

# Nonlinear Relationship between Debt Financing and Business Performance in Real Estate Companies with Different Growing Abilities\*

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**Abstract**—Demand for funds is high for listed real estate companies. The degree of debt financing has a great impact on their business performance. This paper examines the relationship between debt financing and business performance under different growing abilities by building a panel threshold regression model for 107 listed real estate companies in China. It is shown that a negative declining effect exists between the rate of debt and business performance. Also, there is a triple threshold effect for companies with different growing abilities. The negative influence decreases with the growing abilities of business. As a result, listed real estate companies should adopt appropriate debt financing scale based on their development levels in order to maximize the benefits.

**Keywords**—panel threshold model; debt financing; business performance; growing abilities

## I. INTRODUCTION

Capital structure reflects the rights and obligations of enterprise stakeholders. It is intrinsically related to corporate governance structure, market value and business performance. Much research effort has been devoted to the choice of capital structure, however, the related conclusions varies. Nowadays, China is striding forward from a developing country to a developed country. With gradually increasing urban proportion, the real estate industry has experienced fast development due to the demand produced by transportation of old city, construction of city, rural proportion settlement and so on. Its contribution to Gross Domestic Product (GDP) has been rising for consecutive ten years. With further improvement of urbanization rate, the status of real estate industry as the pillar industry for national economy will also be consolidated. In China, Real Estate Corporations have high asset to liability ratios and high reliance on bank credit in financing channel. It is thus of great significance to discuss the capital structure of the real estate industry from the perspective of preventing enterprise risk and improving performance.

Up to now, great progress has been achieved in capital

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structure and business performance studies, however, with no uniform censuses on the relationship between them. Most existing work assumed a linear relationship, and placed more emphasis on the whole industry when selecting samples, which ignores the heterogeneity within the industry. This paper, we take listed real estate companies as research object to investigate the real estate industry using the panel threshold regression method developed by Hansen [1]. We study the relationship between capital structure and business performance of companies with different growing abilities, which provides a potential reference for financing risk prevention and business performance improvement.

## II. THEORY AND LITERATURE

### A. Relationship between Capital Structure and Business Performance in a General Point of View

Deploying appropriate proportion of equity and liabilities to reduce capital costs and maximize revenue and profits is the goal of capital structure theory. The capital structure theory today has been completed gradually from the MM theory [2] emerged in 1958. Based on these theories, empirical analysis was adopted to study the connection between capital structure and business performance, but there is still no accordant conclusion. Jensen and Harris [3-4] reputed that the cash flow administrated freely by managers can be reduced by raising liabilities. The risk of debt clearing restricts managers from self-interested behaviors, which lowers the managers' agency costs. Thus the corporate capital structure is positively related to business performance; However, Hirota and Boot [5-6] deemed that there is a negative relationship because of the excessive liabilities due to the imperfect financial system in developing country. In [7-8] the authors considered the endogenous issues and adopted the simultaneous equations model to study this problem. They proposed that a bidirectional influence effect exists between capital structure and business performance. Blue-chip companies are more inclined to endogenous financing and equity financing, while debt financing is the last choice, and it shows significant negative effects.

*B. Relationship between Capital Structure and Business Performance in Real Estate Industry*

Due to the particularity of the real estate industry, much research interest has been attracted to study the relationship between capital structure and business performance in this area. Giacomo and Christian [9] found that the capital structure is negatively related to profitability based on the empirical analysis on US real estate investment trust funds. Bwembya [10] also found that capital structure is negatively related to profitability based on the research of 34 Australian real estate investment trust funds. For the Chinese market, Song Liu and Richu Yan [11] demonstrated that liability is negatively related to profitability, and positively related to business growth but the related behavior is weak. Gongcheng Lan and Yaohua Dai [12] demonstrated that there is no relationship between profitability and capital structure, but capability is positively related to capital structure. There is still no census on this problem even in the real estate industry only.

*C. Nonlinear Relationship Research between Capital Structure and Business Performance*

Margaritis and Psillaki [13] proposed that the relationship between asset-liability ratio and business performance is not linear but inverted U-shaped. Tingqiu Cao [14] split the samples into two groups based on the median of growth indicator and argued that liability is negatively related to corporate performance. Considering the growth difference of corporate, Yujun Lian [15] explored the nonlinear relationship between debt financing and business performance using threshold regression model. He argued that debt ratio of low-growth corporate has a significant negative influence on business performance and in the high-growth corporate the results are reverse but not significant. There still lacks a comprehensive study on nonlinear relationship between corporate debt ratio and business performance for a particular industry.

In summary, the following problems regarding the relationship between capital and corporate performance remain to be solved. First, it has not yet formed a consistent conclusion, and researchers have different arguments on the relationship between capital structure and business performance. Second, most existing empirical research based work adopted a linear model while the nonlinear relationship also exists. Third, previous studies often tend to use full samples to test the connection, which ignores the heterogeneity of corporates.

In this paper, we adopt the panel threshold regression model to explore the relationship between debt ratio and business performance in real estate companies with different growth capabilities. We assume the following hypotheses,

Hypothesis 1: Debt ratio has a negative impact on business performance in real estate corporate.

Hypothesis 2: Debt ratio has a nonlinear impact on business performance in real estate corporate.

Hypothesis 3: The impact of debt ratio on business performance weakens as the corporate grows.

III. EMPIRICAL RESULTS

*A. Variable Setting and Descriptive Statistics*

We adopt the following principles to filter companies from all 155 listed real estate companies. For all the 9 years from Year 2005 to Year 2013, the selected companies should:

- Have continuous relevant data.
- Not marked by ST or PT.
- Not delisted or bankrupted during the period, asset-liability ratio NOT larger than +100%, net profit growth rate NOT larger than +100% or smaller than the -100% or containing singular values.”

The final sample size is 107. That have the balance panel data of nine years from 2005 to 2013. As shown in “Table I”, there are variable settings and the results of descriptive statistics with the analysis software STATA11.

TABLE I. DESCRIPTIVE STATISTICS

variable name	Metering method	Mean value	Maximum value	Minimum value
ROE	Net/net worth	0.076	2.160	-1.780
DEBT	The total debt/total assets	0.575	0.990	0.010
SIZE	Total assets to 10 logs base	9.568	11.681	7.899
OPE	Business net income/average total assets	0.307	1.659	0.000
OC	The top ten shareholders of the sum of shares	0.531	0.901	0.161
OWN	State-owned enterprises 1 or 0	0.367	1.000	0.000
CZL	At the beginning of this year total assets growth/total	-0.050	2.836	-1.602

We can see from “Table I” that the development of China's real estate enterprise is very uneven. The maximum asset-liability ratio is 99% while the minimum ratio is 1%, and the average is 57.9%, which is far above the average of 40% for all listed companies in 2013. The debt financing rate is too high to significantly improve enterprise operating performance. For return on equity (ROE), the average is only 0.076, the maximum value is 2.16, and the minimum value is 1.78. This indicates that for-profit companies and losses are basically consistent. In addition, the average total assets turnover is 0.307, which indicates that the turnover ability of the real estate enterprises is relatively weak. The reason is that the real estate development cycle is long, and the money collecting process is slow. The average of equity concentration is 0.531, which indicates that the management of real estate companies is highly centralized. All these features make this industry so special that we need to study it separately rather than an overall study together with other industries.

### B. Test of Threshold Effects

As discussed before, there may a nonlinear relationship between the corporate capital structure and corporate value. We now use the Bootstrapping method to test the gradual distribution of F-value and obtain the P-value to determine whether there is a threshold effect. “Table II” below shows the statistics for threshold effect test.

TABLE II. DESCRIPTIVE STATISTICS

	The critical value				
	F value	P value	1%	5%	10%
The Single threshold Test	197.578***	0.000	12.200	5.152	3.176
The Double threshold Test	50.019***	0.000	8.325	4.862	3.641
The Triple threshold Test	13.453***	0.000	7.364	4.056	3.091

<sup>a</sup>. The P value and the critical value are all using the results of "bootstrap" method which had been simulated 500 times;

<sup>b</sup>. \*, \*\*, and \*\*\* represent the significance at 10%, 5% and 1% significance level respectively.

From “Table II”, after 500-repeated bootstrap F value tests, all results of P-value for the single-threshold, the double-threshold and the triple-threshold tests are 0.000. The results for F value are all greater than the critical value at the 1% significance level of threshold, i.e., they passed the threshold effect of significant test in the single-threshold, the double-threshold, and the triple-threshold tests. This indicates the existence of the nonlinear relationship between the corporate capital structure and operating performance and thus supports Hypothesis 2. The following will analyze the triple threshold effect which is based on the above two.

### C. Estimate of threshold value

“Fig. 1”, “Fig. 2” and “Fig. 3” show the tendency of Likelihood ratio sequence LR ( $\gamma$ ) (threshold function) with respect to the growth ability (threshold variable). We can see the structure of threshold estimation and confidence interval. When the threshold value is at the lowest (i.e., the value of  $\gamma$ ) when LR is zero, the threshold parameters are -0.076, 0.020 and 0.067 respectively. At the 95% confidence level, the confidence value is 7.35 shown by dashed lines in the graph.

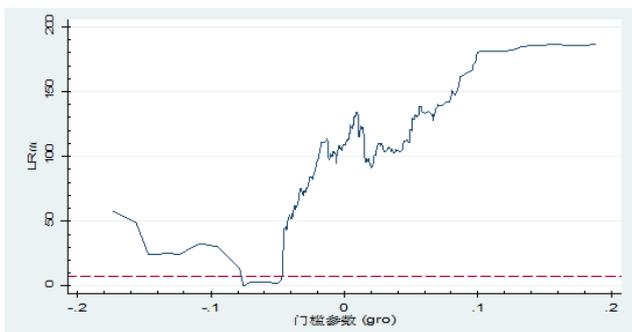


Fig. 1. Estimated value of threshold 1 and 95% confidence interval

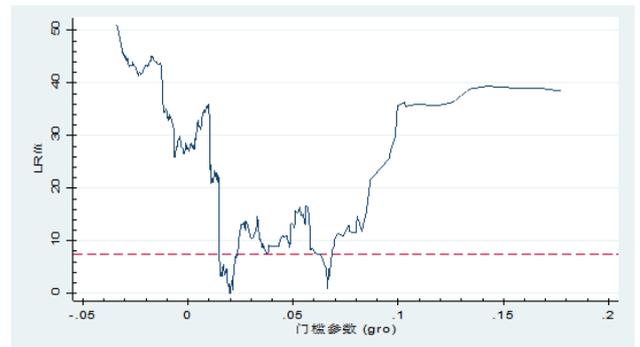


Fig. 2. Estimated value of threshold 2 and 95% confidence interval

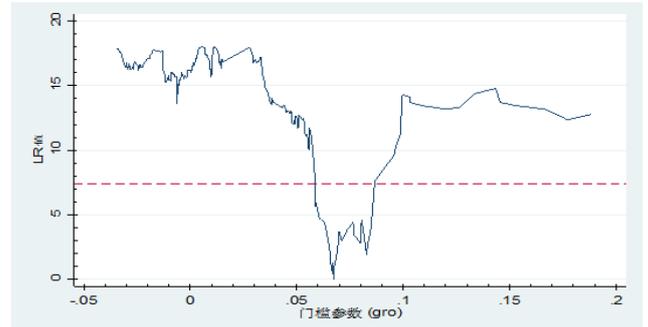


Fig. 3. Estimated value of threshold 3 and 95% confidence interval

The real estate companies can be divided into four intervals according to three threshold values, interval I ( $Gro \leq -0.0766$ ), interval II ( $-0.076 < Gro \leq 0.020$ ), interval III ( $0.020 < Gro \leq 0.067$ ) and interval IV ( $0.067 < Gro$ ). From the situation of interval division, growth varies significantly among real estate companies. The growth of some enterprises is weak and even shows a negative trend, while that of some enterprises is very strong. “Table III”

TABLE III. ESTIMATION RESULTS OF THE THRESHOLD VALUE

	estimated value	confidence interval
Threshold value $\gamma_1$	-0.076	[-0.076,-0.047]
Threshold value $\gamma_2$	0.020	[0.015,0.068]
Threshold value $\gamma_3$	0.067	[0.059,0.086]

### D. Results of Threshold Regression

The results for regression parameter estimations in each interval are shown in “Table IV” below. As seen:

- Interval I ( $Gro \leq 0.0766$ ): ROE is reduced by 1% when DEBT increases by every 1% .
- Interval I ( $Gro \leq 0.0766$ ): ROE is reduced by 1% when DEBT increases by every 1% .
- Interval III ( $0.020 < Gro \leq 0.067$ ): ROE is reduced by 0.413% when the DEBT increases by every 1% .

- Interval IV ( $0.067 < Gro$ ): ROE is reduced by 0.312% when DEBT increases by every 1%.

As the growth ability increases, the negative effect of DEBT on ROE shows a decreasing trend. The reason is that for low growing companies, its ROE is often small and even shows a negative development. This makes the equity financing amount of this type limited. But because of the company's poor profitability and the low level of the free cash flow, debt financing makes the enterprise to repay the debt principal and interest even in the state of enterprise's losses, which will further enlarge the negative impact of the debt financing on the business performance. With the improvement of enterprise growth, the enterprises have certain capital which can increase the scale of financing by issuing share. This makes the negative impact weak, although the debt financing will make part of the earnings owned by creditors, and have the negative impact on business performance. Thus Hypothesis 3 is proved.

For the control variable, it shows a positive correlation between company size and Rate of Return on Common Stockholders' Equity (ROE). Although the size of the real estate company is generally large, increasing the size appropriately still improves business performance, which market potential exists as before. There is a positive correlation between the Total Assets Turnover (TAT) and ROE. Currently, the TAT of the real estate company is generally weak. Therefore, there is no doubt that improving the corporate turnover ability is an important means to increase company profits. Total Assets Growth Rate (TAG) and ROE present a positive correlation with a weak influence degree. The reason is that the growth of company total assets often depends on financing from various channels. At the same time, enhancing the assets size will also bring about greater financing costs.

TABLE IV. MODEL PARAMETER ESTIMATION RESULTS

ROE	Coef	SE	T	P—Value
DEBT_a	-0.924***	0.059	-15.75	0.000
DEBT_b	-0.503***	0.053	-9.48	0.000
DEBT_c	-0.413***	0.054	-7.70	0.000
DEBT_d	-0.312***	0.057	-5.49	0.000
SIZE	0.220***	0.021	10.71	0.000
OPE	0.131***	0.033	3.94	0.000
OC	0.077	0.056	1.38	0.168
OWN	-0.014	0.0160	-0.90	0.369
CZL	0.066***	0.011	6.14	0.000

<sup>c</sup> DEBT\_a, DEBT\_b, DEBT\_c, DEBT\_d respectively means the debt rate in four intervals.

<sup>d</sup> SE means standard error. \*, \*\*, \*\*\* respectively means significance in 10%, 5%, 1% significance levels.

### E. Analysis in Different Intervals

"Table V" lists the numbers of companies in each interval for each year from Year 2005 to Year 2013. We can see that most real estate companies are in Intervals II and III while there is smaller number of companies in Intervals I and IV. Especially after 2010, the number of companies in interval IV decreased rapidly with a series of measures issued by Chinese government to stabilize the real estate market. Companies in interval I have smaller than average size compared with others. Domestic first-line real estate companies, however, such as Vanke, Gemdale, CMPD, BCDH, Evergrande, were mostly in Interval III before 2010, and fell to Interval II with the increasing market regulation after 2010. In recent years, most real estate companies have entered Intervals II and III. It shows that real estate companies gradually develop to maturity, and market gradually tends to stability.

TABLE V. NUMBERS OF COMPANIES IN EACH INTERVAL

	2005	2006	2007	2008	2009	2010	2011	2012	2013
Interval 1	8	8	11	13	4	8	6	8	5
Interval 2	71	47	37	68	53	62	69	71	69
Interval 3	23	28	26	23	27	22	22	22	23
Interval 4	5	24	33	3	23	15	10	6	10
Total	107	107	107	107	107	107	107	107	107

"Table VI" lists. As seen, with the growth ability increases, ROE index goes up straightly while Debt Asset Rate (DAR) increases gradually. It indicates that a company with stronger growth ability has a greater business performance as usual and a stronger tendency for debt financing.

However debt financing has an apparent negative correlation with business performance. As a result of the in-coordination between debt financing expansion rate and growth ability with the growing development in real estate industry, excess debt financing has a negative impact on

business performance. In addition, due to nature of excessively high centralization, major shareholders play a key role in making financing decision. They usually choose debt financing instead of equity financing to avoid dispersing equity. During the debt financing, because of the different effect function between shareholders and creditors, managers on behalf of the interests of shareholders may implement decisions which is beneficial to shareholders and harmful to creditors. Creditors are bound to request increasing restrictive clauses and take supervisory actions to protect their own rights, which leads to debt costs increase.

TABLE VI. CONCLUSION AND SUGGESTIONS

		ROE	DEBT	SIZE	OPE	OC	OWN	CZL
Interval 4	Mean	-0.233	0.543	8.975	0.274	0.445	0.352	-0.346
	Max	0.020	0.89	10.034	0.936	0.759	1.000	0.975
	Min	-1.560	0.040	7.933	0.002	0.203	0.000	-1.134
Interval 4	Mean	0.075	0.575	9.675	0.289	0.535	0.335	-0.069
	Max	0.540	0.990	11.139	1.241	0.877	1.000	2.707
	Min	-1.780	0.010	7.933	0.001	0.166	0.000	-0.991
Interval 4	Mean	0.120	0.591	9.588	0.346	0.542	0.472	-0.050
	Max	0.500	0.910	11.000	1.659	0.901	1.000	2.479
	Min	-0.290	0.100	8.220	0.000	0.161	0.000	-1.602
Interval 4	Mean	0.178	0.566	9.406	0.340	0.549	0.341	0.196
	Max	2.160	0.900	10.562	1.410	0.900	1.000	2.836
	Min	-0.420	0.160	8.059	0.005	0.210	0.000	-1.078

In this paper, we showed that there is a nonlinear relationship between capital structure and operation performance of real estate enterprises. We also showed that the liability ratio has a significant negative effect on the operating performance, and the negative impact is gradually weakens with the increase of the enterprises' growth ability. For real estate enterprises in different growth stages, increasing the scale of debt financing is not conducive to the improvement of its operating performance.

In view of the above analysis, some suggestions from the perspectives of financing management and cost control are as follows.

- For financing environment of domestic real estate enterprises, there are two sources of external financing for real estate enterprises in China, i.e., equity financing and debt financing. Equity financing consists of stock financing, fund financing and trust fund financing. Stock financing has strict restrictions on low-growth real estate enterprises, and there is a short of "strict" real estate investment funds due to the lack of policy. Investors choose not real estate trust financing as its costs which are much higher than debt financing. As a result, debt financing becomes the only option for most of companies as its threshold limits are relatively low. This results in the current imbalance status of financing structure of China's real estate enterprises. Our suggestion is that the government should strive to develop new financing channels, relax the financing threshold properly, and implement policies that are conducive to a variety financing maths.
- For enterprises with low-growth abilities, high debt ratio is a big burden. These enterprises should maintain its debt financing scale reasonably, develop other financing ways, and shrink the business scope. For enterprises with high-growth abilities, high debt ratio still has negative effects on its operating

performance, but this effect is weak. These enterprises should conduct equity financing while maintaining proper debt financing ratio. At the same time, they should also strengthen internal control, enterprise management and enhance control ability to further save operating and management costs.

- Other suggestions are enhancing technology, training specialized personnel of real estate industry, promoting professionalism and intelligence of the real estate industry. Enhancing technology level and personnel power can shorten project durations, reduce quality accidents, improve risk management, and promote professionalism and intelligence so as to reduce costs.

REFERENCES

- [1] Hansen. Threshold effects in non-dynamic panels: Estimation, testing and inference[J]. Journal of Econometrics, 1999, 93(2), 345-368.
- [2] Modigliani F, Miller, M H. The cost of capital, corporation finance and the theory of investment[J]. The American Economic Review, 1958, 48(3): 261-297.
- [3] Jensen MC Agency costs of free cash flow, corporate finance and take overs[J]. American Economic Review, 1986, (76): 323-339.
- [4] Harris M, Raviv A. Capital structure and the informational role of debt[J]. The Journal of Finance, 1990, 45(2): 321-349.
- [5] Hirota G. The impact of capital structure on the performance of microfinance institutions[J]. Journal of Risk Finance, 1999, 8(1): 56-71.
- [6] Boot L, Aivazian A, Mirguez-Kunt D, Maksimovic V. Capital structure in developing countries[J]. The Journal of Finance, 2001, 56(1): 87-130.
- [7] Deping Chen, Zhihai Zeng. The interaction between capital structure and enterprise performance—Empirical Test Based on the GEM Listing Corporation[J]. Accounting Research, 2012, (8), 6-71
- [8] Yiping Chen, Xindong Zhang. Ownership, capital structure and company efficiency[J]. China Management Science, 2012, 20(11): 459-467.
- [9] Giacomo Morri, Christian Beretta. The Capital Structure Determinants of REITs. Is it a Peculiar Industry?[J]. Journal of European Real Estate Research, 2008, (1): 6-57.

- [10] Bwembya Chikolwa.Determinants of Listed Property Trust Bond Ratings:Australian Evidence[N].Proceedings from the PRRES Conference-2008,Pacific Rim Real Estate Society,Istana Hotel,Kuala Lumpur,pp.1-34.
- [11] Song Liu,Richu Yan,Factors affecting the capital structure of the company—from the empirical evidence of the Chinese real estate listed companies[J].Statistics and Decision.
- [12] Gongcheng Lan,Yaohua Dai,Feng Lan,Peng Lei,Empirical research on the optimal capital structure of the real estate industry[J].Accounting Monthly,Theory Edition,2008,(5):56-59.
- [13] D.Margaritis and M.Psillaki.2010.Capital Structure,Equity Ownership and Firm Performance.Journal of Banking & Finance,3.
- [14] Tingqiu Cao,Wenxiang Sun,Jianxia Yu,Capital structure,ownership structure,growth opportunity and corporate performance[J].Nankai Business View,2004(1):58-64.
- [15] Yujun Lian,Jian Cheng,Study on the relationship between capital structure and business performance under different growth opportunities[J].Modern Economic Science,2006,28(2):97-103.