# Research on the Mechanism and Threshold Effect of Housing Price Increase on Debt Financing Cost of Real Enterprises

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## Abstract

**Clarifying the relationship between real estate and debt financing costs of real enterprises is of great significance for promoting the balanced development of real estate industry and real economy. Based on the data of listed enterprises from 2005 to 2020, this paper uses the mediating effect model and panel threshold model to test the mechanism and threshold effect of housing price rise on the debt financing cost of real enterprises. The results show that the increase of housing price reduces the allocation of credit resources of real enterprises, which leads to the increase of their debt financing costs. However, with the easing of financing constraints brought by the continuous rise of housing prices, it shows the characteristics of phased decline.**

## Keywords

**Real Estate; Real Enterprises; Debt Financing Costs; Credit Resources.**

## 1. INTRODUCTION

Since the reform of the housing market, China's real estate industry has developed rapidly, and the real estate price has soared rapidly. The price of commercial housing rose from 3,168 yuan per square meter in 2005 to 9,860 yuan per square meter in 2020, the proportion of real estate development investment increased from 19.64% to 26.83%, and the proportion of real estate credit increased from 14.10% to 28.70%. At the same time, the proportion of real enterprises' credit decreased from 85.10% to 67.45%, showing the phenomenon of "difficult financing" and "expensive financing", which triggered the concern about the conflict between the real estate boom and the healthy development of real enterprises. As the operating foundation and supporting force of the modern economic system, the healthy development of the real economy is vital to promote the high-quality economic development in China. Therefore, since 2018, the Chinese government's work reports and documents have repeatedly stated that "we will continue to focus on the real economy" and "strengthen the financial sector's ability to serve the real economy". In this context, in-depth discussion of the impact degree, channel and stage characteristics of the rising housing price on the debt financing cost of real enterprises is conducive to understanding the logic behind the phenomenon of "difficult financing" and "expensive financing" of real enterprises, and can also provide a theoretical basis for promoting the balanced development of real estate industry and real economy.

Existing literatures mainly study the relationship between housing prices and debt financing costs of real enterprises from the perspective of corporate asset mortgage, and few studies are conducted from the perspective of credit resource allocation (Sufi, 2007; Baum et al., 2015) [1] [2]. In addition, previous literatures only used linear regression models to study (Luo et al., 2018; Cai, 2021) [3] [4]ignoring the dynamic relationship between housing prices and debt financing costs of real enterprises. From the perspective of credit resource allocation, this paper studies the transmission mechanism of the impact of housing price rise on the debt financing
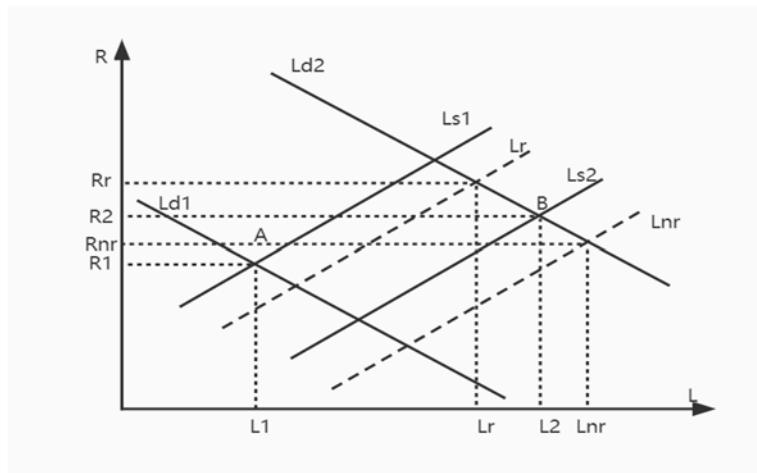
cost of real enterprises, and takes housing price as the threshold variable to construct a panel threshold model to study the impact of housing price on the debt financing cost of real enterprises in different stages, which is more accurate. The marginal contribution is as follows: (1) Using the mediating effect model, we empirically test that the rising housing price increases the financing cost of debt financing of real enterprises by reducing the allocation of credit resources of real enterprises. (2) According to the difference of the impact of housing price on the allocation of credit resources of real enterprises in different stages of real estate development, the panel threshold model is used to measure the impact of rising housing price on the debt financing cost of real enterprises, and its stage characteristics are found.

## 2. THEORETICAL MECHANISM AND HYPOTHESIS

### 2.1. Transmission Mechanism of Housing Price Rise Affecting Debt Financing Cost of Real Enterprises

The cost of debt financing reflects the cost of obtaining credit funds for enterprises, which is usually measured by the interest rate at the time of loan. According to the money market equilibrium theory, the loan interest rate is determined by the money market fund supply and demand. Therefore, the impact of rising house prices on the cost of debt financing of real enterprises depends mainly on the supply and demand of the credit market. From the perspective of credit demand, the high profits brought by rising house prices have prompted enterprises to increase investment in real estate, resulting in an increase in credit demand for real estate ( Kuang, 2011 ) [5]. At the same time, rising house prices have driven up the cost of land and raw materials. Enterprises need more external funds to invest in order to maintain and expand production ( Liu Lin and Liu Hongyu, 2003 ; luo and Zhou, 2013 ) [6] [7]. Therefore, the rise in housing prices has led to a sharp rise in the total demand for money in the financial market. From the perspective of credit supply, the growth rate of credit supply in China has been declining since its rapid rise in 2009, from 23 % to 12.8 % in 2020. Since the rise of housing prices, real enterprises have been facing the problem of financing difficulties, and the credit supply in the financial market has not met the credit needs of all enterprises. Therefore, the growth of credit supply is less than the growth of corporate credit demand. As shown in Figure 1, the aggregate supply of credit rises from Ls1 to Ls2, the aggregate demand for credit rises from Ld1 to Ld2, the equilibrium point of credit in financial markets moves up from A to B, and the total cost of financing in financial markets increases from R1 to R2. The rise of housing price makes the real estate industry occupy the credit resources of real enterprises (An, 2018) [8], the proportion of real estate credit rises, and the real estate credit supply moves from Ls2 to Lnr. In contrast, the credit share of real enterprises decreases, its supply curve shifts to Lr, and the financing cost increases accordingly, rising to Rr. Therefore, the following hypothesis H1 is proposed.

H1: The rise in housing prices increases the debt financing cost of real enterprises by reducing their credit resource allocation.

## 2.2. Threshold Effect of Housing Price Rise on Debt Financing Cost of Real Enterprises

When the level of house price is low, the real estate industry belongs to the period of rapid expansion, and the occupation of credit resources is serious, which leads to the low allocation of credit resources of real enterprises. During this period, rising house prices have raised the cost of financing real corporate debt by the most. As house prices continue to rise, the real estate industry into the highly prosperous period, the enterprise value of the mortgage assets is more and more high, the entity enterprise growing ability to obtain credit resources via collateral channels (Zhong, 2017) [9], entity enterprise credit allocation of resources has increased, the real estate prices increase the degree of entity enterprise debt financing cost reduction. After that, the excessive rise in housing prices caused the national government to regulate the real estate market. Since 2016, the central government has repeatedly emphasized the positioning of "houses are for living in, not for speculation", and strictly cracked down on the behaviors of real estate enterprises, real estate agents and Internet financial institutions that carry out financial related businesses in violation of regulations. Under the policy adjustment, the real estate industry the blind expansion of ease, credit growth dropped from 26.99% in 2016 to 11.6% in 2020, the real estate industry from entity enterprise credit resources less, entity enterprise can obtain credit supply corresponding rise, real estate prices increase the degree of entity enterprise debt financing cost further reduce. Therefore, the following hypotheses are proposed:

H2: rising prices on the real corporate debt financing costs exist threshold effect, when the low level of house prices, rising prices increase the degree of entity enterprise debt financing cost is higher, as house prices continue to rise, entity enterprise to obtain the credit resources has increased, the real estate prices increase the degree of entity enterprise debt financing costs down, diminishing present stage characteristics.

## 3. DESCRIPTION OF MODELS, VARIABLES AND DATA

### 3.1. Mediating effect model

This paper takes the allocation of credit resources as the mediating variable and constructs a mediating effect model to verify the transmission mechanism of the impact of housing price rise on the debt financing cost of real enterprises (H1).

$$Cos\,t_{it} = \alpha_0 + \alpha_1 HP_{it} + \alpha_2 X_{it} + \lambda_i + \varepsilon_{it} \tag{1}$$

$$M_{it} = \beta_0 + \beta_1 HP_{it} + \lambda_i + \varepsilon_{it} \tag{2}$$

$$Cos\ t_{it} = \varphi_0 + \varphi_1 HP_{it} + \varphi_2 M_{it} + \varphi_3 X_{it} + \lambda_i + \varepsilon_{it} \tag{3}$$

Where, i represents the individual variable, t represents the time variable, Cost is the enterprise debt financing cost, X is the control variable, including enterprise scale, enterprise profitability, interest protection multiple and cash abundance rate. M is the intermediary variable, which is represented by the allocation of credit resources.

According to the intermediary effect of test steps: ① the model ( 1 ) is tested. If $\alpha_1$ is not significant, it shows that there is no correlation between housing price and debt financing of real enterprises. If significant, the next test is carried out. ② Test whether $\beta_1$ and $\varphi_2$ of model (2) and (3) are significant. If at least one of them is not significant, then the sobel test is performed. If the sobel test is significant, there is a mediating effect; otherwise, there is no mediating effect. ③ If both $\beta_1$ and $\varphi_2$ are significant in the previous step, then to test whether coefficient $\varphi_1$ is significant; if it is significant, there is a mediating effect; otherwise, there is no mediating effect.

## 3.2. Panel threshold model

with real estate price as the threshold variable,this paper constructs the Hansen panel threshold model to study the phased impact of housing price rise on the debt financing cost of real enterprises.

$$Lev_{it} = \delta_0 + \alpha_1 HP_{it}(hp_{it} \le r_1) + \alpha_2 HP_{it}(r_1 < hp_{it} \le r_2) + \alpha_3 HP_{it}(r_2 < hp_{it} \le r_3) + \sum_{j=4}^{7} \alpha_j Co_{jit} + \varepsilon_{it} \tag{4}$$

i is the individual variable, t is the time variable, Cost is the enterprise debt financing cost,HP is the housing price level, which is also the threshold variable, r is the unknown threshold value. Coj represents the control variable, which is composed of enterprise size, enterprise profitability, interest protection multiple and cash abundance ratio. $\varepsilon_{it}$ is the random interference term.Firstly, different samples are divided based on the threshold value, and the existence of a significant threshold value is judged according to whether the estimated parameters are significantly different. The null hypothesis is: H0: $\beta1=\beta2$, and the test statistic is $LR = [SSR^*\text{-}SSR(\hat{r})]/\hat{\sigma}^2$. If the P value is less than the critical value, the null hypothesis is rejected and the threshold effect is proved to exist, which can be tested in the next step.Secondly, it investigates whether the estimated threshold value is the same as the real value. The null hypothesis is H0: r1= r2, and the statistic is $LR(r) = [SSR(r)\text{-}SSR(\hat{r})]/\hat{\sigma}^2$, and it is determined whether it is significant according to the Hansen rejection domain criterion.

## 3.3. Samples and data

Considering the integrity of the annual data of housing prices in prefecture-level cities, this paper takes listed companies from 2005 to 2018 as research samples, and screens the original data as follows : ( 1 ) remove the samples of real estate and financial industries according to the classification of CSRC ; ( 2 ) removing ST, ST * enterprises with poor business continuity ; ( 3 ) Remove enterprises with serious lack of financial data. Finally, 18020 samples of 3153 listed companies were determined, involving 242 prefecture-level cities. The micro data of listed companies from the wind database, macro data according to the enterprise is located in the prefecture-level city to match the national information center real estate network housing price data.

**Table 1.** Descriptive statistics of main variables

| Variables | Processing method | Average value | Standard Deviation | minimum value | Maximum value |
|---|---|---|---|---|---|
| Debt financing cost(Cost) | Interest expense / ( long-term and short-term loans ) | 0.0820 | 0.0913 | 0.0005 | 0.9992 |
| Commodity housing price(HPa) | Take the natural logarithm | 8.8601 | 0.7031 | 6.0794 | 10.5837 |
| Residential property prices(HPb) | Take the natural logarithm | 8.8400 | 0.7333 | 5.8571 | 10.6076 |
| enterprise scale(LnA) | Natural log of total assets | 3.4201 | 1.3889 | -1.5709 | 9.8624 |
| Corporate profitability(Tmm) | Total net profit/assets | 0.0459 | 0.0420 | 0.0001 | 0.8847 |
| Interest protection multiple(Icr) | (Net profit + interest expense)/ Interest expense | 20.0368 | 49.1771 | 1.0011 | 497.139 |
| Cash abundance ratio(Cfo) | Net cash flow/total assets | 0.0447 | 0.0732 | -0.4630 | 0.8759 |
| Allocation of credit resources(Ca) | Take the natural log of total liabilities | 2.5495 | 1.6285 | -2.7488 | 9.2819 |

## 4. EMPIRICAL RESULTS AND ANALYSIS

### 4.1. Transmission Mechanism of Housing Price Rise Affecting Debt Financing of Entity Enterprises

**Table 2.** Test results of mediating effect of housing price rise on debt financing cost of real enterprises

| Variables | Mediation Test | | | Robustness Test | | |
|---|---|---|---|---|---|---|
| | (1) cost | (2) loan | (3) cost | (1) cost | (2) loan | (3) cost |
| HP | 0.0192*** (4.37) | -0.0479** (-2.49) | 0.0170 ** (3.85) | 0.0160*** (3.88) | -0.0459** (-2.51) | 0.0139*** (3.34) |
| loan | | | -0.0462*** (-11.07) | | | -0.0463*** (-11.07) |
| cons | -0.0616* (-1.72) | -0.6667*** (-4.60) | -0.0924** (-2.55) | -0.0343 (-1.03) | -0.6873*** (-5.08) | -0.0662** (-1.96) |
| Control variables | yes | yes | yes | yes | yes | yes |
| Fixed effects | yes | yes | yes | yes | yes | yes |
| R2 | 0.4080 | 0.7182 | 0.4181 | 0.4049 | 0.7181 | 0.4151 |
| N | 18020 | 18020 | 18020 | 18020 | 18020 | 18020 |

From the first column of Table 2, it can be seen that the coefficient of housing price affecting the debt financing cost of real enterprises is 0.0192, which is significantly positively correlated. Column 3 shows that the coefficient of housing price to credit resource allocation is − 0.0479, which passes the test at the significant level of 5 %, indicating that the rise of housing price leads to the decline of credit resource allocation of real enterprises. In Model ( 3 ), the house price coefficient is 0.017, and the credit resource allocation coefficient is − 0.0462, both of which pass the significance test, indicating that the rise in house prices causes a decline in the allocation of credit resources of real enterprises, thus causing an increase in their financing costs. Replacing commercial housing prices with housing prices for robustness tests, similar

results are obtained, which all verify that the rise in housing prices increases the cost of debt financing by reducing the allocation of credit resources of entity enterprises. Suppose H1 has been verified.

## 4.2. Threshold Effect of Housing Price Rise on Debt Financing Cost of Real Enterprises

### 4.2.1. Threshold significance and authenticity test

Taking commercial housing price as the threshold variable, the significance and authenticity of the panel data are tested. As shown in Table 3, there is a double threshold test for the impact of housing price on the debt financing cost of real enterprises, and it passes the test at the significance level of 1%. Therefore, the double threshold model was used for estimation to obtain the corresponding real threshold estimates (column 8 in Table 3), which were all within the 95% confidence interval, indicating that the estimates were true and reliable.

**Table 3.** Test results of threshold effect

| variable | model | F | P | critical value | | | Estimate of threshold | 95% confidence interval |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | | | | 1% | 5% | 10% | | |
| Housing Price | Single threshold | 12.59 | 0.03 | 14.61 | 11.23 | 9.70 | 8.417 | [8.158,8.483] |
| | Double threshold | 27.01 | 0.00 | 17.92 | 12.22 | 10.27 | 8.817 | [8.730,8.825] |

### 4.2.2. Parameter estimation results of threshold model

As shown in the second column of table 4, the house price has two thresholds of 8.417 and 8.817, corresponding to the commercial housing price of 4523 yuan / square meter and 6748 yuan / square meter respectively. When the house price is less than 4523 yuan / square meter, the positive coefficient of the debt financing cost of the entity enterprise is 2.40 %. During this period, the rapid expansion of real estate attracts a lot of money into the real estate industry, and the allocation of credit resources of the entity enterprise is seriously squeezed. The rise of house price has a strong positive effect on its debt financing cost. After crossing the first threshold, the positive effect is reduced to 2.31 %, which is the high prosperity stage of the real estate industry. The rise in housing prices leads to the appreciation of corporate mortgage assets, alleviates the situation that the real estate industry squeezes the credit resources of entity enterprises, and improves the allocation of credit resources of entity enterprises. Therefore, the increase in real estate prices to raise the cost of debt financing entity enterprises weakened. After crossing the second threshold value of 6748 yuan/square meter, the positive coefficient further drops to 2.15%. At this stage, the rise of housing price makes the mortgage value of enterprise assets further appreciate, which is conducive to the real enterprise to obtain credit resources, so that the financing cost of the real enterprise further drops. In general, the rise in house prices reduces the debt financing allocation of real enterprises and triggers the increase in their debt financing costs. But when housing prices reach 4523 yuan per square meter, they push up the debt financing costs of real enterprises to the greatest extent. With the further rise of housing price, the appreciation of corporate mortgage assets is conducive to the allocation of credit resources for real enterprises. Therefore, the positive effect of housing price increase on the debt financing cost of real enterprises is gradually weakened. Suppose H2 is proved.

**Table 4.** Parameter estimation results of threshold model

| Variables | Core explanatory variable | |
|---|---|---|
| | current prices | Lagged one-stage housing price |
| Icr | -0.0002*** | -0.0002*** |
| | (-7.70) | (-7.76) |
| Scale | -0.0102 | -0.0137*** |
| | (-5.46) | (-7.17) |
| Roa | 0.1495*** | 0.1595*** |
| | (5.21) | (5.56) |
| Cfo | 0.1421 *** | 0.1392*** |
| | (11.14) | (10.94) |
| cons | -0.1003** | -0.1320** |
| | (-2.60) | (-4.57) |
| Hpa≤8.4173 | 0.0240*** | 0.0285*** |
| | (5.05) | (7.91) |
| 8.4173< Hpa≤8.8173 | 0.0231 *** | 0.0276*** |
| | (5.04) | (7.91) |
| 8.8173< Hpa | 0.0215*** | 0.0255*** |
| | (4.68) | (7.27) |
| Fixed effects | yes | yes |
| R2 | 0.3553 | 0.3702 |
| N | 17719 | 17719 |

### 4.2.3. Robustness analysis

After the housing price lags one period, the panel threshold regression results are shown in Column 3 of Table 4. The housing price still has a double threshold effect on the debt financing cost of the entity enterprise, and the crowding out coefficient of the housing price decreases from 2.85 % to 2.76 %, and finally to 2.55 %. After replacing the independent variables, the threshold test results and regression results are shown in Table 5 and Table 6. Taking housing price as the core explanatory variable and threshold variable, two threshold values of 8.432 and 8.869 are obtained, which correspond to 4592 yuan / square meter and 7108 yuan / square meter respectively. Crossing the threshold value, the crowding-out coefficient of house prices decreased from 2.04 % to 1.96 %, and finally to 1.80 %. Therefore, it can be concluded that with the continuous rise of housing prices crossing the threshold value, the decline in the allocation of credit resources of real enterprises has been alleviated, so the degree of debt financing cost of real enterprises raised by the housing price shows a phased decline feature. Suppose H2 is proved.

**Table 5.** Test results of threshold effect of substitution variables

| Robustness test | Threshold model | F | P | critical value | | | Estimate of threshold | 95% confidence interval |
|---|---|---|---|---|---|---|---|---|
| | | | | 1% | 5% | 10% | | |
| Substitution of independent variables | Single threshold | 12.34 | 0.033 | 14.82 | 10.89 | 9.59 | 8.432 | [8.371, 8.496] |
| | Double threshold | 11.38 | 0.043 | 15.63 | 10.89 | 9.55 | 8.869 | [8.896, 9.497] |

**Table 6.** Parameter estimation results of the replacement variable threshold model

| Variables | Substitution of independent variables |
|---|---|
| Icr | -0.0002*** |
| | (-7.66) |
| Scale | -0.0098*** |
| | (-5.22) |
| Roa | 0.1486*** |
| | (5.18) |
| Cfo | 0.1417*** |
| | (11.11) |
| cons | -0.0693* |
| | (-1.91) |
| HPb≤8.4320 | 0.0204*** |
| | (4.50) |
| 8.4320< HPb≤8.8685 | 0.0196*** |
| | (4.49) |
| 8.8685< HPb | 0.0180*** |
| | (4.14) |
| LTP≤4.6835 | |
| 4.6835<LTP | |
| Fixed effects | yes |
| R2 | 0.3520 |
| N | 17719 |

## 5. CONCLUSION

Based on the panel data of listed enterprises from 2005 to 2020, this paper empirically tests the transmission mechanism and threshold effect of housing price affecting the debt financing cost of real enterprises. The results show that : ( 1 ) the rise of housing prices raises the debt financing cost of real enterprises by reducing the allocation of credit resources of real enterprises ; ( 2 ) As housing prices continue to rise, the extent to which housing prices raise the cost of debt financing of entity enterprises gradually decreases, showing a phased feature. Therefore, the following suggestions are put forward : ( 1 ) the Chinese government should not only pay attention to the expansion of ' quantity ', but also focus on the regulation of credit structure when regulating credit policy to support entity enterprises ; the expansion of ' quantity ' alone will strengthen the mismatch of credit resources and the distortion of credit structure, which is not conducive to the development of entity enterprises. ( 2 ) According to the existing research conclusions, the rise in real estate prices has squeezed the credit resources of entity enterprises, so the central government should adhere to the positioning of " housing without speculation, " maintain the continuous stability of policies, and gradually guide credit funds to entity enterprises.

## REFERENCES

[1] Sufi A：Information asymmetry and financing arrangements: Evidence from syndicated loans, The Journal of Finance, 62(2007)No.2,p.629-668.

[2] Baum C F, Stephan A and Talavera O:The effects of uncertainly on the leverage of nonfinancial firms, Economic Inquiry, 47 (2009)No.2,p.216-225.

[3] Luo Xiaoling, Bie Ao, Zhu Pingheng: Effect of Housing Price Rise on Financing Constraint of Manufacturing Enterprises,An Empirical Study Based on data of Chinese listed Companies, Finance and economy, 45(2018) No. 11,p.56-61.

[4] Cai Guowei, Wu Yuqing: The credit squeeze effect of the real estate sector in China: heterogeneity effect and mechanism of,Journal of sun yat-sen university (social science edition), 21( 2021) 3,p.146-156.

[5] Kuang Weida:Real estate investment, real estate credit and China's economic growth , Economic Theory and Economic Management,20(2011), No. 1,p.59-68.

[6] Liu Lin, Liu Hongyu:Economic Analysis of the Relationship between land price and housing price , Journal of Quantitative and Technical Economics,15(2003),No.7,p.27-30.

[7] Luo Kongsheng, Zhou Yahong:Journal of Finance and Economics, 39(2013), No. (08) ,p.133-144.

[8] An Lei, Shen Yue, Xu Yan:How the Rise of housing price affects the debt Financing of Real Enterprises -- Also on the implementation effect of real estate regulation policy,Contemporary Economic Science, 40(2018), No.5,p.47-61.

[9] Zhong Teng:Real economy effect of real estate collateral value change, Research of Finance and Economics, 43(2017) , No. 10,p.55-66.