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# To Explore the Influence of Debt on Financial Risk of Real Estate Enterprises

# -- Empirical test based on PVAR model

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## ABSTRACT

It has become urgent to establish the credit evaluation system of real estate enterprises which conforms to the national conditions of China. This paper explores the possible paths that the increase of debt of real estate enterprises affects the financial risk of real estate enterprises, analyzes the relationship between the major factors that affect the financial risk of real estate enterprises, and uses PVAR model to test the above theoretical analysis. The research finds that the increase in the debt ratio of real estate enterprises will have a significant negative impact on the improvement of their long-term solvency, and the factors affecting the financial risk of real estate enterprises are interconnected on the time level. At the same time, when the debt ratio increases, enterprises with higher media attention will accumulate more financial risks.

## KEYWORDS

Real estate enterprise; Real estate enterprise debt; PVAR model

## 1. INTRODUCTION

Since China promoted the housing commercialization reform from 1998, China's real estate industry has been developing rapidly. Nowadays, the real estate industry has made great contributions to China's economic development and has become a pillar industry in our country. However, it is undeniable that most of the funds of the real estate enterprises at this stage come from credit loans. This means that the real estate industry at this stage is a capital-intensive industry. Therefore, the implementation of effective loan monitoring and credit evaluation programs for real estate enterprises will not only help the long-term healthy development of real estate enterprises, but also effectively avoid the accumulation of systemic financial risks, so as to make sure that the national economy develops stably and healthily.

Many scholars have carried out in-depth research on this issue. Altman for the first time judged whether an enterprise has or will fall into bankruptcy and financial crisis through five factors, including its profitability and repayment ability, and introduced indicators such as capital flow ability. Through empirical and empirical analysis [1]. W.H. Beaver proposed that several financial ratios can provide significant help for the business situation and the prediction of whether an enterprise will fall into bankruptcy crisis [2]. Zhang Gao added three new non-financial indicators to evaluate the financial risk of real estate enterprises on the basis of the previous 25 financial risk assessments, and achieved better forecasting results [3]. Luo Weiduo points out that financial risk can be divided into

internal risk and external risk. The internal risk includes liquidity risk, profitability risk, capital operation risk and other factors, while the external risk includes market, policy, credit risk and so on [4]. Chen Yufeng and Huang Jing believe that banks and other financial institutions should improve the loan risk management and control system, increase the intensity of loan review, and systemize risk management, so as to restrain the risk contagion effect and self-reinforcing effect within banks [5]. Deng Xiaoyan found that increasing the operating profit of real estate enterprises, increasing the ratio of newly started area to construction area, increasing the investment completion rate and increasing the balance of development loans would weaken the financial risks of the real estate industry, increase the ratio of house price to income, increase the asset-liability ratio of real estate enterprises and accelerate the growth of the balance of personal house purchase loans, and increase the financial risks of real estate, including the ratio of house price to income, operating profit and development The loan balance has a greater impact on the real estate [6]. Ren Yida proved through empirical test that social responsibility and media attention have a significant impact on the financial risk of real estate enterprises. Social responsibility can help reduce the financial risk of enterprises, while media attention can enhance the effect [7].

However, domestic and foreign scholars only analyzed the financial risk of real estate enterprises through these financial indicators separately.Meanwhile there is no systematic research on the relationship and mechanism of the specific real estate liabilities and financial risks. Based on the situation above, this paper will specifically analyze how the debt ratio plays a role in the financial risk of real estate enterprises, and at the same time explore the internal relationship between various financial indicators of real estate enterprises, hoping to provide appropriate guidance for setting up a suitable evaluation system for real estate enterprises.

## 2. THEORETICAL ANALYSIS AND RESEARCH HYPOTHESIS

### 2.1. The Solvency of the Enterprise

The accumulation of liabilities of real estate enterprises, the most direct result is the increase of asset-liability ratio. In addition, the increase in the proportion of liabilities in assets means that one or more of the factors such as current ratio, quick ratio and equity ratio are bound to rise. With the increase of debt ratio, the interest required to be paid will rise, and the interest rate protection multiplier will also decline under the condition that corporate profits remain unchanged. Correspondingly, the solvency of the enterprise,both long-term and short-term, will also decline with the increase of the debt ratio. From this, we can put forward two hypotheses.

Hypothesis 1.1: The increase of corporate debt ratio will accumulate the financial risk of enterprises by reducing their short-term solvency.

Hypothesis 1.2: The increase of corporate debt ratio will accumulate financial risks by reducing the long-term solvency of enterprises.

### 2.2. The Profitability and Development Ability of the Enterprise

On the one hand, as the development loans of real estate enterprises are invested in the development and expansion of real estate enterprises, the scale of real estate enterprises has been expanded, and after the completion of the development of real estate or projects, enterprises will get a new profit growth point; The operating rate of return, the return on total assets and the return on net assets also increase accordingly. However, due to the long development cycle of real estate, several years or more are required to have a positive impact on the enterprise's profitability, and thus alleviate enterprise's financial risk. In addition, the growth of the debt ratio tends to limit the further borrowing of enterprises, thus inhibiting their ability to develop. These effects often occur immediately after the debt ratio increases. This leads us to the second hypothesis:

Hypothesis 2: The increase of corporate debt ratio will restrain the profitability and development ability of the enterprise in the early stage, and then improve the profitability and development ability of the enterprise again several years later.

### 2.3. The Media's Role in Expanding Risk

The attention of the media has a positive effect on the enhancement of the financial risk of enterprises. In the process of media disseminating unfavorable information about real estate enterprises, some noise traders get the noise information that the stock price of the enterprises will fall, and then attract more noise traders to "jump out" and invest in the enterprises. Therefore, under the influence of the media, individual irrationality is more likely to develop into collective irrationality. After the withdrawal of a large number of noise traders, enterprises get less financial support than before the increase of debt ratio, which has an adverse impact on the asset growth of enterprises, thus increasing the financial risk of enterprises at a deeper level. From this, we can get the third hypothesis:

Hypothesis 3: With the same increase in debt ratio, companies with higher media attention will accumulate more financial risk.

In addition, the path of the increase of debt ratio on the financial risks of enterprises is not independent of each other, and the short-term debt repayment ability may be transformed into long-term debt, which will affect the enterprise’s long-term solvency. As an important criterion to judge the loan qualification of real estate enterprises, the solvency of enterprises is significantly related to the development and expansion of enterprises. Therefore, the solvency of enterprises may also be related to the profitability and development ability of enterprises. Therefore, the fourth hypothesis can be obtained.

Hypothesis 4: The factors that determine a firm's financial risk are intrinsically linked.

## 3. EMPIRICAL RESEARCH

### 3.1. Data Source, Variable Setting and Descriptive Statistics

#### 3.1.1. Data source

Due to the different financial conditions of different real estate enterprises, this paper selects 55 A-share listed real estate companies covering all parts of the country (excluding ST shares) as the research object. The sample period is 2012-2022. Based on the transmission mechanism of increasing debt ratio to corporate financial risk, The panel vector autoregressive (PVAR) model is used to study the interaction between debt ratio and corporate financial risk. The variables originally intended to be selected include current ratio, quick ratio, asset-liability ratio, equity ratio, cash ratio, total asset growth rate, operating profit growth rate, operating income growth rate, and media attention. All the data are from the wind database.

#### 3.1.2. Variable setting

In order to avoid collinearity, principal component analysis was used for indicators and variation-maximizing rotation was performed, and the results obtained were shown in the figure below.

**Table 1.** Result of principal component analysis

| Variable | factor1 | factor2 | factor3 | Uniqueness |
|---|---|---|---|---|
| Liquidity ratio | 0.8291 | -0.0132 | -0.0604 | 0.3088 |
| Quick ratio | 0.9347 | 0.0335 | 0.0157 | 0.125 |
| Equity ratio | -0.354 | 0.0348 | 0.2891 | 0.7899 |
| Cash ratio | 0.8791 | 0.0232 | -0.0727 | 0.2214 |
| total asset growth rate | -0.1341 | 0.3103 | 0.1239 | 0.8704 |
| operating profit growth rate | 0.025 | 0.263 | -0.1622 | 0.9039 |
| operating income growth rate | 0.0351 | 0.2949 | -0.0186 | 0.9114 |

As can be seen from the figure above, the equity ratio, the growth rate of total assets, the growth rate of operating profit and the growth rate of operating income account for a high degree of uniqueness. The ratio of property rights represents the company's long-term solvency, the growth rate of total assets represents the company's development competitiveness, and the growth rate of operating profit and operating income represents the company's profitability. The uniqueness of cash ratio is low, and they jointly represent the company's short-term debt paying ability. The three extracted principal components (Factor1, Factor2, and Factor3) are denoted as f1, f2, and f3, respectively. It should be noted that the absolute value of the coefficients of f1 in the current ratio, quick ratio and cash ratio is large, indicating that f1 mainly represents the short-term solvency of a company. At the same time, f2 has a larger absolute value for the total asset growth rate, operating profit growth rate and operating income growth rate, indicating that f2 mainly represents the company's long-term debt paying ability. Similarly, f3 stands for a company's long-term solvency. By looking at the correlation between f1, f2, f3 and asset-liability ratio and media attention, we can test the above hypothesis.

**Table 2.** Selected variables

| Name of Variable | Variable code | Variable meaning | Calculation method |
|---|---|---|---|
| f1 | f1 | Short-term solvency | Principal component analysis |
| f2 | f2 | Development capability and profitability | Principal component analysis |
| f3 | f3 | Long-term solvency | Principal component analysis |
| Asset-liability ratio | d | The company's debt-to-asset ratio | Direct access |
| Media attention | m | The amount of media attention the company receives | Direct access |

After first order difference, each indicator still has obvious significance.

**Table 3.** Variables after first order difference

| Variable Name | Variable code | Variable meaning | Calculation method |
|---|---|---|---|
| First difference of f1 | Df1 | Change in short-term solvency from the previous year | The first difference of f1 |
| First difference of f2 | Df2 | Development capacity and profitability change from the previous year | First difference of f2 |
| First difference of f3 | Df3 | Change in long-term solvency from the previous year | First difference of f3 |
| First difference of asset-liability ratio | Dd | The change in the company's debt-to-asset ratio from the previous year | A first-order difference in the debt-to-asset ratio |
| First-order difference of media attention | Dm | Change in the amount of media attention the company receives from the previous year | First-order difference in media attention |

## 3.2. Model Building

In the application of panel data, PVAR model treats all variables as endogenous variables, and analyzes the relationship between each variable and its lag term. Using panel data, PVAR model can not only effectively reflect the heterogeneity of individuals, but also fully consider the time effect. It is more effective for data content with short time span. At the same time, compared with the general VAR model, PVAR model has a larger data cross section, which increases the sample capacity and freedom, and the reliability of its inference is also increased due to more observations.

$$y_{it} = \gamma_0 + \sum_{j=1}^{m} \gamma_j \, y_{i,t-j} + f_i + e_t + u_{it} \quad (1)$$

In the formula, i represents the enterprise (i = 1, 2, ..., 55); t for year (t = 0, 1, 2, ..., 8); j represents the order of lag (j = 1, 2, ..., m). yit is a 3 × 1 dimensional column vector; Gamma 0 is the intercept term vector; γj is the matrix of the coefficient to be estimated in the lag period of variable; yi, t-j is the variable of city i lagging period j; fi is individual effect; et is the time effect; uit is the random error term.

## 3.3. Empirical Test and Analysis

In order to avoid the pseudo-regression caused by non-stationary series, the stationarity test of five main variables is carried out by IPS unit root test. The test results show that all data are stationary data after first-order difference. According to AIC,BIC and HQIC information criteria, the first order lag is selected as the optimal lag order. The GMM estimation results are as follows:

**Table 4.** GMM result

| | h Df1 | | h Df2 | | h Df3 | | h Dm | | h Dd | |
|---|---|---|---|---|---|---|---|---|---|---|
| | coef. | z | coef. | z | coef. | z | coef. | z | coef. | z |
| L h Df1 | 0.057 | 0.43 | 0.16 | 0.74 | 0.121 | 0.37 | 0.12 * * * | 2.89 | 0.0016 | 0.38 |
| L h Df2 | 0.066 * * | 2.12 | 0.47 * * * | 3.04 | 0.047 | 0.8 | 0.019 * | 1.94 | 0.001 | 1.27 |
| L h Df3 | 0.08 | 1.62 | 0.59 | 1.57 | 0.0002 | 0 | 1.018 | 1.21 | 0.0028 * | 1.94 |
| L h Dm | 0.153 * * | 2.19 | 0.86 | 1.57 | 0.273 | - 1 | 0.06 | 1.18 | 0.0015 | 0.51 |
| L h Dd | 0.466 | 0.28 | 16.87 | 1.62 | 6.618 | 1.12 | 1.22 | 1.31 | 0.119 | 1.53 |

Notes: *p< 0.1, **p< 0.05, ***p<0.01

The estimated results show that the increase in the asset-liability ratio of the company in the previous period compared with the previous year does not have a significant impact on the Df2 of the current period, so hypothesis 2 is not valid. The reason may be that the profit effect and the restricting development effect brought by the increase in debt cancel each other, and there are differences in the specific circumstances of different enterprises, and finally the result is not significant.

The increase in the asset-liability ratio of the company in the previous period compared with the previous year has no significant impact on the Df1 of the current period, but has a significant negative impact on the Df3 of the current period. Hypothesis 1.1 has not been verified, but hypothesis 1.2 has been verified. The reason why the increase of Dd in the previous period does not have a significant impact on Df1 in the current period may be that on the one hand, there is a situation in the company that current liabilities are converted into long-term liabilities. On the other hand, the loans of real estate enterprises are mostly long-term development loans for development and construction, and short-term loans are mainly used for short-term capital turnover in real estate enterprises, so their share is not large.

At the same time, the estimated results also show that the increase of Df1 in the previous period has a significant negative impact on Df2 in the current period, indicating that the factors affecting the financial risk of enterprises are interconnected at the time level. Hypothesis 4 has been verified. In addition, the estimation results show that Df2 of the previous period has a significant negative impact on Df2 of the current period. Therefore, the change of Df2 caused by Df1 gradually weakens over time.

It is noted that the increase of Dm in the previous period can have a significant negative impact on Df1 in the current period, indicating that higher media attention can indeed lead to a greater decline in short-term solvency when the asset-liability ratio increases at the same rate as the change in the previous year. Hypothesis 3 is verified. At the same time, it is noted that the increase of Df1 in the previous period has a significant positive impact on DF1 in the current period, indicating that the "catalytic" effect of media attention shows a weakening trend as time goes by.

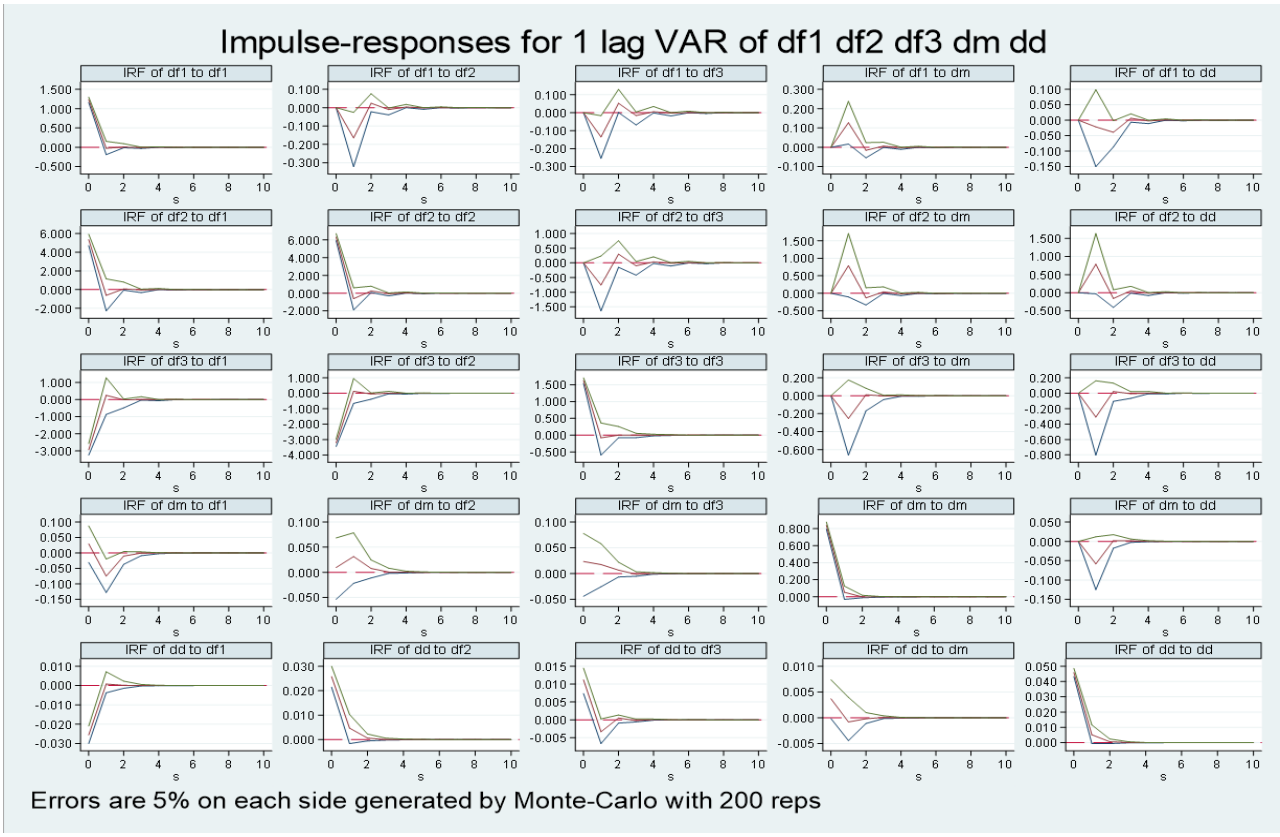


**Figure 1.** The image of pulse response function

From the image of impulse response function, we can see this fact more clearly. As shown in Figure 1, when Dd impact occurs, it has a positive impact on Df3 in phase 0, but a negative impact on Df1. In phase 1, the impact on Df1 becomes insignificant, but a significant negative impact on Df3. Hypothesis 3 is further verified in the impulse response function image. When Df1 has a positive impact, it has a significant negative impact on Df2 in the first period, and it is noted that within 95% confidence interval, Df3 is also negatively affected in the first period, which further indicates that enterprises can convert current liabilities into long-term liabilities, but the liabilities converted between different individuals are different. When Dd produces a positive impact, it has a significant positive impact on Df2 in the period 0, but this impact becomes less significant in the first period. Thus, it can be seen that the increase in the change of liabilities can indeed provide a profit and development trend for enterprises in the first year, but this trend will become no longer obvious after one year. When Dm has a positive impact, it has a significant negative impact on Df1 in the first phase, and gradually loses its impact from the second phase, which also confirms the correctness of hypothesis 4.

## 4. CONCLUSION AND DISCUSSION

Based on the internal relationship between various factors that affect the real estate companies' financial risk, this paper puts forward several paths that the increase of debt ratio of real estate companies can affect the companies, and empirically analyzes the existence of these paths through the PVAR model and based on the data of 55 listed real estate companies from 2012 to 2022. And the relationship between the factors that affect the financial risk of the company is discussed. The empirical study finds that the increase of the corporate debt ratio will have an adverse impact on the improvement of the company's long-term solvency, but it does not have a negative effect on the company's short-term solvency. The reason may be that on the one hand, there is a situation in the company to convert current liabilities into long-term liabilities; On the other hand, most of the loans of real estate enterprises are long-term development loans for development and construction, and short-term loans are mainly used for short-term capital turnover in real estate enterprises, so their share is not large. At the same time, the increase in the debt ratio of real estate enterprises can only have a positive impact on the profitability and development ability of the real estate enterprises in this year, but does not have a long-term promoting effect. Among the factors affecting the financial risk of real estate enterprises, empirical research shows that the increase of short-term debt repayment ability in the first phase will have a significant negative impact on the increase of profitability and development ability of real estate enterprises in the second phase, indicating that under the condition that other circumstances remain unchanged, Excessive increase in the stock of current assets or quick assets will limit the profitability and development of real estate enterprises. Meanwhile, this paper has also received media attention that there is a catalytic effect on the accumulation of financial risks of real estate enterprises, which is mainly manifested in the short-term solvency. However, this catalytic effect is gradually weakened with the passage of time.

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