

Article

# Evaluation of Debt Repayment Ability of Listed Companies in China's Real Estate Industry

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Received: February 23, 2025; Received in revised form: March 29, 2025; Accepted: March 30, 2025; Available online: March 31, 2025

**Abstract:** A multidimensional evaluation model of debt-paying capacity was developed for the real estate industry using factor analysis applied to the financial data of 140 Chinese real estate enterprises. Following data suitability testing, four key factors were extracted and interpreted: liquidity, long-term financial stability, operational efficiency, and long-term capital maintenance. The factor score matrix was used to compute comprehensive solvency scores, ranking enterprises by performance. Results indicate that firms with stronger liquidity and more balanced financial structures demonstrate significantly higher solvency levels. Practical recommendations for improving solvency are proposed, including strengthening financial structure, enhancing cash flow, and optimizing operational efficiency. The findings provide valuable reference for financial risk assessment and decision-making in the real estate sector.

**Keywords:** Factor Analysis; Debt-Paying Ability; Real Estate Companies; Financial Indicators; Risk Management

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## 1. Introduction

Currently, the Chinese real estate market is at a critical juncture of transformation. Following the sharp decline in prices and sales volume since the second half of 2021, many developers have faced liquidity problems and deteriorating financial conditions. In 2022, the industry's investment decreased by 10%, while real estate sales dropped by 26.8%. Entering 2023, although there have been some positive changes in the market, the development of the real estate industry remains less than optimistic. The central government attaches great importance to the transformation and development of the real estate industry. High-level meetings such as the Central Political Bureau meeting, the Central Economic Work Conference, and the Central Financial Work Conference have repeatedly emphasized the need to prevent and resolve risks in the real estate sector. The Central Political Bureau meeting on September 26, 2024, for the first time proposed to "promote the stabilization and recovery of real estate"; the adoption of the "three red lines" indicators (the asset-liability ratio excluding advance receipts, the net debt ratio, and the cash-to-short-term-debt ratio) indicates that if the real estate industry is to develop well and rapidly, it must pay attention to the company's debt-paying ability. Against this backdrop, there is an urgent need for a precise evaluation and analysis of the debt-paying ability of real estate companies. Debt-paying ability is not only a key indicator of a

company's financial health but also a crucial factor in its ability to maintain stable development in a competitive market.

Scholars have examined the solvency of real estate enterprises from various perspectives. Debt-paying ability is commonly defined as a firm's capacity to repay short- and long-term obligations using its assets [1][2][3]. Research indicates that many Chinese real estate companies face high debt ratios and low creditworthiness, which severely weaken financial health [4][5]. It is widely acknowledged that inadequate solvency increases financial risk and may threaten enterprise survival and sustainable development [6][7]. Additionally, Lü (2019) emphasized that debt-paying capacity reflects a firm's ability to fulfill obligations across all stages of production and operation, making it a critical indicator of financial condition and future development [8].

Empirical studies have employed diverse methodologies to assess solvency. Han (2015) used regression analysis to examine the effect of operating cash flow on debt-paying ability [9]. Liang et al. (2025) proposed an entropy-logistic model for detecting financial anomalies in real estate firms, demonstrating high diagnostic accuracy [10]. Wang (2023) adopted a CRITIC-weighted TOPSIS approach to rank financial risks under external shocks [11]. Other findings suggest that housing price appreciation may temporarily boost short-term liquidity but often results in excessive leverage, thus eroding long-term stability [12].

At the macro-policy level, researchers have analyzed how regulatory measures and external financing affect enterprise solvency. Zhu et al. (2025) found that offshore financing can mitigate short-term liquidity risk but may reduce land investment efficiency and increase operational exposure [13]. Cao (2025) emphasized the complex interaction between real estate and hidden debt risks during the industry's structural transition [14]. Meng (2025) argued that monetary policies targeting housing prices and tax incentives are more effective in stimulating real-sector demand, while prudential adjustments to mortgage value ratios are useful for containing household debt default risk [15].

Currently, domestic and international scholars have rich research results and solid theoretical foundations on the debt-paying ability of the real estate industry, with distinctive empirical methods, providing a broad and solid research basis and important references for this study.

In light of these developments, this study evaluates the solvency of 140 Chinese real estate enterprises (excluding 22 ST-designated companies) using factor analysis to construct a multidimensional debt-paying capacity model. The sample includes firms of various sizes and geographic coverage, ensuring the representativeness of the analysis. By examining key financial indicators such as the current ratio, quick ratio, and debt-to-asset ratio, the study aims to identify the principal drivers of corporate solvency and provide empirical evidence to support more effective risk management practices in the industry.

## **2. Materials and Methods**

### *2.1. Research Method*

Factor analysis is a tool for simplifying complex datasets, reducing multiple variables through statistical methods to reveal potential associations and underlying structures. This method helps us understand the hidden factors behind surface data. In this study, factor analysis is used to identify and quantify the latent factors affecting the debt-paying ability of real estate enterprises. Given the numerous financial indicators of real estate enterprises, directly observing and analyzing the

relationships between each indicator is both complex and unintuitive. Factor analysis effectively extracts a few core factors reflecting debt-paying ability.

First, principal components are extracted from the financial dataset, which represent the main variations in the data. These components are rotated using the variance maximization method to obtain a clearer and more interpretable factor structure. Each factor is independent and uncorrelated with other factors. After obtaining the factor loadings, the factors are named and interpreted based on their weights on the original variables, such as "liquidity factor" and "profitability factor."

Assuming there are  $n$  observed variables  $X_1, X_2, \dots, X_n$ , they can be expressed as a linear combination of a few unobservable common factors  $F_1, F_2, \dots, F_p$ , and a specific factor. The mathematical model can be expressed as:  $X = AF + \epsilon$ .

Where  $X$  is the vector of observed variables,  $A$  is the factor loading matrix,  $F$  is the vector of common factors, and  $\epsilon$  is the error term.

In this study, we have collected the 2022 financial data of 140 real estate companies, including but not limited to indicators such as the current ratio, quick ratio, and debt-to-asset ratio. The data source is the Guotai Junan database. Through factor analysis, these indicators can be synthesized to form a comprehensive judgment on the debt repayment ability of real estate companies.

## 2.2. Research Variables

In this study, several important financial indicators that cover both short-term and long-term debt repayment ability of enterprises are considered. These include measurements of the company's liquidity (such as the current and quick ratios), cash holdings (such as the cash ratio), financial stability (such as the debt-to-asset ratio), debt repayment ability (such as interest coverage ratio), operational efficiency (such as the ratio of cash flow to current liabilities), and long-term financial health (such as the ratio of long-term loans to total assets and the ability to service fixed expenditures). A total of 10 key financial indicators are used to comprehensively assess the debt repayment ability of real estate companies. These indicators not only involve the company's liquidity, leverage levels, and profitability but also include cash flow conditions, reflecting the company's ability to meet various financial obligations. The purpose of the research is to reveal the debt repayment behavior and financial health of real estate companies in the real-world economic environment. As shown in Table 1:

**Table 1.** Research Variables.

Variable Name	Variable Symbol	Formula
Current Ratio	$X_1$	Current Ratio = Total Current Assets / Total Current Liabilities
Quick Ratio	$X_2$	Quick Ratio = (Total Current Assets – Inventory) / Total Current Liabilities
Conservative Quick Ratio	$X_3$	Conservative Quick Ratio = (Cash & Cash Equivalents + Marketable Securities + Accounts Receivable) / Total Current Liabilities
Cash Ratio	$X_4$	Cash Ratio = Cash & Cash Equivalents / Total Current Liabilities
Interest Coverage Ratio A	$X_5$	Interest Coverage Ratio A = EBIT / Interest Expenses

Net Operating Cash Flow to Current Liabilities Ratio	$X_6$	Net Operating Cash Flow to Current Liabilities Ratio = Net Cash Flow from Operating Activities / Total Current Liabilities
Debt-to-Asset Ratio	$X_7$	Debt-to-Asset Ratio = Total Liabilities / Total Assets
Long-Term Debt to Working Capital Ratio	$X_8$	Long-Term Debt to Working Capital Ratio = Long-Term Debt / Working Capital
Net Operating Cash Flow to Total Liabilities Ratio	$X_9$	Net Operating Cash Flow to Total Liabilities Ratio = Net Cash Flow from Operating Activities / Total Liabilities
Fixed-Charge Coverage Ratio	$X_{10}$	Fixed-Charge Coverage Ratio = EBITDA / Fixed Financial Charges

### 3. Results

#### 3.1. KMO Test

In corporate financial analysis, factor analysis is primarily used to screen out key factors from a series of financial indicators related to debt-paying ability. These factors can comprehensively reflect an enterprise's debt-paying ability, and it is required that there be a certain correlation among the selected original indicators. Before conducting factor analysis, a series of statistical tests are usually performed to verify whether the dataset is suitable for this statistical method. In this study, the Bartlett's test of sphericity mainly verifies the non-randomness of the correlation matrix, i.e., whether the variables under study are only accidentally related; the KMO test measures the proportion of common variance among observed variables, thereby determining whether the dataset is suitable for factor analysis. The KMO statistic reflects the strength of the correlation between variables, thus determining whether the selected indicators are suitable for factor analysis. The results of this study show that the selected financial indicators are suitable for factor analysis, and the main factors representing the debt-paying ability of enterprises can be further extracted.

According to the results of the KMO and Bartlett's tests (see Table 2), the KMO index reached 0.684, and the significance level of the Bartlett's test of sphericity was 0.001, below the 0.05 significance level. This indicates sufficient reason to reject the null hypothesis of the Bartlett's test of sphericity, confirming that the dataset is not entirely random in terms of correlation and is suitable for factor analysis.

**Table 1.** KMO and Bartlett's Tests.

KMO and Bartlett's Test		
KMO Sampling Adequacy Measure		0.684
Bartlett's Test of Sphericity	Approximate Chi-Square	761.117
	Degrees of Freedom	45
	Significance	<0.001

### 3.2. Total Variance Explained

By solving the characteristic equation of the correlation matrix, the eigenvalues were obtained, as shown in Table 3. The initial eigenvalues refer to the eigenvalues of the correlation matrix or covariance matrix before conducting principal component analysis. These values indicate the degree to which each factor explains the total variance before rotation. For example, the eigenvalue of the first principal component is 3.910, indicating that it alone explains 39.099% of the total variance. When extracting the first four principal components, their cumulative variance contribution rate reached 83.567%, meaning these four components can explain approximately 83.567% of the total variance, effectively reflecting most of the sample information. Therefore, the original multiple indicators can be simplified into four main factors without losing much information. This result indicates that factor simplification is reasonable and effective in maintaining data integrity.

**Table 2.** Total Variance Explained.

Variable Name	Variable Symbol	Formula
Current Ratio	$X_1$	Current Ratio = Total Current Assets / Total Current Liabilities
Quick Ratio	$X_2$	Quick Ratio = (Total Current Assets – Inventory) / Total Current Liabilities
Conservative Quick Ratio	$X_3$	Conservative Quick Ratio = (Cash & Cash Equivalents + Marketable Securities + Accounts Receivable) / Total Current Liabilities
Cash Ratio	$X_4$	Cash Ratio = Cash & Cash Equivalents / Total Current Liabilities
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Fixed-Charge Coverage Ratio	$X_{10}$	Fixed-Charge Coverage Ratio = EBITDA / Fixed Financial Charges

After performing factor analysis on the 10 financial indicators of the debt-paying ability of real estate companies, four main common factors were extracted. As shown in Figure 1, the scree plot clearly shows that the first four factors collectively account for the majority of the total variance, while subsequent factors contribute relatively little to the variance explanation and are not considered key factors in the analysis. This indicates that most of the debt-paying ability information is concentrated

in the first four factors, and the extraction of these factors provides an effective way to simplify data for understanding the debt-paying potential of real estate enterprises.

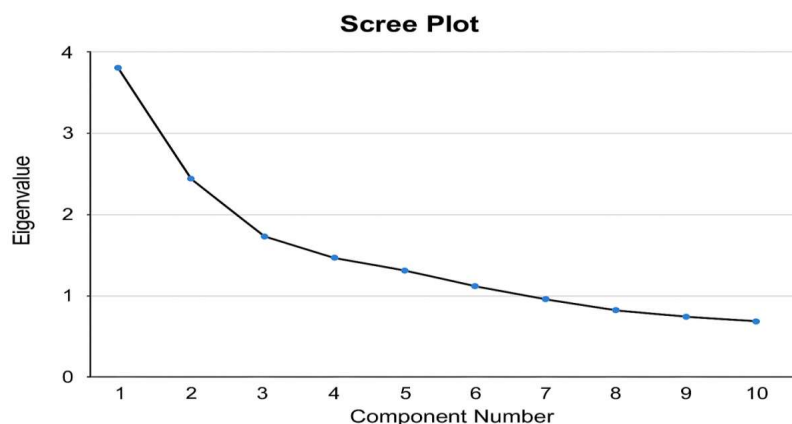


Figure 1. Scree Plot.

### 3.3. Factor Loading Matrix

After maximum variance rotation, the rotated component matrix was obtained, as shown in Table 4:

Table 3. Rotated Component Matrix.

Rotated Component Matrix				
	Component			
	1	2	3	4
X <sub>1</sub>	0.712	0.17	-0.291	-0.089
X <sub>2</sub>	0.935	0.056	0.049	0.106
X <sub>3</sub>	0.945	0.066	0.059	0.089
X <sub>4</sub>	0.898	0.108	0.126	0.009
X <sub>5</sub>	0.199	0.922	0.16	-0.041
X <sub>6</sub>	-0.111	0.099	0.913	-0.07
X <sub>7</sub>	-0.639	-0.179	-0.04	0.376
X <sub>8</sub>	0.026	0.002	-0.043	0.952
X <sub>9</sub>	0.161	0.203	0.904	0.009
X <sub>10</sub>	0.098	0.955	0.134	0.007

Based on the component matrix analysis, this study successfully extracted four significant common factors from 10 key financial indicators through the maximum variance rotation technique. The first factor is significantly associated with liquidity indicators reflecting the short-term debt-paying ability of enterprises, such as the current ratio and quick ratio. The second factor is closely related to indicators reflecting the long-term financial health of enterprises, such as the asset-liability ratio. The third factor mainly involves indicators measuring the operational efficiency of enterprises, especially those related to cash flow. The last factor reflects the performance of enterprises in maintaining long-term funds and debt repayment ability, such as the fixed charge coverage ratio. These factors were named F<sub>1</sub> (Liquidity Factor), F<sub>2</sub> (Long-Term Financial Stability Factor), F<sub>3</sub>

(Operational Efficiency Factor), and  $F_4$  (Long-Term Debt Maintenance Factor), collectively providing a comprehensive interpretation of the debt-paying ability of real estate enterprises and offering important statistical support for a deeper understanding of their financial status.

### 3.4. Factor Scores

Let the public factor  $F$  be represented by the following linear combination model:

$$F_i = \sum_{j=1}^n W_{ij} \times Z_j$$

Where  $F_i$  represents the score of the  $i$ -th factor,  $W_{ij}$  represents the score coefficient of the  $j$ -th indicator for the  $i$ -th factor, and  $Z_j$  represents the standardized score of the  $j$ -th indicator.

The calculation of the composite score can be further refined as:

Composite Score =  $V_1 \times F_1 + V_2 \times F_2 + V_3 \times F_3 + V_4 \times F_4$ , where  $V_i$  represents the score of the  $i$ -th factor.  $F_i$  represents the score of the  $i$ -th factor.

By substituting the factor coefficients from the factor score matrix (Table 4) into the model (3), the factor score function is derived. By substituting the 10 variables of each sample into this function, the factor scores for each sample ( $F_1$ : Liquidity Factor,  $F_2$ : Financial Structure Factor,  $F_3$ : Operational Efficiency Factor, and  $F_4$ : Long-Term Debt Repayment Ability Factor) can be calculated.

Similarly, the factor scores for  $F_2$ ,  $F_3$ , and  $F_4$  can be calculated, and then the comprehensive score of each company's debt-paying ability can be determined based on the weights. Table 5 shows the comprehensive scores of the sample enterprises.

**Table 4.** Comprehensive Scores of Sample Enterprises.

Composite Scores of Sample Companies						
Stock Code	Stock Abbreviation	$F_1$	$F_2$	$F_3$	$F_4$	Composite Score
600007	China National Foreign Trade	3.93	0.95	3.32	0.11	2.63
000036	Hualian Holdings	3.34	0.98	3.46	-0.16	2.38
900957	Lingyun B-shares	3.33	-0.83	1.33	0.49	1.59
000537	Guangyu Development	4.81	-0.26	-4.53	1.14	1.17
.....	.....	.....	.....	.....	.....	.....
600716	Phoenix Shares	1.2	-2.63	-5.1	-1.28	-1.35

## 4. Discussion

Based on the calculated factor scores and comprehensive rankings, enterprises with higher scores—such as China World Trade Center (score: 2.63) and Hualian Holdings (score: 2.38)—demonstrate strong performance in liquidity management and operational efficiency. These companies exhibit high cash ratios and ideal quick ratios, indicating they can effectively withstand short-term debt pressure. Furthermore, their long-term financial structures appear relatively sound, with reasonable debt-to-asset ratios, strong interest coverage ratios, and a high ability to meet fixed expenses, all contributing to their ability to maintain long-term debt repayment capacity.

In contrast, companies with lower rankings—such as Phoenix Shares (score: -1.35)—show significant shortcomings in liquidity and cash flow generation. Their short-term liquidity indicators

are weak, with high debt ratios and considerable interest repayment pressure. The lack of financial support for long-term debt results in an overall weaker solvency position.

This contrast highlights that a company's ability to repay debt is deeply influenced not only by its current liquidity but also by the robustness of its financial structure and the efficiency of its operations. Firms that effectively balance liquidity with financial discipline tend to maintain superior repayment ability, while those with excessive leverage and inefficient operations are at greater risk of financial distress.

## 5. Conclusions

Drawing on the factor score analysis, this study concludes that the overall debt repayment capacity of real estate enterprises is largely determined by four dimensions: liquidity, long-term financial structure, operational efficiency, and long-term solvency. Companies with higher comprehensive scores typically exhibit greater financial resilience and a stronger ability to meet both short- and long-term debt obligations. Those with lower scores, by contrast, must take urgent steps to improve their financial health and risk posture.

In response to the widespread debt pressures currently facing real estate enterprises, the following targeted recommendations are proposed:

1) Enhance asset liquidity: Optimize inventory management and accelerate accounts receivable collection to increase the proportion of cash and cash equivalents, thereby strengthening short-term solvency.

2) Strengthen financial structure: Employ debt financing cautiously, especially short-term debt, and increase equity capital to reduce financial risk and improve long-term repayment capacity.

3) Improve operational efficiency: Apply refined management techniques, control costs, and streamline business processes to increase revenue and profit, thus generating stronger internal cash flow for debt servicing.

4) Monitor and manage risks: Establish a comprehensive risk management system to track market fluctuations, interest rate changes, and other external variables that may impact solvency, and develop contingency strategies accordingly.

5) Adjust financial policies and strategies: According to market conditions and internal development needs, make timely adjustments such as issuing bonds or engaging in lease financing to optimize the capital structure.

6) Exercise caution in investment decisions: Conduct thorough financial feasibility assessments before initiating new projects to avoid overinvestment and minimize the potential for added repayment burdens.

**Funding:** This research received no external funding.

**Conflicts of Interest:** The author declares no conflict of interest.

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(Executive Editor: Sihao Kou)