Application of regression function model based on panel data in bank resource allocation financial risk management

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Abstract

Based on the traditional form of the endogenous growth model, and for it to increase the micro-foundation that includes the homogeneous and representative bank resource allocation, this paper constructs an endogenous economic growth model that includes the investment structure of the residential sector and financial deepening. Using China’s prefecture-level data proves that due to the inherent difference between the central planner’s single equilibrium solution and the family’s decentralised equilibrium solution, when the residential sector’s preference for real estate investment causes the investment structure to deviate from the optimal level of society, the increase in the proportion of real estate investment The allocation efficiency of financial resources has a significant inhibitory effect and drags down the realisation of long-term potential economic growth. In the absence of a central planner in a market economy, increasing leverage may not mean financial deepening, but may reduce financial efficiency (FEt) and accumulate systemic financial risks.

Keywords: bank resource allocation, endogenous growth model, systemic financial risk, family housing purchase, risk management

AMS 2010 codes: 34A34

1 Introduction

With reference to the estimation of the leverage ratio of various sectors in China by the National Balance Sheet Research Centre, 2008 is the node of the change in the leverage ratio of China’s non-governmental sectors. Previously, the leverage ratio of the non-financial corporate sector and the residential sector in the non-governmental sector was still at a relatively low level. At the beginning of 2008, the leverage ratio of the

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doi:10.2478/amns.2021.2.00056
non-financial corporate sector was about 98%, and the leverage ratio of the residential sector was about 20%. By the end of the second quarter of 2018, the leverage ratio of the non-financial corporate sector in China had fluctuated to 156.4%, while the leverage ratio of the residential sector was linear and rose to 51%. Over the same period, the proportion of housing mortgage loans in total bank loans has been rising, which has become a phenomenon-level problem that needs urgent attention in China; the increase in debt financing caused by the increased leverage of the residential sector has a significant statistically positive correlation with the prosperity of the real estate market. However, in the early period of the 2008 financial crisis, with the exception of China, a very significant phenomenon in the world’s major market-oriented economies was the sudden increase in the total debt financing of the residential sector. For example, in the 5 years before the crisis, the cumulative growth rate of the leverage ratio of the Japanese residential sector was about 46%, and the cumulative growth rate of the US residential sector’s leverage ratio was about 44%; except for the relatively backward economy in Italy, the cumulative growth rate of the leverage ratio was about 36%. Except for Germany, where the real estate price has been declining since World War II, it is −2%. In the 5 years before the crisis, the cumulative growth rate of the leverage ratio of the residential sector in Western European countries was between 44% and 45%. As the leverage ratio of the residential sector and the non-financial corporate sector in China are both much higher than those of the OECD countries over the same period, ‘high leverage may trigger a financial crisis’ has become a social consensus, and based on the public reaction to this social consensus, departmental decisions will naturally lead to ‘deleveraging’ policies.

A more realistic interpretation of the ‘deleveraging’ policy is that in market economy countries, families buy real estate to obtain the benefits that real estate can bring, and the most important thing is to obtain public services accompanying real estate by holding real estate. And based on public services to increase the discounted value of household income in each period. Then, theoretically speaking, between the eastern, central and western regions of our country, there should be the eastern region with higher potential income growth or relatively higher total factor productivity. The residential sector has a stronger willingness to purchase assets, while in the micro-main body the willingness to buy a house will inevitably be reflected in the concentration of population in the eastern region, which is basically consistent with the population flow in China. It is worth noting that, as a follow-up indicator of household real estate purchase behaviour, real estate investment should also be adapted to population growth. In fact, in relatively underdeveloped areas such as China’s central and western regions and population outflow regions, the total amount of local credit is used as the base; the proportion of real estate investment and the proportion of housing mortgage loans are higher than those in the eastern region. This seems to be a phenomenon completely contrary to Schumpeter’s ‘financial development’ theory, that is, the purchase of assets represented by real estate by the household sector does not seem to be for the purpose of obtaining opportunities to participate in the division of labour in the housing market. The resulting increase in the share of private sector financial resources cannot be understood as the accumulation of financial resources to promote long-term economic growth. On the contrary, it may lead to expected changes brought about by the decline in potential output, thereby increasing systemic financial risks in the region and through contagion. The effect threatens the soundness of the nationwide financial system [1].

In the process of advancing the nationwide ‘deleveraging’ policy and the accompanying ‘supply side reform’ policy, the growth momentum of leverage in China’s non-financial corporate sector has been suppressed, except for the residential sector. At the end of the second quarter of 2018, the leverage ratio of non-financial enterprises decreased by 0.6 percentage points from the beginning of 2017; the leverage ratio of the government sector decreased from 36.2% to 35.3%; and the leverage ratio of the financial sector also decreased from 69.7% to 64.3%. In the context of the significant ratcheting effect of leverage, it is not easy for China’s leverage ratio regulatory policy to achieve the above policy effects. However, in the same period, among the various economic entities in the society, only the leverage ratio of the residential sector rose from 49% at the end of 2017 to 51% in the second quarter of 2018. With reference to historical data in the United States, economic history studies after the end of World War II found that short-term consumer loans have always been the main factor influencing the rise in the leverage ratio of the residential sector; this situation is in the historical process of the transition from
developing countries to developed countries in some OECD member countries. This is particularly obvious, but the situation in our country is quite different. As of the end of 2017, despite the Fed’s various measures to intervene in the short-term credit market, short-term consumer loans in the United States still accounted for 25% of all loans; while China’s short-term loans accounted for only 17% of total loans in the same period, and China’s leverage ratio increased rapidly. More matching is the rapid rise in housing mortgage loans. Therefore, in a statistical sense, an important contributor to the leverage ratio of China’s residential sector is 23.8 trillion yuan in housing mortgage loans (including entrusted loans) as of the end of the second quarter of 2018.

After the outbreak of the international financial crisis, China has experienced the simultaneous prosperity of real estate prices and financial markets that the United States experienced 10 years before the crisis. At the same time, it is worth noting that the United States has experienced a simultaneous depression of real estate prices and financial markets in the 5 years after the crisis; therefore, will China repeat the history that occurred in the United States, with simultaneous depression of credit activities and real estate prices, and the public sector? The question of the means to design a crisis plan for this situation will become a problem that the monetary authority must think about in the future to maintain financial stability and promote financial development. Since credit activity is currently the main business activity of the main participants in China's financial market, the credit cycle will directly affect the stability of the Chinese financial market and is a better indicator of systemic financial risks. At the current stage and at the national average level, housing is undoubtedly the smallest economic decision-making unit constituting the residential sector – and the most important asset decision of the family. Therefore, the discussion of the real estate market, from the perspective of economic behaviour, must introduce the analysis of bank resource allocation behaviour.

2 Literature review

As a part of the selection of bank resource allocation by residents, what impact will the real estate market boom triggered by mortgage purchases have on the systemic risks of the Chinese financial market? At present, the academic circles have not yet obtained consistent views on the discussion of systemic financial risks or the mechanism of crisis generation. However, at least we can know based on the current research that the real estate market and the credit market may go through a certain mechanism, based on the objective existence of adverse selection of the mortgage market and the heterogeneity of representative subjects (mainly referring to the heterogeneity of income in the household sector). Irrespective of (sex) condition, the increase in the total amount of loans can endogenously lead to the collapse of the credit market and the real estate market through the adverse effects on financial efficiency (FEt) and long-term potential economic growth rate. In general, the contingent channel that links the two markets is the endogenous collapse mechanism of the financial market represented by ‘real estate market prosperity-total loan supply increase-leverage ratio-FEt decline-long-term output decline’. It is recognised that the existence of the mortgage loan market results in the increase in the leverage ratio, which has led to a decline in the efficiency of financial resource allocation; and the decline in FEt means a decline in financial soundness [2].

Traditionally, economists represented by monetarism generally recognise the credit cycle and the real estate market cycle as two independent research objects for research, and at the same time analyse the potential interaction between the two based on the mechanisms underlying the following two broad paths: First, the prosperity and depression of real estate prices lead to the prosperity and depression of the credit market. Second, the prosperity and depression of the credit market lead to the prosperity and depression of real estate prices. In related previous studies, some scholars have proved that even if the dynamic adjustment of real estate prices is completely ignored, financial frictions can trigger a spontaneous collapse of the credit market due to the existence of information asymmetry. Their main point is that due to the existence of multiple equilibriums caused by adverse selection, a simple increase in the total amount of credit in a particular economy can become an endogenous factor that causes the phenomenon of first boom and then collapse in lending activities. In the initial stage, the increase in the total amount of credit supply led to an increase in lending activities, thereby increasing the
proportion of the so-called ‘secondary market’ credit amount in the total market. However, as the overall credit quality of borrower declines, high-quality borrowers may decide to bear the corresponding costs on their own in order to obtain better credit conditions. And this kind of market search behaviour may lead to the inefficiency of the financial market, which in turn leads to the collapse of the subprime mortgage market, and the real estate market crisis through the liquidity constraints of market entities. Large fluctuations in real estate prices are a key factor in the interaction between the real estate market and the credit market. In particular, if housing prices are expected to rise, the bank will increase its willingness to approve loans, although this means that the bank may have to lend money to lenders with lower credit quality. In addition, in anticipation of rising housing prices, the residential sector is more inclined to participate in speculative activities [3]. Although it seems reasonable, this intuitive behaviour tends to lead to a ‘single equilibrium problem’, i.e. if housing prices are expected to rise in the future, the current credit demand and the accompanying housing demand should be at a higher level. This in turn will push the current house price to rise to a higher level, thereby making the possibility of future house price increases relatively lower. Or, to put it another way, as housing prices rise, the real estate price level will eventually approach the maximum at a certain point in time – we can call this point the ‘benchmark.’ At this point, future housing prices are expected to fall. But if this is the case, banks and the residential sector involved in speculative activities are relatively less likely to buy at the time – therefore, the ‘benchmark’ housing prices should not be at the highest level. The problem is that in the equilibrium of rational expectations, there should be no ‘idiots’ willing to buy at the highest price that will only go down thereafter; therefore, there is a self-collapse mechanism in the real estate market, and its collapse will inevitably trigger a credit market crisis. Therefore, the difference between the two paths is mainly reflected in the discussion between the two market cycles, which is and which is the result; in general, scholars generally believe that the interconnection between the rise and fall of real estate prices and the fluctuation of the credit market can lead to the overall prosperity and depression of economic activities; and the overall economic activity also has a counterproductive effect on both, and can have an amplifying effect on the fluctuations of the two [4].

Based on the above-mentioned endogenous collapse mechanism, some scholars have also discussed the relationship between financial deepening and long-term economic growth represented by the possession of financial resources in the private sector. In the traditional sense, the financial development theory represented by Schumpeter believes that financial deepening can increase the financial resource support obtained by innovation, thereby promoting the improvement of total factor productivity and promoting long-term and sustainable economic growth. However, some documents after the 2008 crisis pointed out that with the continuous improvement of financial deepening, the positive effect of financial deepening on economic growth is declining; in most cases, the promoting effect of financial deepening on economic growth is only reflected in the financial industry itself. The scale of growth noticed in the short-term is not because the expansion of financial market resources has a beneficial effect on other industries, which is the ‘removal from reality to the virtual’ often mentioned in the academic circles of our country; in some cases, the commercial banking system, the inefficiency of active business behaviour and financial deepening resulting from high leverage can even hinder technological progress, thereby reducing the potential growth rate of total factor productivity, adversely affecting long-term economic growth expectations and ultimately threatening the robustness of the financial system [5].

Therefore, the impact of residential mortgage purchases on the soundness of the financial system can be understood as the impact of the real estate market boom on FEt under the advancing demand. Regarding this effect, the current research results can be roughly divided into two categories: ‘promoting effect’ and ‘inhibiting effect’. Some scholars have reviewed the views that hold the promotion effect. They believe that the more important the connection between land and capital in the production of tangible assets, the more sensitive housing prices are to basic shocks such as output growth rates and global interest rates; relaxation; Financial constraints have only a small impact on housing prices, while changes in interest rates have a great impact on housing prices. In contrast, financial innovation that relaxes collateral constraints has little impact on housing prices; therefore, inefficiencies originating from banks’ active operations such as financial innovation should not be passed on to the growth of housing mortgage loans. It is interesting to observe that recent studies by some domestic schol-
ars tend to support another point of view. From the perspective of the supply side of financial resources, the increase in regional real estate prices driven by increased leverage may provide banks with false expectations of unlimited house prices. Furthermore, it ignores the endogenous collapse mechanism of the real estate market, thereby reducing the motivation of the banking system to provide financial resources to other sectors; therefore, the microeconomic behaviour of households to increase leverage to purchase houses may reduce the efficiency of financial resource allocation and cause a decline in the overall level of social welfare. Some scholars have given a more observable point of view: at the level of financial resource demand, the increase in housing prices caused by leverage will increase the opportunity cost of production enterprises to invest in their main business, and therefore inhibit the willingness of social members to carry out innovation, reduce the efficiency of the allocation of financial resources and then reduce the growth of total factor productivity within the economy through the effects of financial development, and inhibit long-term economic growth [6].

3 Theoretical model

Based on the traditional Lucas model, this paper constructs a two-sector endogenous growth model with unlimited existence, using family economic behaviour as a micro-foundation to analyse the social investment structure formed by family economic behaviour and related FEt.

3.1 Bank resource allocation decisions and investment preferences

Assuming that the price is constant and the utility function of the representative households in each period is the logarithmic function of consumption with a fixed coefficient, the utility maximisation problem in the family life cycle can be described as the sum of the discounted utility of the family during its existence:

$$\int_0^\infty e^{-\beta t} \ln C_t dt$$

Among them, $C_t$ represents household consumption in period $t$, and $e^{\beta t}$ is the discount factor. Obviously, according to the above utility function, households should prefer to maximise consumption discounts rather than stable consumption. After the household obtains the income $y$ corresponding to the total output of the society (due to the assumption of constant price, there is no need to distinguish whether $y$ is nominal output or actual output), the consumption surplus represented by $y-C$ will enter the financial system as savings and be transformed; it is the total social investment $I$. Assuming that there is no direct financial market in the economy, households need to transfer their savings to financial intermediaries represented by banks before they can be converted into final investment. Here, let $\omega$ represent the conversion rate of banks converting savings into investment; assuming the conversion rate $\omega_0 = 1$ of the frictionless direct financial market, all savings will be converted into investment; then the financial market of $\omega = 1$ is where the residential sector fully participates in financial activities; and the market environment is the market with the highest degree of financial deepening. However, due to the market participation of indirect financial market intermediaries, even assuming that there is no other friction in the market, financial intermediary activities will consume certain costs, and these costs constitute transaction costs or financial frictions in the indirect financial market where the economy is located, as shown in Figure 1.

Therefore, we use $\omega_1$ to represent the savings-to-investment conversion rate, and the closer $\omega_1$ is to $\omega_0$, the higher the level of financial deepening in the market, and vice versa, the lower; $\omega_1 = 0$, the residential sector does not participate in the financial market at all, i.e. the financial market is in a state of collapse. It is worth noting that the savings-to-investment conversion rate and savings itself determine the constraints of household financial resource budgets:

$$\omega_1 (y-C) - I = 0, \quad \omega_1 \in [0, 1]$$

The household sector allocates the financial resources it holds within the budget constraints. It is assumed that there are only two assets that households can choose, namely real estate investment and stocks. Stocks constitute
the new capital of other productive sectors except real estate. Assuming that the depreciation rate $\delta$ in each period is a fixed constant, the share of financial resources for households purchasing real estate in all financial resources is $v$, and the share of financial resources invested in other productive investment opportunities is $1-v$. This article assumes that $v$ is an exogenous parameter. Suppose the total real estate assets is $H_t$, and productive investment corresponds to the total accumulation of physical capital in the economy as $K_t$, i.e. households can accumulate real estate in increments of $\Delta H_t$ and material capital in increments of $\Delta K_t$. Among them,

$$\Delta H_t = vI_t - \delta H_{t-1}$$  \hspace{1cm} (3)

$$\Delta K_t = (1-v)I_t - \delta K_{t-1}$$  \hspace{1cm} (4)

Therefore, when the exogenous investment structure parameter $vI_s$ is determined, the family’s cross-border investment is under the joint constraints of financial resource budget constraint in Eq. (2), real estate asset accumulation in Eq. (3) and capital accumulation in Eq. (4). Periodic decision-making behaviour can be summarised as maximising the objective utility function in Eq. (1). Obviously, the formula provided in Eq. (1) can be optimally solved by determining the income $y$.

3.2 The endogenous growth model and the determination of income

Assuming that the population in the economy is a constant that does not increase, it can be defined as 1 by a regular transformation [7]. The production function is the Cobb–Douglas production function. There is an income equation for the resident sector:

$$y_t = A_t K_t^\alpha H_t^{1-a-\gamma}$$  \hspace{1cm} (5)

Among them, as above, $y$ still represents the output without considering the price, i.e. the actual income of the residential sector. $A$ represents the technological level reflected in total factor productivity, and $\alpha$ and $1-\alpha-\gamma$ are the output shares of productive material capital stock and real estate stock, respectively. It is worth noting that, without considering the heterogeneity, for representative individuals in the household sector, since a part of real estate investment is not actually used for production, it forms part of consumption or the next period of acquisition [8]. More financial resources (increasing $\omega_1$ in the individual sense and lowering the financial constraints of the household sector) come to be involved, as a result of which only a part of the real estate is involved in the formation of income $y$; thus, its unit contribution rate is only $(1-a)-\gamma$, where $0<\gamma<1-a$ applies. However, from the perspective of the economy as a whole or from the perspective of the central planner, the assets formed by real estate investment determined by bank resource allocation are actually participating in the social production process. Under the constraints of Euler’s theorem, output will be fully distributed among the input production factors. Therefore, the unit return that the real estate stock $t$ should receive is its social benefit $(1-a)-\gamma$; while the private sector represented by the family believes that $H_t$ can be obtained, the unit return is $(1-a)-\gamma$. Therefore, there will be obvious conflicts between the decentralised equilibrium and the single
equilibrium of real estate, and the market participation of real estate has a spillover effect on other resources; this article sets this externality as $H^T$. By averaging the default distances of banks each year, we get Figure 2.

Fig. 2 Time series of banks’ average default distance.

### 3.3 Equilibrium value solution and comparative analysis

Based on the above conditions, the target utility function of the representative household sector is optimised. Under the balanced growth path, the maximum utility of the household will be realised under the condition that the ratio of the stock of productive material capital to the stock of real estate is constant, i.e.

$$\frac{K}{H} = \frac{1 - v}{v}$$

Therefore, in order to maintain the equilibrium growth rate or sustainable growth rate of the economy, the representative households’ investment decisions on the two asset stocks must be directly determined by the exogenous investment structure coefficient $v$. Since the equilibrium scale of the two types of assets will inevitably appear as a linearised relationship ($K = \theta H, \theta = (1 - v)/v$) after the regular transformation, the equilibrium growth rate of output $g$, the stock of productive material capital and the stock of real estate are the same, and these are:

$$g = A \omega_1 (1 - \gamma) (1 - v)^a v^{1 - a} - (\beta + \delta)$$

(7)

Assuming that other parameters remain unchanged and only considering the relationship between $FE_t$ and $v^t$, for the central planner, the realisation condition of a single equilibrium of the economy is the first-order optimisation condition of $g$, i.e. the optimal investment structure can be expressed as:

$$v^*_1 = 1 - a$$

(8)

Similarly, under the condition of decentralised decision-making in the residential sector with the family as the decision-making unit, the optimal investment structure determined by a homogenised family can be expressed as:

$$v^*_2 = (1 - a - \gamma)(1 - \gamma)$$

(9)

As this article assumes $0 < \gamma < 1 - a$, it is obvious that there is $v^*_1 > v^*_2$ here, i.e. when real estate’s externality to the economy is positive, the optimal investment structure of decentralised equilibrium is smaller than the optimal investment structure derived from a single equilibrium; and when the spillover effect of real estate on the economy is negative, $v^*_1 < v^*_2$, the stock of real estate assets accumulated by households purchasing real estate will be greater than the stock of real estate assets, thereby ensuring the continuous growth of the social economy.
At the same time, it can be seen from Eq. (7) that the equilibrium growth rate of output (g) of an economy is a linear function of the level of financial deepening (ωt). Here, FEt is defined as the effect of financial deepening on the growth rate of output; the marginal contribution rate is derived from the left and right sides of Eq. (7).

\[
FE_t = \frac{dg_t}{d\omega_t} = A_t (1 - \gamma) (1 - v_t)^{a_t - 1}
\]

(10)

Therefore, from Eq. (10), we can see that under the condition that the economy maintains a stable growth rate, the financial efficiency (FEt) is mainly determined by the economic technology level (At), the household sector investment structure parameter (v_t) and the real estate stock determined exogenously. The spillover effect or externality (γ) and the marginal rate of return (α) of productive material capital stock are jointly determined. Although the discount factor β and asset depreciation rate δ of the residential sector can have an impact on the equilibrium economic growth, they have no direct impact on FEt. Relating Eqs (8) and (9), when the current investment structure v_t formed by household decentralised decision-making is greater than the social optimal condition v∗_t, the asset allocation behaviour of households purchasing real estate will lead to a decline in the efficiency of financial resource allocation, which will affect systemic finance. The accumulation of risk has an acceleration effect. This risk accumulation effect is also affected by the endogenous collapse mechanism of the real estate market. The present article is based on the premise that when real estate sales are relatively good and the leverage ratio is relatively stable, there are still some potential participants in the real estate market, and the real estate corresponding to the single equilibrium problem, the ‘benchmark’ for the market to transition from prosperity to depression, has not yet been reached. Therefore, the sales situation has an inhibitory effect on mitigating the accumulation effect of bank resource allocation on financial risks. Therefore, based on the theoretical model, this article proposes the following hypothesis to be tested: after the bank’s resource allocation behaviour corresponds to the investment structure above a certain level, it will use the reduction of FEt as a channel to generate an accumulation effect on systemic financial risks, and the sales of real estate may reduce this accumulation effect [9].

4 Empirical analysis

In this part, we use the influence path of ‘asset allocation behaviour-investment structure-FEt-economic growth-systematic financial risk reduction’ to introduce real estate investment as a lagging item of real estate purchase activities triggered by bank resource allocation behaviours, and analyse the impact of investment on structure of economic growth, thus demonstrating the relationship between the asset allocation behaviour of China’s residential sector and the systemic risk of China’s financial market. Referring to Peng Yuchao (2015), we construct the following regression model:

\[
g_{it} = (\beta_1 - 1) y_{it-2} + \beta_2 FD_{it-1} + \beta_3 H_{it} FD_{it-1} + \beta_4 H_{it} + \epsilon_{it}
\]

(11)

Among them, g_{it} represents the economic growth rate. Considering that the availability of data and the research period is limited to the period between 2013 and 2017, this article uses the GDP growth rate to measure g_{it}. However, there are some endogenous problems. For example, the GDP growth rate itself is partly derived from investment growth. Therefore, in the follow-up empirical analysis process, this article uses the industrial added value as a substitute variable to test the analysis conclusion for robustness. In order to ensure the unity of the unit and overcome the possible nonlinear relationship between variables, y_{it} takes the natural logarithm of the nominal GDP. Taking into account the availability of data, this paper uses loan balance/GDP to measure the level of financial deepening (FE_{it}), and uses the current period of real estate investment/fixted asset investment to establish a variable H_{it} to measure the investment structure (v_{it}) of the household sector in the previous period. Obviously, according to the hypothesis to be tested, as proposed by the theoretical model, there should be a certain threshold or threshold for H_{it}. After breaking this threshold, the β3 in the above parameters must
be negative. Therefore, the regression model in this paper mainly tests the null hypothesis that \( \beta_3 \) is a positive value. The data comes from the annual data of 200 prefecture-level cities that can be retrieved in the Wind database and ‘China City Statistical Yearbook (2017)’. Due to the short period of theoretical model research (2013–2017), this article’s empirical analysis partly ignores the impact of price level changes, and all data are selected from nominal values. The mean value of FD calculated by the sample is about 0.744, and the standard deviation is about 0.431.

In general, even if prefecture-level cities with higher and lower per capita economic scales are excluded in the sample selection process, the level of financial deepening of the remaining prefecture-level cities in China still has significant imbalance and inadequacy. Looking at the national situation, similar to prefecture-level cities near Beijing, Shanghai, Guangzhou and other central first-tier cities, the proportion of real estate investment driven by real estate demand in underdeveloped areas is also at a relatively high level [10]. Taking into account the endogenous nature of the boom and bust of the real estate market and the credit market as described in the reference, as well as the limitation of the sample size and the operational applicability of the dynamic panel data model, this paper uses the generalised moment (GMM) estimation method to estimate; further, the fixed coefficient effect panel data model and the substitution variable method were used to re-estimate the model, and then the robustness test of the model was completed. The results are shown in Table 1.

### Table 1 The impact of bank resource allocation on FE\( t \)

| Dependent variable gi, t-1 | Generalised moment estimate 1 | Generalised moment estimation 2 | Fixed coefficient model | Substitution variable |
|---------------------------|--------------------------------|---------------------------------|-------------------------|-----------------------|
| \( y_{i,t-2} \)           | −0.047                         | −0.049                          | −0.432                  | −0.3369               |
| \( FD_{i,t-1} \)          | 0.071                          | 0.213                           | 0.193                   | 0.1921                |
| \( H_{i,t} \)             | −0.114                         | 0.2794                          | 0.563                   | 0.495                 |
| \( H_{i,t}FD_{i,t-1} \)   | −0.7829                        | −1.152                          | −1.0136                 |                       |

FE\( t \), financial efficiency.

All parameters in Table 1 are statistically significant at the 10% significance level. Columns 1–2 use the two-stage system GMM method to avoid the endogenous problem of the regression model. In the first column, without calculating the cross-multiplication of household sector investment structure and financial deepening, the coefficient of financial deepening level is 0.071, which shows that financial deepening has a continuous beneficial effect on economic growth. From 2013 to 2017, the Schumpeter effect of financial development has existed in China for a long time, and there has been no abnormal state in which financial deepening reduces economic growth. The household’s real estate allocation behaviour itself will constitute a component of GDP in the result. The coefficient in this regression model is −0.114, i.e. the more households there are that tend to purchase real estate, the more likely it is that the regional economic growth will be adversely affected. In the regression equation shown in the second column, after including the cross-multiplication term of the investment structure of the household sector and financial deepening, the coefficient is a large negative value (−0.783); this indicates that the household sector having investment preference is likely to reduce the beneficial effects of financial deepening on economic growth, and the stronger the real estate investment preference reflected in the household investment structure, the lower the efficiency of the use of financial resources. Rough calculations are as under the current real estate investment accounted for a 1% increase in the proportion of the previous period’s fixed asset investment, which will reduce the contribution of financial deepening to economic growth by about 0.78% of the externalities generated by the abuse of financial resources; while real estate investment has a significant promotion effect on economic growth (the parameter is about 0.2794). Therefore, the economic significance derived from the theoretical analysis is proved by the statistical significance of the empirical analysis here. From 2013 to 2017, the preference of the residential sector for real estate investment has a significant inhibitory effect on the efficiency of the allocation of financial resources in China, and thus it has a cumulative effect on China’s systemic financial risks [11].
The third column uses the fixed-effect model of controlling the difference between cities, provinces and annual differences to verify the robustness of the analysis conclusions of the dynamic model. The fourth column uses industrial added value instead of GDP growth and other products (such as the direct formation of corporate sector, the equity of innovation investment) having a larger opportunity cost. With nominal interest rates above a relatively low level, the household sector continues to expand its total share of financial resources through various methods (financial innovation), and the leverage ratio is in a trend of continuous growth. Due to the ratcheting effect of leverage, the demand for leverage in the residential sector has self-increasing properties. Increased leverage means that before the residential sector exhausts the available financial resources, the price of its investment target (real estate) will continue to rise, and in the case that the public sector does not impose additional capital constraints on banking financial institutions, the residential sector’s loan collateral is fair and the value is also rising. Adequate collateral means lower loan credit risk, and the increase in the fair price of collateral has also formed a significant wealth effect for the consumption and investment activities of the residential sector. Therefore, based on lower nominal interest rates, banking and other financial institutions also tend to meet the financing needs of the residential sector with sufficient collateral, as the explained variable is tested, and the parameters are generally similar to the second column. Therefore, the above analysis conclusion has certain robustness [12].

The empirical analysis results point out that the dynamic panel data model established from the 2013–2017 data of 200 prefecture-level cities in China shows that based on the preference for real estate investment, the bank resource allocation activities carried out by the residential sector are not shown in all regions. Direct promotion of long-term economic growth. At the same time, real estate investment that is affected by preferences and is higher than the optimal investment structure of the society is likely to stimulate demand growth at the cost of reducing the efficiency of financial resource allocation in the short term, thereby forming a false prosperity of the regional economy, and passing the mortgage market (including but not The endogenous self-collapse mechanism (limited to the housing mortgage market) has a cumulative effect on the systemic financial risks of the financial system. To a certain extent, real estate investment preferences represented by the use of leverage by the residential sector will pose a substantial threat to China’s financial stability. The above mechanism can be understood as a simple logic: affected by certain factors, the residential sector has expectations of price increases in the real estate market, and then believes that the scale of credit invested in the entire financial system is in the process of cyclical expansion [13].

Theoretically, the total financial resources provided by the financial industry will increase until the new income of the residential sector is equal to the new loan cost (interest expenditure), and the economic aggregate should also be able to achieve stability at this level. Long-term economic growth. But the problem is that even if the endogenous collapse mechanism of the real estate market is not considered, the long-term stable economic growth state cannot actually be achieved due to the following two factors. First, at the supply level, the steady economic growth requires innovation, and due to the wealth effect and speculative opportunities, investment decisions with households as decision-making units tend to create real estate resources that cannot be fully utilised for the society, and then in a static state in the scope of analysis, financial resources are squeezed out of other productive investment opportunities. Innovation stems from the continuity of material capital accumulation for productive investment. Therefore, the improvement of financial deepening level may not directly guarantee the stability of economic growth. Secondly, at the demand level, the wealth effect brought by the self-prosperity mechanism of the real estate market for families has made families’ individualised demand for products continue to rise, and diversification will inevitably reduce production efficiency. Therefore, while the real estate market is booming, the production efficiency within the economy will decline in the short term due to the diversification of product demand. The short-term decline in efficiency will mean a decline in household income, which will make households unable to bear the interest expenses of new loans, thereby leading to the collapse of the credit market. Therefore, the achievability of the long-term steady-state growth rate of the economy through the supply channel, the achievability of the short-term economic prosperity through the demand channel and the decentralised investment decisions formed by the investment preferences of the residential sector may reduce
the total financial expansion caused by FEt and adversely affect the long-term sustainable economic growth.

5 Policy recommendations

The policy implications of this article are as follows: First, when economic entities have an excessive preference for a certain asset, the monetary authority cannot adopt an expansionary monetary policy to suppress systemic financial risks; therefore, the market will further release its liquidity preference. The market performance of financial market products other than assets may only have a weak impact, and at the same time may increase the risk level of the market where the preferred asset is located. Second, financial deepening still plays an important role in promoting China’s economic growth. However, due to the reduction effect of asset allocation activities on FEt caused by preferences, it is not necessarily scientific to measure the proportion of private sector loans in total loans. Third, the mechanism by which the increase of leverage in the residential sector leads to a decline in FEt lies in the fact that economic entities are affected by certain exogenous factors and prefer certain assets, and the investment structure brought by asset allocation activities deviates from the social optimal investment structure; and the investment structure that deviates from the socially optimised investment structure will cause a waste of financial resources. Fourth, credit interest rates have a significant impact on restraining the rise in leverage. At the same time, monetary policy with currency stability as the core helps to adjust the expectations of the residential sector. Therefore, interest rate liberalisation is a long-term and reliable way to achieve financial stability [14].

To summarise, in the absence of a central planner in a market economy environment, increasing leverage may not mean financial deepening. The root cause of the financial crisis lies in the inefficient increase in the leverage ratios of various sectors of society. Specific policy recommendations mainly include the following three points: (1) Contrary to some recent feedback from the banking industry, using subsidies for bank operations as a way to reduce the adverse effects of interest rate marketisation on banks will not reduce the possibility of a financial crisis. Subsidies to achieve a certain monetary policy goal not only have high social costs [15], but the investment not only did not reduce the leverage ratio of banking financial institutions, but increased the leverage ratio of these institutions. From the perspective of risk accumulation, Will have a continuous adverse impact on future social benefits. Second, banks should adjust their financial structure on their own to ensure the stability of their own goodwill [16]. The social benefits of the deposit insurance system are actually lower than the private benefits it can bring to banks. Therefore, such policies must not be adopted at zero cost. In order to ensure social fairness, it is necessary to levy differentiated fees for heterogeneous banks enjoying the deposit insurance system (currently our country has implemented this aspect) and set corresponding rights and interests’ requirements. Third, the banking supervision led by laissez-faire will inevitably lead to the outbreak of the next financial crisis. Therefore, even if leverage ratio supervision is widely criticised within the global banking industry, it is still an effective and fair supervisory tool in the context of rising leverage.

6 Conclusion

Based on the traditional form of the endogenous growth model, and for it to increase the micro-foundation that includes homogeneous representative bank resource allocation, this paper constructs an endogenous economic growth model that includes the investment structure of the residential sector and financial deepening. Using China’s prefecture-level data proves that due to the inherent difference between the central planner’s single equilibrium solution and the family’s decentralised equilibrium solution, when the residential sector’s preference for real estate investment causes the investment structure to deviate from the optimal level of society, a corresponding increase can be discerned in the proportion of real estate investment. The allocation efficiency of financial resources has a significant inhibitory effect, and through this effect it drags down the realisation of long-term potential economic growth. The analysis of the mechanism of bank resource allocation activities on
the inhibitory effect of FEt pointed out that the increase in the proportion of real estate investment supported by leverage in the residential sector will have a crowding-out effect on financial resources, entering other production industries and forming a stock of productive material assets; while productive materials The accumulation of asset stock directly determines technological progress, which in turn determines the potential economic growth rate of an economy. Therefore, the adjustment of bank resource allocation triggered by the preference for real estate increases the overall risk level of the real estate market in China based on the self-collapse mechanism of the real estate market. At the same time, low efficiency consumes a lot of financial resources. The self-collapse mechanism of the mortgage market increases the overall credit market in China and the risk level; and ultimately, based on the negative incentives for technological innovation, it directly hinders China’s long-term economic growth. Therefore, reducing the preference of the residential sector for real estate investment has important practical guiding significance for maintaining China’s financial stability.

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