

Study on Financial Risk of Real Estate Enterprises in China

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Abstract. Against the backdrop of the new crown epidemic, the volume of transactions in China's real estate market has fallen sharply. Most real estate enterprises are facing huge financial risk. It is particularly important to assess the financial risks of enterprises quickly and effectively. This paper financing, investment and operation are taken into account, which include nine financial risk assessment indicators. 28 sample companies listed on the Shanghai, Shenzhen and Beijing A-share markets in the first quarter of 2022 and 2023 are studied. Factor analysis and related models are used to predict the financial risk in 2023.

Keywords: Estate Industry; Financial Risks; Risk Assessment; Factor Analysis.

1. Introduction

Real estate enterprises have developed at top speed in China for decades. Due to the COVID-19 pandemic from 2019, revenues and profits are falling. Sales area and sales volume declined 24.3% and 26.7% in 2022. Most real estate enterprises suffer serious loss. The downturn in real estate sales led to downturn in investment. Land market is depressed, and newly-commenced projects are scarce. Even incentive policy of government is further supplied, the conditions in real estate enterprises are not improved. Since real estate is related to the national economy and people's livelihood, and the market is adjusted in 2022, financial risk management has been concerned by market and government. Moreover, the existence of financial risk is inevitable, and the assessment and management of financial risk are important, which insure the sustainable and healthy development.

The financial risk in real estate enterprises has the particularity itself-natural monopoly which is not in the general companies' possession. Most of the risks are divided into several classifications roughly.

Since the amount of money in real estate projects are large, which includes land purchase, building materials purchase, labor cost and so on, enterprises need to raise money in various fund channels. In the long period, deploy funds irrationality leads inefficient use of funds, the probability of repayment of principal and capital cost increases. Moreover, funding is also affected by capital supply and demand market, macroeconomic environment, structure of financing sources, currency structure, term structure. The uncertainty of factors shown above increase the financial risk of real estate enterprises [1].

Real estate is with property of high unit price, great fluctuation and so on [2]. It is high risk in investment, enterprises might loss profit even capital. Since the profit and loss are uncertain, an effective regulatory mechanism should be built to model the investment behavior.

The process of real estate project includes project approval, preliminary preparation, engineering construction, marketing service and so on. The project cycle length is very long. The larger the investment scale, the longer financing takes, the slower the turnaround will be. The average length of payback period is 5-8 years, and some of the projects even use more than 10 years [3]. The uncertain of every step in the process will cause the movement of funds sluggish, and it could affect enterprises' profit or loss.

2. Establish Index System

2.1. Factor Analysis Model

Since the financial risk is affected by various factors, and the affections differ in degree. Factor analysis model is used to identify factors which could explain the financial risk.

Given a p dimensional random vector $X = (X_1 \ X_2 \ \cdots \ X_p)^T$, satisfies

$$X = \mu + A \cdot f + e \quad (1)$$

$f = (f_1 \ f_2 \ \cdots \ f_q)^T$ is a q dimensional random vector, $q \leq p$, satisfies the equation $E(f) = 0$, $E(f \cdot f^T) = I_q$. f_i is common factor, and it affects all the components in X . $e = (e_1 \ e_2 \ \cdots \ e_p)^T$ is p dimensional random vector, satisfies $E(e) = 0$, $E(e \cdot e^T) = \text{diag}(\sigma_1^2 \ \sigma_2^2 \ \cdots \ \sigma_p^2) = \Sigma$. Moreover, $E(f \cdot e^T) = 0$. e_i is defined as specific factor, which only affect component X_i of vector X . μ and A are parameter matrixes, and A is defined as factor loading. Element a_{ij} in A is the loading of factor f_j in component X_i .

Suppose $h_i^2 = \sum_{j=1}^q a_{ij}^2$, and $D(X_i) = h_i^2 + \sigma_i^2$. When $h_i^2 \geq \sigma_i^2$, it means the effect of common factor is larger than specific factor.

Suppose $g_j^2 = \sum_{i=1}^p a_{ij}^2$, as larger as g_j^2 is, the effect of common factor f_j to X is gradually increasing.

2.2. Model Established

The original variables are interrelated but also different. The factor analysis is a model to reduce the dimensionality of original variables dimensionality. It could identify common factors from the complex factors[4]. All the original variables convert to a few aggregate variables. Financial risk of real estate enterprises is estimated by financial indexes. Therefore, all the financial indexes need to be converted to less than 4 aggregate variables. The model is established by steps below.

2.2.1. Financial Risk Indicators Selection

Based on the peculiarity of real estate enterprises in China and, 9 financial risk indicators are selected[5-7], which include profit ratio of sales x_1 , return on equity x_2 , asset-liability ratio x_3 , current ratio x_4 , velocity rate x_5 , cash ratio x_6 , increase rate of business revenue x_7 , net profit growth rate x_8 , rate of return on total assets x_9 .

2.2.2. Original Data Selection

The samples are from listed real estate companies in Shanghai, Beijing and Shenzhen A-share, which include 28 enterprises. The data is from annual report 2022 and first quarter report in 2023.

2.2.3. Factor Analysis Applicability Test

Before using factor analysis, data need to verify the multicollinearity through the KMO test and Bartlett test[8,9]. The results of data in 2022 are shown in Table 1. It shows that the KMO test is 0.635, which is larger than 0.5, and the significance value is less than 0.05 in Bartlett test. It means data of indicators in 2022 has significant collinearity, and the data is suitable for factor analysis.

Table 1. BMO Test and Bartlett Test of Sphericity 1

KMO Measure of Sampling Adequacy		.635
Bartlett Test of Sphericity	χ^2	208.593
	DOF	36
	Significance	.000

Similar to data in 2022, Table 2 shows that data in first quarter 2023 is also suitable for factor analysis.

Table 2. BMO Test and Bartlett Test of Sphericity 2

KMO Measure of Sampling Adequacy		.548
Bartlett Test of Sphericity	χ^2	196.211
	DOF	36
	Significance	.000

2.2.4. Common Factor Identification

Common factor variance of data in 2022 is shown in Table 3, and the extract value of current ratio x_4 is lowest, which is 0.688. Extract values of remaining indicators are between 0.8 to 0.91. All the information indicates the original variables could be well expressed by common factors, especially the extract value of rate of return on total assets x_9 is more than 0.9. In conclusion, the loss of original data identified by three common factors is little.

Table 3. Common factor variance 1

	Original	Extract
x_1	1.000	.799
x_2	1.000	.870
x_3	1.000	.876
x_4	1.000	.688
x_5	1.000	.778
x_6	1.000	.767
x_7	1.000	.860
x_8	1.000	.850
x_9	1.000	.903

Table 4. Common factor variance 2

	Original	Extract
x_1	1.000	.840
x_2	1.000	.630
x_3	1.000	.782
x_4	1.000	.875
x_5	1.000	.861
x_6	1.000	.856
x_7	1.000	.792
x_8	1.000	.725
x_9	1.000	.882

Similar to that in 2022, data in first quarter 2023 is shown in Table 4. The extract value of return on equity x_2 is lowest, which is 0.630. Extract values of remaining indicators are between 0.72 to 0.89. All the information indicates the original variables could be well expressed by common factors,

especially the extract value of rate of return on total assets x_9 is more than 0.85. In conclusion, the loss of original data identified by three common factors is little.

2.2.5. Total Variance Explanation

The total variance explanation in 2022 is calculated. Three factors could explain 82.1% information of original data. Therefore, 3 common factors could express more than 80% information. So 3 common factors are kept.

Similar to the data in 2022, the total variance explanation in first quarter 2023 is calculated. Three factors could explain 80.5% information of original data. Therefore, 3 common factors could express more than 80% information. So 3 common factors are kept.

2.2.6. Interpretations of Factors

Using Varimax rotation with maximum variance to rotate the component matrix. Related results are shown in Table 5 and 6, which are represent the data of 2022 and first quarter 2023.

Table 5. Rotation composition matrix 1

	Factor		
	1	2	3
x_1	-.891	-.210	.197
x_2	.843	.257	.026
x_3	.814	.316	.065
x_4	.803	-.142	-.154
x_5	.029	.921	-.144
x_6	.650	.686	.098
x_7	.581	.679	-.020
x_8	-.091	.144	.912
x_9	.032	.305	-.870

Table 6. Rotation composition matrix 2

	Factor		
	1	2	3
x_1	.891	-.284	.000
x_2	-.860	-.175	.107
x_3	.851	.368	-.010
x_4	.794	.472	-.051
x_5	.113	.909	-.022
x_6	.370	.863	.018
x_7	.025	.726	.320
x_8	-.028	-.081	.886
x_9	-.094	.429	.730

Common factor F_1 is named as solvency indicator factor. It has larger loading on profit ratio of sales x_1 , return on equity x_2 , asset-liability ratio x_3 , current ratio x_4 . Common factor F_2 is named as profitability indicator factor. It has larger loading on velocity rate x_5 , cash ratio x_6 , increase rate of business revenue x_7 . Common factor F_3 is named as growth ability indicator factor. It has larger loading on net profit growth rate x_8 , rate of return on total assets x_9 .

2.2.7. Evaluation Model

According to the factor score coefficient matrix (TABLE 7), evaluation model based on data in 2022 of F_1, F_2, F_3 has established. And the score function F is:

$$F = 0.48 \times F_1 + 0.29 \times F_2 + 0.23 \times F_3 \quad (2)$$

According to the factor score coefficient matrix TABLE 8), evaluation model based on data in first quarter 2023 of F_1, F_2, F_3 has established. And the score function F is:

$$F = 0.42 \times F_1 + 0.38 \times F_2 + 0.20 \times F_3 \quad (3)$$

3. Empirical Analysis

Table 7. Factor score coefficient matrix 1

	Factor		
	1	2	3
x_1	.051	.289	.032
x_2	-.224	.577	-.053
x_3	-.279	.095	.081
x_4	.335	-.296	-.071
x_5	.257	-.045	.054
x_6	.233	.001	.079
x_7	-.039	.147	.552
x_8	-.094	.156	-.513
x_9	.079	.280	.106

Table 8. Factor score coefficient matrix 2

	Factor		
	1	2	3
x_1	-.099	.387	-.145
x_2	-.069	.267	.133
x_3	-.293	.039	.018
x_4	.387	-.263	.137
x_5	.270	.033	.026
x_6	.228	.094	-.028
x_7	.095	-.168	.682
x_8	-.026	.091	.478
x_9	.012	.321	-.080

Using function (2) and (3), 28 real estate enterprises are evaluated. Based on F values, financial risk are divided into 4 types, which are shown in TABLE 9 and 10. In TABLE 9. If the F value is larger than 0, it indicates the financial condition is well and the financial risk of this enterprise is low. On the contrary, if the F value is smaller than 0, the financial risk is at a higher level.

In 2022, about 9 enterprises have F value larger than 0, 5 of them display a good condition, and the F value is even larger than 0.5. Remaining 19 enterprises are not in well management.

In first quarter 2023, the condition of these 28 enterprises has modified. Only 17 enterprises are not in well condition, it indicates the real estate industry gets out of the trouble.

Table 9. F value based on data 2022

F value	amount	Proportion
$F > 0.5$	5	17.9%
$0 < F < 0.5$	4	14.3%
$-0.5 < F < 0$	16	57.1%
$F < -0.5$	3	10.7%

Table 10. F value based on data quarter 1 2023

F value	amount	Proportion
$F > 0.5$	4	14.3%
$0 < F < 0.5$	7	25.0%
$-0.5 < F < 0$	15	53.6%
$F < -0.5$	2	7.1%

4. Conclusion

Using factor analysis, financial risk assessment of 28 enterprises in China is analysis. The whole data of 2022, and data of first quarter 2023 are analyzed respectively. It shows that in 2022, most of the real estate enterprises sustained the financial risk because of COVID-19 pandemic. In the first quarter 2023, the condition of all the real estate enterprises has improved. Despite the risk is relative high, real estate enterprises actively take corresponding measures to prevent financial risk, and to avoid the adverse effect to the enterprises.

The model also indicates that common factor F_1 named as solvency indicator factor, F_2 named as profitability indicator factor and F_3 named as growth ability indicator factor. From these common factors, to reduce the financial risk, managements should be considered. First, capital structure should be optimized. Before finance, proportional allocation of equity capital to debt capital should be analyzed, and optimizing the financing mix and scale. Second, enterprises should expand financing channels. Third, payback period should be shortened to diversify the investment risks.

Acknowledgments

The research were partially supported by the National Natural Science Foundation of China No.11701061, the High-level Talents Innovation Support Program of Dalian No.2021RQ062, the Basic Research Project of the Education Department of Liaoning Province No. LJKQZ2021170, and Interdisciplinary project of Dalian University (DLUXK-2023-ZD-001).

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