, especially after 2003 when the real estate industry had become a pillar sector of the national economy. In addition to the significant changes from the supply side of the real estate market, the continuous and rapid rise in real estate prices had become a significant sign of the demand side of real estate.¹ On one hand, this represents the continued strong demand in the real estate market. On the other hand, from the perspective of the essential attributes of real estate products, the release of derivative demands such as investment demand and social security demand in the real estate market has also become a kind of wealth distribution. Real estate products are no longer as pure as consumer goods for self-use, but also gradually show the function of social products to accelerate wealth growth and wealth differentiation.

The most significant change was reflected in the ratio of real estate prices to per capita income (referred to as the “price-to-income ratio”). According to general international experience, the price-to-income ratio is in “healthy interval” if it’s between 3 to 5. From the national average in China, this value had been more than 5 since 2003 (see Figure 2). If the characteristic cities are selected according to the first-tier, second tier and third-tier cities, the price-to-income ratio of the first-tier cities can even reach 10 and above. From a static point of view, the high price-to-income ratio has caused huge pressure on real estate owners and new entrants into the market. Yet, from a dynamic point of view, for real estate buyers who have purchased real estate, especially those with investment needs as their goal, the appreciation of real estate products had become an extremely important share of their personal wealth growth. To a certain extent, the accelerated process of China's social property rights distribution relied on the accelerated distribution of urban real estate property rights, and the entire social capitalization process based on property rights was more prominent in the capitalization process of urban real estate property rights. The accumulation of social wealth and the distribution of personal wealth were distributed to individual urban residents in the form of urban real estate and were basically based on the initial wealth level of the individual (often through income or intergenerational inheritance, etc.), personal credit level, identity (mainly household registration), and wealth regeneration. The wealth distribution order in which individual factors such as accumulation (through property purchase or re-lending) and macro factors such as the degree of urban economic prosperity, population concentration and population mobility were arranged in sequence that gradually unfolded in the whole society. Following this development logic, the wealth distribution pattern of China's urban economy has basically formed a wealth stratification with real estate property

¹ In general, demand-side research should include two aspects: price and output. Logically, it should be considered from the above two aspects. However, because this study mainly examines the impact of the “wealth effect on the demand side of housing”, its impact is directly manifested in price, rather than output. Changes in output can also theoretically be derived from price signals and are therefore not studied separately.

rights and real estate value as the most important weights. The value-added of real estate products is deeply “bound” with the distribution of wealth in the Chinese economy. Real estate products have become “economic growth vouchers” and “wealth growth vouchers” held by Chinese urban residents: considering the supply side, if the economy continues to grow, the value of real estate products will increase; considering the demand side, if the value of real estate products increases, personal wealth will increase in value.

To sum up, continuing the development logic of neoliberal economics theory, the real estate market is “bilaterally bound” with the macro economy on the supply side and the demand side. A comprehensive evaluation and external representation of the internal market index system could no longer fully demonstrate the “health” status of China's real estate market, nor could it provide a reasonable theoretical explanation for the fluctuation of real estate health status. From this point of view, in addition to conducting a more comprehensive internal evaluation of the market, real estate health research also needs to test the relationship between typical proxy variables on the supply and demand sides of the real estate market and key macroeconomic variables (as a necessary supplement to the internal health evaluation of the real estate market, and an in-depth study of the factors that cause fluctuations in the health of the real estate market).

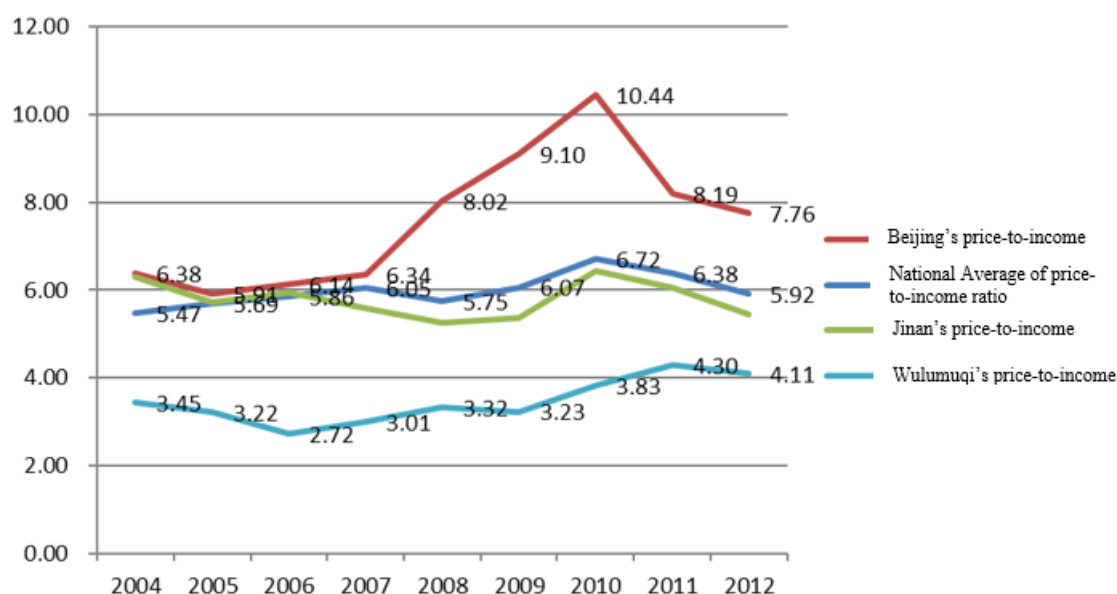


Fig 2. National and first, second and third-tier case cities housing price-to-income ratio

3.1.2 The real estate market in non-equilibrium state and the “correction” of the new Keynesian theory

As mentioned above, under the guidance of the development logic of neoliberal economics, the real estate market and the macroeconomy have formed a “symbiotic” relationship. This has two consequences: first, the overall macroeconomic fluctuations have a more significant impact on the real estate market, and the real estate market is more sensitive to macroeconomic fluctuations (supply side); second, macroeconomic output is more closely distributed (demand side). Western scholars' criticism of neoliberalism includes: “its main essence is not the production of wealth and income, but the redistribution of wealth and income” [10]. The reality of China's real estate market and macroeconomic development also confirms this: a “homeownership society” constructed around homeownership was gradually taking shape [11]. This accordingly created two “dangers”: first, the real estate market volatility, which is closely related to the growth of the national economy and the level of residents' personal wealth, will inevitably affect the conditions of these two; second, once the real estate market is volatile or “abnormal”, whether it can quickly return to the “healthy range” to reduce the negative impact of volatility on macroeconomic growth and residents' personal wealth.

However, due to the long period of real estate construction (supply side), the long period of effective real estate demand (demand side: from house selection, payment, registration to check-in), the difficulty to achieve macro “consistency of action” between the two, and the characteristics of “immobility” and “spatial heterogeneity” of real estate as a consumption and investment product, the resulting regional characteristics of the real estate market and the monopoly of buying a house have comprehensively determined the development of neoliberal economics. The equilibrium state or product market clearing state under logic is difficult to achieve in the real estate market -- “non-equilibrium state” is the normal state of the real estate market [12], the structural mismatch between supply and demand of real estate products is itself one of the economic characteristics of the real estate market. On the other hand, limited by the above-mentioned characteristics of real estate products and the real estate market itself, it can restore prices and supply and demand to a state of equilibrium or an acceptable non-equilibrium state, thereby maintaining the market in a “healthy range”, relying solely on “invisible hand” adjustment is not sufficient. In this basic reality, the government's policy intervention in the real estate market has become a necessary condition.

Neo-Keynesian economics believes that non-market clearing, delays in price adjustment (or price stickiness), and the government's superiority in information make it necessary for the public sector to implement administrative means to intervene in economic regulation [13,14,15]. In particular, based on China's basic national conditions, the Chinese government controls the production factors required by the production sector at the source — the flow of population between urban and rural areas through the household registration system; the supply of land factors through the urban-rural dual land system; the financial system with the central bank as the core controls the liquidity of the currency; and, in the form of state-owned enterprises, dominates the multi-industry sector enterprises, including the real estate enterprises. Therefore, it is equipped with various aspects such as factor resources, market information acquisition and technological progress. Significant advantages not only help the government to implement relevant policies, but also make the government the only force that can intervene in short-term market fluctuations and return it to a “healthy track”. Since 2003, to boost the overall economy, the Chinese government proposed the regulation of “development of the real estate industry”, and continuously introduced policies to respond to short-term fluctuations in the real estate industry. The issue of real estate health is no longer a “single real estate market” or “real estate market – macroeconomic” structure, but a “real estate market – macroeconomic policy” market that integrates macroeconomic policies. In addition to its own development and macroeconomic impact, the healthy development of the real estate market will also have a profound impact on the effect of public policies. Therefore, the research framework of real estate health needs to be further expanded.

From the previous research on the development of the real estate market, we can see that the connotation of the internal health of the real estate market has been continuously enriched with the advancement of the real estate marketization reform, including the housing commercialization reform and monetization reform, as well as the deepening of the impact of macroeconomic changes and administrative macro-control policies. and complete. From the beginning of the real estate market-oriented reform, the pure pursuit of “production” and “price” continued to increase, to the basic establishment of the price mechanism in the early 1990s, to the introduction of structural factors for the first time in 1993 for evaluation, and to 2006, when the “National Six Regulations” introduced the speed dimension, which further enriches the connotation of the concept of health. Currently, the evaluation dimension of the internal health of the real estate market is mature. Specifically, it mainly includes four important dimensions: supply and demand, price, structure, and speed [16].

Price-level health means that housing prices remain within a reasonable range, and its main indicators include the price-to-income ratio. Structural health means that the overall structure of the real estate market is complete, and the proportion is reasonable, and a hierarchical housing system is built with ordinary commercial housing as the main body, secondary market, rental housing and affordable housing as important supplements, and high-end housing is also included. A healthy speed level means maintaining a reasonable growth rate in housing investment, development, construction, sales, and prices. The quality level is healthy, mainly refers to the macro level, the effective supply

and effective demand within the real estate market maintain a dynamic balance relatively. The overall health of the real estate market is an empowering evaluation that combines the above four dimensions of “health”. It is also important to note that the internal health of the real estate market is dynamically evolving. In different periods of the development of the real estate market, its “health” and “healthy degree” depend on its own evolutionary stage. The immediate impact of macroeconomic and public policies on it is also presented through the characteristics of the four dimensions within the real estate market. For example, in the period of rapid growth of the real estate market, the price and output rose rapidly at the same time, which did not reflect healthy characteristics in terms of price and speed, but its supply-demand relationship and structure were reasonable, so it was still within a healthy range. This also means that a more in-depth analysis with reference to the third part, “Health Dimensions Related to Macroeconomics”, is necessary.

The scientific evaluation of the internal health of China’s real estate market is the cornerstone for the real estate market’s health system research. It is one of the important characterizations of the coordinated development between the macro economy and the real estate market, as well as one of the important references for public policy formulation.

As mentioned above, as the development logic of “neoliberalism” encounters a bottleneck, “market failure” is gradually emerging in the real estate market, and the real estate market is increasingly “bound” with the macro economy. The Chinese government’s policy intervention is to maintain the sustained and healthy development of the real estate market provides necessary support. It should be noted that the reform of China’s real estate market is a mandatory change policy from the beginning, which also determined the close relationship between public policies and the evolution of the real estate market itself. In particular, when the healthy “neoliberal” evolution of the real estate market encounters a “crisis” (like after 2003), the key role of public policy in influencing its healthy evolutionary approach has gradually emerged and consolidated. Therefore, in the healthy dynamic evolution system of the real estate market, the coordination and cooperation between the public policy and the real estate market evolution are its key components.

With the development of the real estate market, the deepening of the close relationship between the real estate market and the overall macroeconomy, and the deepening of the formulation, implementation and reflection of housing policies, housing policies have also evolved from a single policy of “price limit” and “limitation” at the beginning of real estate marketization. Beyond the real estate market, a set of mutual constraints and coordination with the overall macro-control policy (including monetary policy and fiscal policy), other factor market policies (such as land market, capital market policy), and industrial policy (financial policy, etc.) Complete policy support system. Among them, housing policy is most closely linked with land policy, financial policy, and fiscal and taxation policy. Therefore, the healthy evolution of the real estate market is closely related to the implementation of the above-mentioned three-dimensional policies on the real estate market. The degree of coordination between the policy system and the real estate market evolution becomes the key support for the healthy evolution of the real estate market.

3.2 Empirical Design: ITS Model

State-owned land was decided to be sold in the form of “bid, auction and listing” on August 31st, 2004. Since then, Under the premise of sufficient land supply every year, there is a “quasi-market behavior” between land supply and demand, and there is a long-term “balanced” or “unbalanced” relationship with the effective demand for land use. That is, when the land system is established, this land supply behavior can be “expected”, so it can be regarded as a factor within the system; as for monetary policy, from June 2004 to December 2007, the People’s Bank of China raised the benchmark deposit and loan interest rates three times in a row, and it also raised interest rates seven times in a row. In essence, this is still the use of market-oriented control measures, and the market is left to adjust the money demand spontaneously, and the money supply is still “adaptive”, which is in coordination with economic growth for a long time, and can be “expected”, so it can be regarded as a factor within the system. Different from land supply and currency issuance, some public policy

formulations acting on the real estate market are “counter-market cyclical” [17] and “cannot be expected by the market”, these public policies are regarded as real estate market-exogenous shocks to the macroeconomic system. Since the 2003 implementation of administrative regulation of the real estate market, in order to achieve the immediate goal of “healthy” real estate market, with the change of the “healthy” status of the real estate market, various public policies have come one after another, and the exogenous impact of public policies on the real estate market has become more and more significant; the effect of public policy implementation profoundly affects the development trend of the real estate market; “the health of public policy” has gradually become an indispensable part of the concept of “health” in the real estate market, and needs to be tested by scientific methods.

(a) If housing is purely a consumer product, according to the equilibrium theory of classical economics, its short-run deviations from market equilibrium price and output will always be corrected spontaneously in the long run [18], any public policy formulation will instead cause long-term welfare losses to the economy by distorting the long-run equilibrium, so public policy is unnecessary. On the other hand, if housing is purely an investment, according to the efficient market hypothesis (Farmer, 1970), then the market will automatically adjust to a clearing state because the information is fully symmetrical and the market entities make rational behavior choices, which means the market itself is economically efficient and does not require exogenous policy intervention. However, as mentioned above, the complex properties of housing determine that the real estate market is full of unique characteristics such as imperfect competition, externality, and regionality. Therefore, the real estate market cannot satisfy many hypotheses in the classical theory, and the phenomenon of market failure would appear. Coupled with the characteristics of the housing product itself, such as a long development cycle, a huge amount of capital, and many industries in related sectors, it is not only closely linked to other sectors of macroeconomic development, but it also becomes a key node of the entire macroeconomy. The quality of one's own “health” also directly affects the overall economy. Based on the reasons above, the administrative regulation and control measures of the real estate market have become an important component of the healthy development of the real estate market, and with the spontaneous development of the real estate market and the repeated exploration of the “quasi-natural experiment” nature of policies, a relatively complete public policy regulation of the real estate market has been formed system.

In 1998, China officially launched the housing monetization reform. However, due to the 1998 financial crisis and the insufficient domestic demand of the country, from 1998 to 2002, the country continued to have real estate market stimulus policies: in 1999, the People's Bank of China's “Guiding Opinions on the Development of Personal Consumption Credit” introduced the mortgage mechanism; In 2000, the annual use of housing provident fund to buy a house would enjoy tax-free discount; In 2002, it lowered the benchmark deposit interest rate for those over 5 years. However, no matter in terms of “production” or “price”, China's real estate market had not formed a process of rapid take-off at the overall macro level. under such background, on August 12th, 2003, the state issued the “Notice on Promoting the Healthy Development of the Real Estate Market”, which positioned the real estate industry as a pillar industry for the development of the national economy. Moreover, based on the structural contradiction between supply and demand in the real estate market at that time, the concept of “housing health” was put forward again, which opened the curtain of administrative regulation for the real estate market. From 1998 to 2003, the policy regulation point of “housing health” is mainly to stimulate “market forces” and activate the real estate marketization momentum. Under such context, on August 31st, 2004, “8·31” stipulates that operating land must be sold through “bidding, auction and listing”. Through the reform of the land system and the introduction of a land use bidding mechanism, the process of marketization of land supply has been accelerated, resulting in a further deepening of the marketization of the real estate market. China's real estate market entered a prosperous period of “quantity and price release” (see Figure 3), in 2004, there was even a short-term overheating of the market. Taking this as an opportunity, the macro-control of China's real estate market has also entered a new stage of regulation and control with the core concept of “real estate market health”. At this stage, the concept of “housing health regulation” mainly lied in: first,

controlled rapidly rising housing prices; second, slowed down the growth in demand for passive housing; third, reduced investment and speculative housing demand and adjusted housing supply and demand structure; fourth, maintained the basic balance of supply and demand in the real estate market. To achieve the above new “health goals”, from March 2005 to December 2007, the People's Bank of China had successively raised the benchmark deposit and loan interest rates 4 times, and it raised the interest rate 7 times after August 2006, which aimed at maintaining the “healthy” development of the real estate market.

This is also the beginning of the administrative regulation of the real estate market by the Chinese public sector using monetary policy. China's real estate market, from 2008 to 2009, finally ushered in a correction, and the national housing sales area even experienced negative growth (see Figure 4). However, when the global financial crisis broke out in 2009, the Chinese government implemented the “4 trillion bailout plan”, and put forward a new proposition of “real estate market health”: first, increase the supply of ordinary commercial housing and appropriately increase the supply of related land; second, speed up differentiated credit support; third, develop and construct affordable housing on a large scale; fourth, curb investment and speculative housing consumption. However, the last policy objective is obviously not at the forefront of the policy objectives of public sector policymakers. First, there were no substantive policy measures such as taxation, down payment ratio, and other financial policies to curb investment and speculative consumption. Second, the real estate industry has become an important pillar of the national economy in the process of deepening the degree of real estate marketization in the past years. Under the context of the global financial crisis, the most effective policy to avoid negative external shocks and the impact of depressed domestic demand was to stimulate the real estate market. This was also the first time since the “Reform and Opening up” that large-scale currency issuance was used to stimulate the real estate market. Under this policy, the real estate market has grown rapidly in both sales volumes and prices in 2018 (see Figure 4); the real estate market with the housing market as the main body once again ushered into a period of prosperity, showing a significant increase in growth rate. Subsequently, in order to control the surge in housing prices and sales, the Chinese government adopted a financial policy of controlling down payments for second homes (in 2010) and implemented the “purchase restriction order”, which was known as the most stringent regulatory policy in history. The administrative control measures acted directly on the demand side of the real estate market, which caused the growth rate of the real estate market to slow down in 2013. After 2013, however, with the emergence of the phenomenon of “high inventory” in the national real estate market, the “purchase restriction” policies in various places began to loosen, and some cities were gradually cancelled.

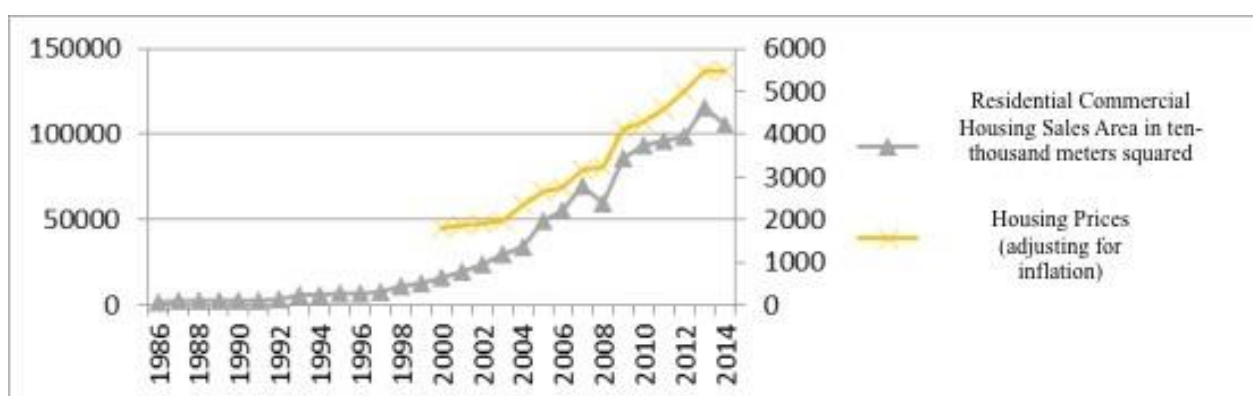


Fig. 3 1986-2014 Residential commercial housing sales area and housing prices

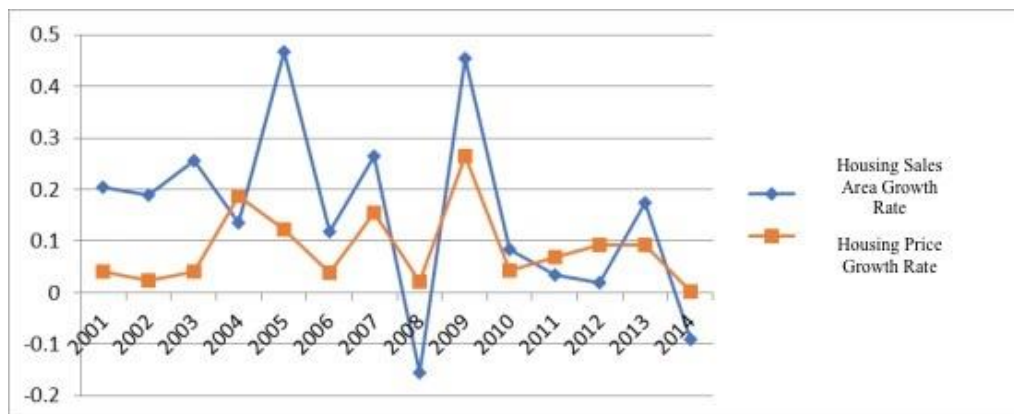


Fig. 4 2001-2014 Residential commercial housing sales area and housing price growth rate

Through the 2003-2013 administrative regulation of the real estate market, the government had not only normalized the mechanism of the public sector intervening in the real estate market through public policies, but more importantly, it had formed the real estate market as the core policy implementation object and the real estate market health as core policy objectives. Through the previous review of the main housing policies, one can see that the administrative regulation of housing policies was mainly achieved through three markets and four dimensions of policies, and thus a three-dimensional housing policy regulation system was formed. Its series of specific real estate market-related policies had also formed a three-dimensional “housing policy bundle”. The three markets are: the real estate market, the land market, and the loanable funds market [19], and the corresponding four dimensions are the housing policy that directly acts on the supply or demand side of the real estate market, and the land policy, fiscal policy and financial policy that act indirectly.

The formation of this housing policy regulation system was not accidental, and there were deep theoretical logic and policy mechanism behind its development. The health of the development of the real estate market and the housing policy regulation system had formed a deeply nested organic whole: the healthy development of the real estate market is first and foremost the policy goal of public policy formulation, and the specific implementation of public policies also needs to rely on the dynamically changing real estate market health. Only by grasping the deep theoretical logic of this can we more accurately grasp the close connection between China's real estate market and China's public sector.

(b) The characteristics of the real estate market itself and the limitations of traditional policy evaluation methods have greatly affected the objectivity, effectiveness, and accuracy of the evaluation of real estate market policy effects. From 2003, the real estate market regulation policies were intensive, and many policies showed continuity (such as “8·31 Land Policy, 2010-2011 policy of continuous interest rate hikes and the increase of the down payment ratio), the Chinese public sector was trying to build a relatively stable housing policy constraints and institutional environment. Under such context, some “jumping” housing policies (such as “purchase restriction orders”, 2006 annual interest rate adjustments and the 4 trillion-dollar rescue plan, etc.) will be significantly different from the impact of continuous housing policies. If the influence of other policies, other macroeconomic and real estate market variables can be eliminated while only focusing on the impact of these “emergent” policies, then it will be useful to study the coordination effect of the housing policy system and the real estate market and judge the significance of impact of public policies on the healthy development of the real estate market.

Based on the above characteristics of the real estate market and its policies, breakpoint regression provides an effective measurement method for measuring the impact of “sudden” housing policies. The idea of “breakpoint” came from the 1950s [20], and in the continuous improvement of theory and practice, a relatively mature measurement method had been formed [21]. The main principle is to judge the significant degree of change of the variable by examining the probability of the explained variable to the disposal effect before and after the critical value while the critical value is determined by the exogenous shock. The implementation of public policy can be analogized to the “experimental

process”, but not one that is complete: many of its variables could not be estimated and controlled. Therefore, the idea of breakpoint regression will help avoid endogeneity issues with parameter estimation [21,23].

At present, the breakpoint regression method has been applied to the real estate public policy evaluation. Li Yuxuan (2015) adopted regression equation by setting breakpoints and used the LSDV method to evaluate the effect of the purchase restriction order for 29 cities in China [26]. It was found that the implementation of the purchase restriction order in various cities had no significant effect on restricting the rapid rise of housing prices, but it had significant impact on the credit policy, though there were regional differences. (Quote) On the other hand, Deng Guoying (2010) built a breakpoint regression estimation model to estimate the impact of the central government’s interest rate policy adjustment on the real estate market demanders’ choice of loan term and other issues and found that the results were significant [24]; the impact of non-systematic factors, including earthquakes, power plant relocation and other exogenous shocks on the real estate market, were also tested. However, since the data was mainly selected from the micro-data of Chengdu, there was no extended discussion on the feasibility of the effect of public policies on a national scale.

However, due to the administrative management system in China, the central government is the highest authority on housing policy, and the release of housing policy is gradually implemented at the local level through administrative channels. Therefore, the evaluation of housing policy should reflect the breadth of policy bundles and the breadth of time and space, which are in line with the actual relationship between China's housing policy system and the real estate market. Moreover, the traditional method of using panel data for breakpoint regression sets Dummy Variable by simply dividing the system changes before and after the implementation of the policy into two, which is too “generalized”; it was not adequate to discern the differences in the implementation time points of policies within cities. Besides, the effect of housing policy on a specific housing policy or on a specific city could not fully represent the impact of real estate market policy from the perspective of national macro-control of the real estate market. This specific study will focus on the impact of various important policy exogenous shocks under the “public policy bundle”, which was closely related to the sustainable and healthy development of housing. Moreover, the research area will be based on major cities across the country. To solve the above problems in a targeted manner and supplement the shortcomings of traditional breakpoint regression based on panel data, the ITS method provides strong technical support for the evaluation of policy effects. The ITS method divides the traditional time series into three groups: “before policy implementation”, “after policy implementation” and “time along entire policy implementation”, and its characteristics are: First, renumber the two grouping series “before (after) the policy implementation”, fit with the change trend of the explained variable at the same time, and refer to the “difference” between the two and the change trend of the explained variable, which will give this difference called the “policy impact”; Second, by setting the control variable “policy implementation throughout the time series”, it is equivalent to setting the “blank group” of the “experimental group”, which was why ITS was known as “The strongest quasi-natural experimental method” [25,26,27].

(c) The generalized ITS estimation model is as follows:

$$\ln Y_t = \beta_0 + \beta_1 time_t + \beta_2 Policy_t + \beta_3 time_after_t + e_t \quad (1)$$

According to the basic implementation of the ITS model, assign the time, policy and “time_after” variables in the ITS model. Cities that started to implement a public policy in 2010 and 2011 have different initial starting points for the time_after assignment. Cities that started to implement policies in 2010 are set to 1 from 2010, and cities that started to implement policies in 2011 are set to 1 from 2011. “Y” adopts different proxy variables according to the focus of public policy on the housing market. Specifically, in this study, for the effect test of the “purchase restriction order”, we select indicators such as housing prices, housing sales, and housing sales rate of change as proxy dependent variables (Hypothesis 1: “Purchase Restriction Order” had significant effects on housing sales price;

Hypothesis 2: “Purchase Restriction Order” had significant effects on housing investment); for the effect test of “831 limit”, land price and land price growth rate are selected as proxy dependent variables (Hypothesis 3: “831 limit” has a positive impact on land prices); for the effect test of “4 trillion investment”, housing prices and housing investment are selected as proxy dependent variables (Hypothesis 4: “4 trillion investment” had a significant effect on the housing price; Hypothesis 5: “4 trillion investment” had a significant effect on the housing investment); For the effect test of “increasing the down payment ratio for second homes”, select the housing price as the proxy dependent variable (Hypothesis 6: “increasing the down payment ratio for second homes” had significant effect on the housing price).

Table 1. Model estimation time, policy, time assignment table after policy (taking the city that implemented the purchase restriction order in 2010 as an example)

year	time	Policy	Time_after
2003	1	0	0
2004	2	0	0
2005	3	0	0
2006	4	0	0
2007	5	0	0
2008	6	0	0
2009	7	0	0
2010	8	1	1
2011	9	1	2
2012	10	1	3
2013	11	1	4

The data source for this study is the annual data on the real estate indicators of 35 major cities across the country from 2003 to 2019 on the official website of the National Bureau of Statistics. The selection of the year ending in 2019 is to exclude the impact of the epidemic on the data after the fourth quarter of 2019. As shown in the chart below, this research includes four indicators: land price (yuan/square meter), housing price (yuan/square meter), housing investment (100 million yuan), housing sales area (10,000 yuan) square meter.

Table 2. RModel estimation time, policy, time assignment table after policy (taking the city that implemented the purchase restriction order in 2010 as an example)

city	ID	year	land price yuan/square meter	housing price yuan/square meter	housingi nvestment/100 million yuan	housing sales area/10,000 square meters
Beijing	1	2003	3870	4456	632.97	1171.1
Beijing	1	2004	4438	4747.14	775.99	2285.8
Beijing	1	2005	5544	6162.13	779.53	2566
...	...	...	...	...	...	...
Urumqi	35	2017	3633	6188	242.82	525.97
Urumqi	35	2018	3806	7757	411.24	509.28
Urumqi	35	2019	1565	8728	377.45	566.85

Note: Detailed data can be viewed on the following website, and can be verified by the statistics of local governments in 35 major cities. <https://data.stats.gov.cn/easyquery.htm?cn=E0105>

4. Data and preliminary analysis

4.1 The purchase restriction policy

“Purchase Restriction Order” refers to the housing purchase restriction policy issued by the government. It comes from the “National Ten Implementation Rules” issued by Beijing on April 30, 2010. China’s real estate regulation policy should follow the principle of least intervention in the market, in line with the law of industry development to a policy system conducive to long-term stable development. To this end, in addition to strengthening housing security, long-term restrictions on the purchase of commercial housing should be implemented in central cities to completely curb speculation and over-investment. Beginning in April 2010, Beijing issued detailed rules for the implementation of the “National Ten Regulations”, which first stipulated that “each household can only purchase one new commercial house”. By 2011, a total of 48 cities had issued purchase restrictions, of which 36 cities The purchase restriction policy does not give a deadline for implementation. Among them, in addition to the Nanning deadline is February 29, 2012, the other 11 deadlines are December 31, 2011. The purchase restriction policies in these cities are very different. The strictest one is Beijing’s five-year purchase restriction, and the loosest one is that the local household registration in Quzhou is only limited to the purchase of the fourth house. The purchase restriction order was introduced from 2010 to 2011, so 2011 was selected as the time breakpoint. Hypothetically, the purchase restriction order has a significant effect on residential sales prices and residential investment.

(a) The ITS breakpoint regression analysis results of the “purchase restriction order” on the housing sales price are as follows:

Table 3. Result of the Purchase Restriction Order’s impact on Housing Sales Price

house_sell	Coef.	P > t
time	-13.612	0.404
time_after	35.826	0.171
policy	242.404	0.05
constant	706.630	0.000

First, overall, housing sales prices have an upward trend over time. Second, the impact of the purchase restriction order on the housing sales price is significant, at the 5% level, due to $P=0.013$. On the one hand, it is in an upward trend, and on the other hand, the purchase restriction order will affect the sales volume of housing and increase the price. Finally, after the implementation of the policy, the long-term impact on housing sales prices is not significant.

(b) The ITS breakpoint regression analysis results of the “purchase restriction order” on housing investment are as follows:

Table 4. Result of the Purchase Restriction Order’s impact on Housing Investment

house_investment	Coef.	P> t
time	12.370	0.366
time_after	38.210	0.081
policy	68.568	0.507
constant	349.272	0.000

First of all, there is an upward trend in residential investment over time. Second, the impact of the purchase restriction order on residential investment is significant at the 10% level. Finally, after the implementation of the home purchase restriction policy, the impact on residential investment was not significant.

4.2 The 831 limit

In March 2004, the Ministry of Land and Resources and the Ministry of Supervision jointly issued Order No. 71, requiring that from August 31, 2004, all land for commercial projects should be sold by public bidding, and local governments should no longer conduct agreements on the grounds of historical problems. At the same time, developers are required to pay the land transfer fee in time, and the government can recover the land if they do not develop for two years. Therefore, the time breakpoint for 831 is set to 2005. The hypothesis is that the 831 deadline has a significant impact on land prices.

The analysis of the impact of the 831 deadlines on land prices is as follows:

Table 5. Result of the 831 policy's impact on Land Prices

land prices	Coef.	P> t
time	225.8519	0.023
constant	5489.43	0.000

Table 6. Result of the 831 policy's impact on Land Prices

land prices	Coef.	P> t
time	2853.029	0.402
time_after	-2610.181	0.444
policy	-1285.886	0.514
constant	1350.971	0.825

Overall, land prices have steadily increased over time. The regression coefficient is significant at the 5% level, but according to the ITS model analysis, it is found that the land price and the growth rate of land price are not rising steadily because of the 831 limit and the p value is greater than 0.1, so the regression coefficient is not significant. The 831 limit has no significant impact on land prices, and other unobserved omitted variables have a positive impact on land prices.

4.3 Four trillion rescue plans

In September 2008, after the outbreak of the international financial crisis, China's economic growth rate dropped rapidly, exports experienced negative growth, many migrant workers returned to their hometowns, and the economy faced the risk of a hard landing. In response to this crisis, the Chinese government launched ten measures in November 2008 to further expand domestic demand and promote stable and rapid economic growth. According to preliminary calculations, the implementation of these ten measures will require an investment of about 4 trillion yuan by the end of 2010. With the passage of time, the Chinese government has continuously improved its policies on the international financial crisis and has gradually formed a package of plans to deal with the sub-crisis. Since then, some people in the media and economic circles have simply interpreted it as a "four trillion bailout plans", and because its duration is from November 5, 2008, to the end of 2010, they chose 2009 as the breakpoint. Assuming a hypothesis, the four trillion bailout plan has a significant impact on housing prices and housing investment.

The analysis of the impact of the four trillion bailout plan on housing prices is as follows:

Table 7. Result of the Four Trillion Bailout Plan's impact on Housing Prices

housing prices	Coef.	P> t
time	0.0075	0.000
constant	0.0588	0.000

Table 8. Result of the Four Trillion Bailout Plan's impact on Housing Prices

housing prices	Coef.	P> t
time	0.0089	0.129
time_after	0.0003	0.959
policy	-0.0194	0.359
constant	0.0576	0.018

Through the coefficient, one can see that housing price shows an upward trend with the growth of time, and the speed of housing price growth with time is quite different before and after the implementation of the policy (0.0089 and 0.0003). However, by observing the size of the p-value, it can be concluded that the impact of the four trillion bailout plan on housing prices is not significant (the p-value is greater than 0.05 except for the constant term). So, the conclusion is that it is not the \$4 trillion bailout that is causing housing prices to grow over time.

The impact of the four trillion bailout plan on housing investment is as follows:

Table 9. Result of the Four Trillion Bailout Plan's impact on Housing Investment

housing investment	Coef.	P> t
time	0.0131	0.000
constant	0.1119	0.000

Table 10. Result of the Four Trillion Bailout Plan's impact on Housing Investment

housing investment	Coef.	P> t
time	0.0152	0.106
time_after	0.0030	0.767
policy	-0.0507	0.135
constant	0.1156	0.003

Through the coefficient, the housing investment shows an upward trend with the growth of time, and the speed of housing investment growth with time is quite different before and after the implementation of the policy (0.0152 and 0.0030). Looking at the p-value, it can be concluded that the four trillion bailout plan does not have a significant impact on housing investment (all p values are greater than 0.05), so the change in the slope before and after the policy should be attributed to other variables.

4.4 Increasing the down payment ratio for second homes

In June 2003, the state restricted the purchase of houses by residents and the financing of real estate enterprises and increased the down payment ratio of residents' loans and the requirements for their own funds for loans to real estate enterprises. In September 2007, the New Deal increased the down payment ratio for second homes to curb the demand for second homes. To adopt a differentiated credit policy, the first proportion, in 2010, the credit conditions for second homes have been adjusted and gradually shrunk from the "National 11", and the requirements have been greatly increased, and the down payment ratio for the first home must not be less than 30%; The 50% of Article 10 has been raised to 60% of Article 8 of the new country, and the loan interest rate shall not be lower than 1.1 times the benchmark interest rate; the issuance of the third and above housing loans shall be stopped. In 2014, the 930-mortgage new policy loosened the restrictions on purchases and loans, and house prices rose. In 2015, 330 continued to ease credit, and real estate demand recovered in an all-round way. In 2016, under the 930 new deal, many hotspot cities restarted purchase and loan restrictions during the National Day; in November 2016, the National Development and Reform Commission restricted real estate development companies from issuing corporate bonds to finance commercial real estate; in April 2017, the China Banking Regulatory Commission severely cracked down on

“down payment” In December 2017, commercial banks and trust companies were not allowed to invest trust funds in real estate in violation of regulations; in May 2019, the China Banking and Insurance Regulatory Commission strictly investigated the illegal injection of funds into the real estate industry by commercial banks. In 2007, the policy of “increasing the proportion of down payment for second homes” was implemented, so we set it to 1 from 2007, and set 2007 as the breakpoint. To test the effect of “increasing the proportion of second homes”, we selected housing prices as the proxy dependent variable. The hypothesis is that increasing the down payment ratio for a second home has a significant impact on housing prices.

Using the ITS model to conduct empirical analysis, the impact of increasing the down payment ratio on the second set of housing prices on housing prices is as follows:

Table 11. Result of the policy (Increasing the down payment ratio for second homes)’s impact on Housing Prices

housing prices	Coef.	P> t
time	408.6828	0.000
constant	4481.49	0.000

Table 12. Result of the policy (Increasing the down payment ratio for second homes)’s impact on Housing Prices

housing prices	Coef.	P> t
time	521.100	0.009
time_after	240.488	0.352
policy	-2690.633	0.019
constant	4305.932	0.000

Overall, housing prices have risen steadily over time. (p value <0.01) According to the analysis of the ITS model, in the year of “increasing the down payment ratio for second housing”, the effect is significant, p value $=0.043<0.05$ and it is negative, indicating that increasing the down payment ratio for second housing is effective. Lower housing prices, adjust purchasing leverage from the demand side, and control purchasing power. However, after the implementation of increasing the down payment ratio for second homes, the long-term effect of the policy on the housing effect is not significant, p value $=0.352>0.1$, and housing prices continue to rise. It shows that there are other unobserved omitted variables that have a positive impact on housing prices.

5. Results

5.1 Housing health system study

China's real estate market has undergone more than 40 years of market-oriented reforms and has gradually formed a relatively complete market mechanism, and has shown powerful market forces. On the other hand, the dependence of China's economy on China's real estate market is still high, and the introduction of the “National Tenth Article” in 2003 marked that the Central Government of PRC has determined the development of China's housing industry as a pillar industry for China's economic growth from the height of the macroeconomic regulator. At the same time, the “health (degree) development” of China's real estate was thus tied to China's economic development. The Chinese government entered the urban housing sector strongly and began to implement administrative regulation of the real estate market. Therefore, the issue of health (degree) development of China's urban real estate market is originated by the public sector under the premise of the special relationship between China's real estate market and macroeconomy, and according to the dynamic change process of China's real estate market evolution itself, the “market failure” and “government failure” in the

real estate market are constantly and dynamically adjusted. The public sector's policy objectives for the health(degree) regulation of the real estate market are thus a dynamic process of constant change.

At the same time, the logic of China's economic growth depends on the development of China's urban real estate market. China's high economic growth is largely dependent on the growth of the Chinese economy, and the core of urban economic growth is the growth of the “real estate economy”. As of 2020, China's real estate investment is 14.02% of GDP, with housing investment accounting for 73.84% of the total real estate investment. Through the special product of “housing” as a link, and the real estate market as the core area of economic growth, the productivity of almost all sectors of the Chinese economy has increased, forming a complex system linking the private and public sectors of the entire macroeconomy with the real estate market as the core. This study is centered on this complex system, and the following preliminary conclusions are drawn.

Through a careful review of previous studies on “housing health”, we found that the relevant research dimensions mainly focus on six dimensions: evaluation of housing health indicators, research on the coordination between real estate market and macroeconomy, evaluation of public housing policy performance, research on long-term housing equilibrium or disequilibrium, research on the consistency between housing cycle and economic cycle, housing bubble measurement and related empirical studies. However, these studies are often based on limited theoretical assumptions and do not cover the entire scope of thinking about the topic of “real estate market health”. Therefore, it is necessary to systematically integrate these studies in terms of research methodology. By systematically sorting out the relevant theoretical tools and using the analytical tools of the New Political Economy, the New Institutional Economics and the Housing Economics, we analyze the problems of the Chinese real estate market itself, its relationship with the macroeconomy and its relationship with the public sector, in order to sort out some theoretical foundations of the “health of the real estate market” in China. This study proposes a shift from “housing health evaluation research” to “housing health system research”.

5.2 Housing market and macroeconomic policy

Based on the above ideas, this study reconsiders the essence of housing products and real estate market. After the reform and opening up of China in 1979, the housing sector has also been market-oriented, and in the past 40 years, the real estate market has gone through the process from scratch to existence, from the budding to the formation of a more complete system. The attributes of housing products have also been enriched and improved, and the basic attributes of consumer goods, investment goods and social security have been gradually marketed. With the improvement of the real estate market itself, the real estate market gradually formed extensive and profound links with the macro social economy and the public sector. The connotation of “healthy” development of the real estate market is also being improved and expanded. Initially, because the real estate market was not yet well-developed, the definition of housing health only focused on “a single internal market indicator evaluation”, such as price and transaction volume. However, with the deepening of the housing reform, especially the monetization of the real estate market (1998), the real estate market became deeply and extensively linked with the macroeconomic development of China, and the study of housing health gradually developed into the need to measure the relationship between itself and the overall macroeconomic development.

Subsequently, when the development of the real estate market was basically completed and the real estate market entered into a “boom period” of rapid growth, certain negative characteristics of the real estate market nature became manifest, so that government public policies became important to correct the “equilibrium deviation” in the short-term situation. The importance of government public policies to correct the “deviation from equilibrium” in short-term situations gradually emerged, and gradually formed a more complete public policy system around housing issues, including land policy, financial policy, fiscal policy and other aspects. Regardless of the effect of public policy implementation, by this stage, the importance of the public sector for the healthy development of the real estate market is beyond doubt. Therefore, the development of the real estate market needs to take

into account the coordination between itself and exogenous shocks, especially public policy changes. Therefore, the traditional research framework of “real estate market health” is not applicable to the new stage of real estate market development, which has evolved into a dynamic “real estate market-macroeconomic policy” system with interactive effects.

5.3 Policy system on Housing health control

With the deepening of the real estate market, the degree of correlation between the real estate market and China's macro economy has become increasingly close. The health of the real estate market is closely related to the overall macro economy. Under this basic premise, “market failures” and “government failures” have been occurring as the real estate market evolves on its own. The support of the public policy system is becoming necessary to correct the “failure” phenomenon, maintain the long-term equilibrium of the real estate market, curb the rapid rise of housing prices, and dynamically adjust the supply and demand structure of the real estate market. Section 4 systematically reviews the formation process of the real estate market policy control system and summarizes the four-in-one public policy system of “Housing Policy, Land Policy, Fiscal Policy, Financial Policy”. Based on the theoretical framework of institutional change and the practice of policy regulation in China's real estate market, a four-quadrant analysis framework of “supply-demand-coercive-induced change” is proposed. Under this framework, the interrupted time regression method ITS is applied to investigate the impact of the “four-in-one” housing policy bundle on both supply and demand in the real estate market.

The results of the empirical study found that: (1) the housing policy bundle has a long-term impact on the supply and demand sides of the real estate market.

The empirical results find that: (1) The effect of the housing policy, such as the “purchase restriction”, on housing sales price is significant, but the long-term effect is not significant. At the same time, the impact of the policy on housing investment and housing prices is not significant, and the long-term impact is not significant, although housing investment and housing prices show an upward trend over time. (2) The impact of land policy on land price and land price growth rate is insignificant, and the long-term impact is not significant, taking “The 831 deadlines” as an example. (3) The fiscal policy, such as the “four trillion investment plans”, is not significant for housing investment and housing price increase, and the long-term effect is not significant. (4) Financial policies such as “raising interest rates” and “raising the down payment for second suites” have significant effects on housing price suppression, but the long-term effects of these policies on housing prices are not significant.

In general, only housing policy and financial policy have substantial short-term effects on housing prices. In the long run, none of the four major policies in the empirical results has a long-run effect on the selected dependent variable.

6. Conclusion

The administrative regulation of the real estate market has been close to 20 years. According to the above analysis, the effect of regulation has been “sometimes effective, sometimes not”. For the “induced demand side” (such as interest rate hikes) of the regulatory policy is only effective in the short term, but the long-term effect is not ideal. But this is not a reason to weaken or even cancel the real estate market regulation. Quite the contrary, in the real estate market investment demand has not been effectively diverted, consumer and security demand is still rigid, the government's action is crucial. In the past exploration, the real estate market control has gradually worked out a real estate market control system including housing policy, land policy, fiscal policy and financial policy, and has worked out a series of real estate market policy implementation strategies for different market conditions. The central and local governments need to continue this idea, complete and improve this system, and be able to “master” the development, release and operation of relevant policies.

When evaluating the health of the real estate industry or the real estate market, it is also necessary to rethink the essence of real estate, fully recognizing that real estate is a product with multiple attributes and functions. It includes investment, consumption and social security attributes, so the evaluation of the industry and market should also form a complete and systematic framework. From the perspective of the overall development of China's real estate, the current period should focus on suppressing investment attributes, gradually returning to the consumer attributes of real estate, and improving its social security attributes.

The real estate market is a concept that cannot be simply generalized. It has significant differences according to function, property, and region. Therefore, it is very important to develop differentiated policy guidance of real estate industry for different functions, different regions, and different property rights attributes, etc. This requires a new relationship between the central and local governments in the distribution of policy-making power, as well as the formation of consistent goals and benign coordination mechanisms between the central and local governments in the overall strategy of urban development and real estate industry development. Among them, it will be very important to formulate scientific and detailed planning for the development of real estate industry in line with the development direction of developing small and medium-sized towns and the relationship between the real estate industry and the overall macro economy, and to coordinate it with urbanization planning, especially the planning of small and medium-sized towns.

In the development of the real estate market, the developed countries in the West have gradually formed a real estate reserve system with "real estate banks" as the core. Similar to the way banks change the money supply through public purchases or issuance according to changes in market conditions, "real estate banks" "gulp" the real estate reserves according to changes in real estate market prices, supply and demand, in order to achieve a new market equilibrium and stabilize the real estate bank is able to stabilize housing prices. While the above highlights the indispensable role of government public policy in an "immature" state, in a highly market-oriented state, the "invisible hand" will play a decisive role in the operation of the market, in which real estate banks will occupy a central position in the mechanism for playing this role.

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References

- [1] Ni Pengfei. China's Real Estate under the Impact of Financial Crisis: Analysis and Forecast of China's Real Estate Market from 2008 to 2009 [J]. *Modern Urban Research*, 2009, 24(3): 21-28.
- [2] Chen Hongyan. Prospects of China's property market in 2013 [J]. *Property Market Today*, 2013(1).
- [3] Li Dongye. The protection of modern historical buildings and the construction of world cities [C]. //2010 Capital Forum Proceedings. 2010:178-181.

- [4] Zhang Ruoxue. The International Comparison of Real Estate Bubble and the Development of China's Real Estate Industry [J]. Finance and Economics, 2010(12): 91-99.
- [5] Jane Dokko, Brian M. Doyle, Michael T. Kiley, Jinill Kim, Shane Sherlund, Jae Sim, Skander Van Den Heuvel, Monetary policy and the global housing bubble, 2009-49.
- [6] Hsiao-Jung Teng, Chin-Oh Chang, K.W.Chau, Housing Bubbles: a Tale of Two Cities [J]. Habitat International, 2012, 39(3): 8-15.
- [7] Chang Zhongze. Liquidity Shock, Monetary Policy Mistakes and Financial Crisis: Reflections on the American Financial Crisis [J]. Financial Research, 2010(07): 18-34.
- [8] Hayek. Competition as a discovery procedure. 1978.
- [9] Xiang Weimin, Li Jiaohouse. Price Fluctuation, Income Level and Consumer Spending. 2014, 20(1):50-55.
- [10] David Harvey. The Enigma of Capital: And the Crises of Capitalism. 2010.
- [11] Richard Roland (2008), The Ideology of Home Ownership: Homeowner Societies and the Role of Housing. Basingstoke: Palgrave Macmillan. £55.00, pp. 282, hbk.
- [12] Wang Wanli. Research on the Decision-Making Mode of Residential Market Actors under Non-equilibrium Theory [J]. Shanghai Management Science, 2013, 35(03): 35-40.
- [13] Huang Jiahua. New Keynesianism and Non-equilibrium Economic Theory [J]. Journal of Fujian Normal University (Philosophy and Social Sciences Edition), 1992(02): 49-56.
- [14] Zhang Hong. A Review of the Formation of the View of Government Intervention: A Comparison of Neoclassical Macroeconomics and New Keynesian Economics [J]. Jiangxi Social Sciences, 2010(11): 86-90.
- [15] Zhu Jun. Land Supply Shock, Public Resource Allocation and China's Economic Fluctuation: The Perspective of the "Dynamic New Keynesian" DSGE Model [J]. Resources Science, 2013, 35(06): 1115-1124.
- [16] Chen, D., Huang, F., Cheng, Y.B. and Caruso, R.A. (2009) Mesoporous Anatase TiO₂ Beads with High Surface Areas and Controllable Pore Sizes: A Superior Candidate for High-Performance Dye-Sensitized Solar Cells. Advanced Materials, 21, 2206-2210.
- [17] Lei Feng, Mark S. Seasholes. Correlated Trading and Location. The Journal of Finance, 2005, Volume 59, Issue 5, p.2117-2144.
- [18] J C Samuelson, M Chen, F Jiang, I Möller, M Wiedmann, A Kuhn, G J Phillips, R E Dalbey. YidC mediates membrane protein insertion in bacteria. Nature. 2000 Aug 10;406(6796):637-41.
- [19] N. Gregory Mankiw. The Savers-Spenders Theory of Fiscal Policy. American Economic Review, Vol. 90, No. 2, May 2000, pp. 120-125.
- [20] Hahn, C.J., W.B. Rossow, and S.G. Warren. ISCCP cloud properties associated with standard cloud types identified in individual surface observations. J. Climate, 2001, 14, 11-28.
- [21] David S. Lee, Thomas Lemieux. Regression Discontinuity Designs in Economics. Journal of economic literature. Vol. 48, No. 2, June 2010. pp. 281-355
- [22] Li Yuxuan. Is the withdrawal of purchase restriction and loan restriction policy reasonable? Empirical analysis based on dynamic panel data of 29 cities [J]. Scientific Decision, 2015(07):24-36.
- [23] Deng Guoying. Research on the impact of exogenous shocks on the real estate market [D]. Southwestern University of Finance and Economics, 2010.
- [24] Shadish, W.R., Cook, T.D. and Campbell, D.T. (2002) Experimental and Quasi-Experimental Designs for Generalized Causal Reference. Houghton Mifflin, Boston.
- [25] A K Wagner, S B Soumerai, F Zhang, D Ross-Degnan. Segmented regression analysis of interrupted time series studies in medication use research. J Clin Pharm Ther. 2002 Aug; 27(4): 299-309.
- [26] Eddy Fan; Andreas Laupacis; Peter J. Pronovost; Gordon Guyatt; Dale M. Needham. How to use an article about quality improvement. JAMA. 2010;304(20):2279-87.
- [27] Walson, L. Introduction and literature review on the health research of real estate market. HMS & gsd, 2021.

- [28] Walson, L. Research on the correlation health between real estate market and macro economy in China-- An empirical study based on panel data. HMS & gsd, 2021.
- [29] Jeffrey E. Zabel. Migration, housing market, and labor market responses to employment shock. Journal of Urban Economics, 2012.
- [30] Cao, J.A. The Chinese Real Estate Market: Development, Regulation and Investment, Abingdon: Taylor and Francis, 2015.
- [31] Case, K.E. and Shiller, R.J. Forecasting Pries and Excess Returns in the Housing Market[J] . AREUEA Journal, 1990, Vol.18 .
- [32] Hui, E. & Wang, Y. Price Anomalies and Effectiveness of Macro Control Policies Evidence from Chinese Housing Markets [J]. Land Use Policy, 2014, 39, 96-109.
- [33] Jorgen W. Weibull. A Dynamic Model of Trade Frictions and Disequilibrium in the Housing Market [J]. The Scandinavian Journal of Economics, 1983(3):373-392.
- [34] Lastrapes, William D . The Real Price of Housing and Money Supply Shocks: Time Series Evidence and Theoretical Simulations [J]. Journal of Housing Economics, 2002(11).
- [35] Lin J Y. An Economic Theory of Institutional Change: Induced and Imposed Change [J]. Cato Journal, 1989, 9(1):1-33.
- [36] Matteo Iacoviello and Stefano Neri. Housing Market Spillovers-Evidence from an Estimated DSGE Model [J]. American Economic Journal: Macroeconomics, 2010(2):125-164.
- [37] Paul de Vries, Peter Boelhouwer. Equilibrium between interest payments and income in the housing market [J]. Journal of Housing and the Built Environment, 2009(1):19-29.