Empirical Analysis of Vanke Enterprise Financial Risk Model Based on Factor Analysis Method

Yaoxiang Lei[1,a,*]

[1]*Zhijiang College, Zhejiang University of Technology, Shaoxing, Zhejiang, China, 312030*
a. zszj@zjc.zjut.edu.cn
*corresponding author

Abstract: As the world's economic recovery faces multiple pressures, the development of some enterprises has been impacted or even closed down. In particular, real estate enterprises are facing enormous competitive pressure and financial risks. Therefore, it is very necessary to establish a financial risk evaluation system for real estate enterprises. This paper establishes a risk evaluation system for the real estate industry, taking Vanke Enterprise as an example, using the factor analysis method and makes risk predictions for the whole finance. This paper collects 19 years' worth of financial data from Vanke enterprises, uses the factor analysis method to analyze four parts of listed real estate companies' solvency, profitability, operating capacity, and growth capacity, and establishes a risk warning model. The results show that the financial risk of Vanke enterprises has shown an obvious rising trend in recent years. Real estate enterprises need to adopt a variety of ways to raise funds, inject fresh blood, and meet their capital needs so as to reduce financial risk.

Keywords: real estate Enterprises, factor analysis, financial risk, risk assessment, financial indicators

1.   Introduction

Due to the particularity of the real estate industry, the industry itself is at a disadvantage in terms of financing, investment cycle, liabilities, etc., and will face various business risks at any time [1]. Andekina R. and Rakhmetova constructed a dynamic evaluation system of enterprise finance through factor analysis [2]. JhaMK and Rangarajan K studied the causal relationship between corporate growth ability and corporate financial performance by collecting data from Indian companies [3]. Zhang Guofu and Qu Wencong also carried out factor analysis on Vanke's financial performance; the results were obtained by comparing Vanke's ranking in the real estate industry for each factor score in the same period, which was more of a horizontal analysis [4]. Zhang Yujie, in the performance evaluation of JY real estate, at the same time selected the final comprehensive score ranking of the company in horizontal and vertical comparison [5]. Horizontal analysis focuses on the comparison between Vanke Group and other competitors in the same industry environment during the same period. By analyzing the changes in scores over the years, it is more intuitive to realize the changes in Vanke's financial performance in the past 19 years and judge the enterprise's operating conditions in different periods. Based on this, this paper takes Vanke as an example, collects 19 year's data, and uses factor analysis method to analyze four parts of listed real estate companies: solvency, profitability, operating capacity and growth capacity, establishes a risk early warning model, and puts forward corresponding

suggestions to provide reference for listed real estate companies.

2. Establishment of Financial Risk Evaluation Index System

This paper takes the domestic and foreign research results as the reference standard, and after repeated comparison, finally determines four categories of debt paying ability, profitability, operating ability and cash flow ability, a total of 13 important financial ratio indicators, and establishes the company's financial risk evaluation index system as the basic variable of the financial risk evaluation. (Table 1) [6].

Table 1: The index system of financial risk evaluation.

Index category	Index name	Composition
Ability to pay debts	Current income ratio	X1
	Quick rate of action	X2
	Asset-liability ratio	X3
Profitability	Return on assets	X4
	Operating profit margin	X5
	Cost expense margin	X6
	Return on equity	X7
Operating capacity	Inventory turnover rate	X8
	Turnover of current assets	X9
	Accounts receivable turnover	X10
	Total asset turnover	X11
Cash flow capacity	Net profit net cash content	X12
	Total cash recovery rate	X13

3. The Construction of Vanke Enterprise Financial Risk Evaluation Model

3.1. Establishing Vanke Enterprise Financial Risk Evaluation Model

According to the financial risk evaluation index system determined above, a total of 78 sets of quarterly financial index data for Vanke Co., Ltd. from 2003 to 2022 are selected as the original sample data in this paper. The acquisition of the original data of financial indicators comes from the Guotai 'an database [7]. In this paper, Excel is used to sort out the original sample data, and statistical analysis software SPSS is used to conduct factor analysis of the samples, so as to establish the company's financial risk evaluation model. In this study, the design implementation of each process topic can be explained as follows.

(1) Sample data selection and standardized processing. In this paper, the financial indicators data of Vanke Co., Ltd. from 2003 to 2022 are selected as the sample data of the financial risk evaluation model, and a total of 78 groups of data are collected.

(2) Feasibility test of sample data

1. KMO test and Bartlett spherical test. In this paper, SPSS statistical analysis software is used to test the applicability of factor analysis of sample data. As shown in Table 2, the KMO test value of the sample data is 0.622>0.5, and the Chi-square approximation of Bartlett's spherical test is 2093.605. The value is large, the significance level is high, and the significance probability value is 0.000<0.001, indicating that the sample data is suitable for factor analysis.

Table 2: Test results of KMO and Bartlett.

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.622
Bartlett's Test of Sphericity	Approx. Chi-Square	2093.605
	df	78
	Sig.	.000

2.Common degree test of variables. Variable commonality refers to the degree to which extracted common factors explain the original variable information. In this paper, the variable commonality of 13 original financial risk evaluation indicators is selected. The data in Table 3 show that the extracted common factors have sufficient integrity of original variable information and explanatory ability.

Table 3: Common factor variance table of primitive variables.

	Initial	Extraction
Current income ratio	1.000	.953
Quick rate of action	1.000	.737
Asset-liability ratio	1.000	.893
Return on assets	1.000	.970
Operating profit margin	1.000	.988
Cost expense margin	1.000	.991
Return on equity	1.000	.954
Inventory turnover rate	1.000	.981
Turnover of current assets	1.000	.992
Accounts receivable turnover	1.000	.718
Total asset turnover	1.000	.987
Net profit net cash content	1.000	.606
Total cash recovery rate	1.000	.830
Extraction Method: Principal Component Analysis.		

(3) Identify common factors. In this paper, the principal component analysis method is used to extract the common factors of the original variables and is combined with the eigenvalue method and cumulative variance contribution rate method to further determine the common factors of the associated targets. As can be seen from the data in Table 4, the first column is the coding of factors, followed by the initial characteristic value of factors and the sum of squared loads after rotation, and the data is described by the variance contribution rate respectively. Finally, this study will select the first four public factors to represent the 13 financial risk evaluation indicators in the original data to analyze the company's financial risk.

Table 4: Total Variance Explained.

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	5.450	41.924	41.924	5.450	41.924	41.924	4.801	36.934	36.934
2	3.095	23.808	65.732	3.095	23.808	65.732	2.359	18.144	55.078
3	1.906	14.664	80.396	1.906	14.664	80.396	2.313	17.795	72.873
4	1.148	8.831	89.228	1.148	8.831	89.228	2.126	16.355	89.228
5	.734	5.645	94.872						
6	.336	2.581	97.453						
7	.210	1.612	99.065						
8	.061	.468	99.533						
9	.034	.260	99.793						
10	.019	.147	99.940						
11	.005	.041	99.981						
12	.002	.017	99.998						
13	.000	.002	100.000						
Extraction Method: Principal Component Analysis.									

As shown in Figure 1, it can be seen from the lithotriptic diagram drawn by factor analysis that the eigenvalues of factors 1 to 4 are at a high level, indicating that the first five factors are common factors that can explain the original variables more completely. Therefore, the lithotriptic diagram provides a more powerful basis for the four common factors determined in the factor analysis in this paper.
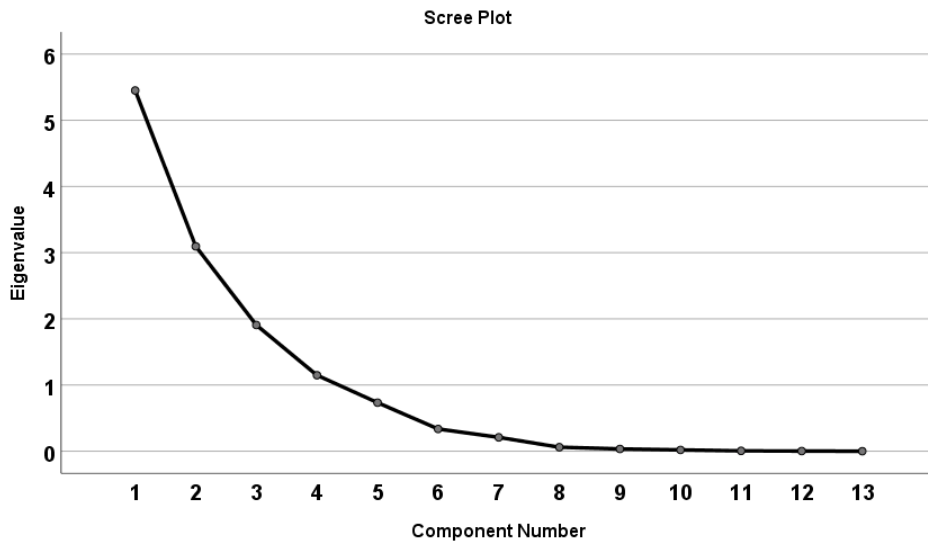

Figure 1: Factor analysis lithotripsy.

(4) The common factors are named based on the rotated factor load matrix. In this paper, a total of four common factors were extracted through factor analysis of the original variables in Table 5 so as to better explain the economic meaning represented by the common factors, and then named them. In this paper, the orthogonal rotation of the maximum variance method is used to process the initial factor load matrix in the process of factor analysis. The details of the factor load matrix after rotation

can be seen in Figure 1. According to Figure 1,

Factor F1 can be determined as the representative factor of operation capacity;
Factor F2 can be determined as the representative factor of cash flow capacity;
Factor F3 can be determined as the representative factor of profitability;
Factor F4 can be determined to be the representative factor of solvency [8].

Table 5: Factor loading matrix after rotation.

	Component			
	1	2	3	4
Current income ratio	.317	-.407	.218	.800
Quick rate of action	.079	.317	.169	.776
Asset-liability ratio	-.380	.559	-.139	-.646
Return on assets	.921	.043	.300	.172
Operating profit margin	.108	-.004	.980	.128
Cost expense margin	.111	-.032	.979	.136
Return on equity	.799	.358	.374	-.218
Inventory turnover rate	.981	.114	-.044	.059
Turnover of current assets	.985	.004	.031	.144
Accounts receivable turnover	.307	.552	.161	-.541
Total asset turnover	.975	-.024	.038	.184
Net profit net cash content	.244	.729	.115	.039
Total cash recovery rate	-.044	.895	-.159	-.053

3.2. Financial Risk Comprehensive Evaluation Model

In this paper, the regression method is used to process the factor score coefficient matrix in factor analysis so as to better reflect the linear relationship between the factor and the original variable [9]. The result format of the factor score coefficient matrix in this paper can be found in Table 6. The scoring formula of common factors F1, F2, F3, and F4 can be calculated from the data in Table, and the linear function formula of each factor is as follows:

$$F_i = C_i * X \tag{1}$$

Combining the scoring formulas of each factor, the objective assignment method is adopted to calculate the comprehensive score of the factor; that is, the variance contribution rate of the common factor is taken as the weight, and the comprehensive score formula of the financial risk evaluation model is obtained. The calculation formula is derived as follows:

$$P = 41.393\% \times F1 + 20.335\% \times F2 + 19.943\% \times F3 + 18.329\% \times F4 \tag{2}$$

Table 6: Factor score coefficient matrix.

Component Score Coefficient Matrix				
	Component			
	1	2	3	4
Current income ratio	.011	-.051	.005	.351
Quick rate of action	-.099	.342	-.017	.540
Asset-liability ratio	-.061	.170	.018	-.219
Return on assets	.184	-.016	.049	-.007
Operating profit margin	-.070	-.008	.464	-.038
Cost expense margin	-.068	-.020	.464	-.040
Return on equity	.162	.061	.131	-.173
Inventory turnover rate	.235	-.002	-.116	-.030
Turnover of current assets	.229	-.041	-.086	-.012
Accounts receivable turnover	.075	.129	.097	-.257
Total asset turnover	.224	-.046	-.085	.007
Net profit net cash content	-.010	.368	.011	.163
Total cash recovery rate	-.062	.463	-.095	.204
Extraction Method: Principal Component Analysis; Rotation Method: Varimax with Kaiser Normalization.				

4.   Financial Risk Comprehensive Evaluation of Vanke Enterprise

Through the factor analysis of 78 groups of original financial index data, four main factors affecting the financial risk of Vanke Enterprise Co., Ltd. are determined. This paper selects and sorts out the scores of financial indicators at the end of each year from 2003 to 2022 (Table 7).

Table 7: Scoring table for comprehensive evaluation of financial risks.

Year	F1	F2	F3	F4	P
2003	1.656	1.046	1.487	-3.763	0.505
2004	1.270	2.276	1.276	-2.017	0.873
2005	1.160	1.773	1.139	-2.028	0.696
2006	1.563	1.840	1.709	-3.700	0.684
2007	4.605	6.858	5.726	-14.392	1.805
2008	3.633	6.052	4.536	-11.134	1.598
2009	4.663	8.455	5.905	-14.319	2.203
2010	3.408	5.980	4.467	-10.620	1.571
2011	3.585	6.233	4.674	-11.352	1.603
2012	4.689	8.094	6.051	-15.061	2.033
2013	4.256	7.231	5.423	-13.574	1.826
2014	4.540	8.613	5.848	-14.283	2.179
2015	6.853	11.878	8.722	-22.258	2.912
2016	8.040	14.261	10.278	-26.278	3.461
2017	10.470	18.943	13.629	-34.774	4.530
2018	14.876	25.935	19.343	-50.151	6.097
2019	15.537	27.087	20.159	-52.387	6.358
2020	12.731	22.255	16.484	-42.701	5.256
2021	8.907	15.330	11.413	-29.636	3.649

Table 7: (continued).

2022	6.330	10.841	8.009	-20.623	2.642

Through the analysis of the data in Table 7, firstly, it can be clearly seen that the corporate debt paying factor score (F4) during the period from 2003 to 2022 is negative all year round, indicating that the enterprise has serious debt paying problems. According to the annual report data of each year, it can also be seen that the enterprise has a large amount of debt and single financing methods, and faces a high financing risk threat [10].

Secondly, the cash flow factor (F2) has increased significantly in the past 13 years. Although it has decreased now, it is still in a relatively good range, indicating that the cash flow situation of the enterprise is good and it can repay short-term liabilities well, but at the same time, it also represents the insufficient use of funds.

Meanwhile, both the operation factor (F1) and profit factor (F3) have increased during the statistical period. Although they have decreased in recent years, factor scores are also high. This indicates that Vanke Group's operating capacity and profitability have improved significantly compared with the early years.

Figure 2: Company financial risk volatility chart.

The comprehensive score fluctuation chart of Vanke's financial performance is shown in Figure 2. By observing the broken line chart in Figure 2, it can be seen that the financial performance score of Vanke Enterprise Co., Ltd. from 2003 to 2022 presents a wavy trend. As can be seen from Figure 2, the company's comprehensive score fluctuated around 2 points from 2006 to 2012. Since then, the comprehensive score has steadily increased, reaching the highest value of 6.358 in 2019, indicating that the financial risk is relatively small and the company is in good business condition during this period. From then until 2022, the overall score decreased gradually, indicating that financial risk increased gradually. Combined with the actual situation, after 2020, the real estate industry was affected by the epidemic, and the cash flow capacity and profitability of enterprises declined, exposing the solvency of enterprises and leading to the decline of the overall comprehensive score. By comparing with the comprehensive evaluation model of financial performance constructed by the factor analysis method, the analysis results have certain reference value for understanding the financial risk of the company.

5.   Conclusion

According to the empirical results, compared with the previous years, Vanke's financial comprehensive score experienced great fluctuations and showed a downward trend in recent years. Further analysis shows that the main source of Vanke's poor financial condition is the solvency factor.

Vanke Company should strengthen the inventory of commercial housing sales, taking into account diversified development. This paper mainly adopts a factor analysis system to analyze the financial status quo of Vanke Company, and the financial data is mainly based on the financial statements issued by various enterprises. Due to the difficulty in finding non-financial indicators, most of them are difficult to quantify and highly subjective, so in order to ensure the feasibility and objectivity of the analysis, this paper does not add the consideration of non-financial indicators. Future research will combine financial and non-financial indicators, especially the comprehensive analysis of the impact of each indicator on the financial situation, so as to make the research more comprehensive.

References

[1] Zhang Runjun & Xue Hanqing. Empirical analysis of financial risk model of listed companies based on factor analysis. Intelligent Computer and Applications (06), 64-68. (2018).

[2] Regina Andekina, Rakhila Rakhmetova. Financial Quality Evaluation of Listed Companies Based on Factor Analysis Method. Applied Mechanics and Materials, (13) 2247-2251 (2013).

[3] Milind Kumar Jha & K. Rangarajan. Analysis of corporate sustainability performance and corporate financial performance causal linkage in the Indian context [J]. Asian Journal of Sustainability and Social Responsibility, (20), 5(2). (2020).

[4] Zhang Guofu, Qu Wencong & Song Zikang. A study on Vanke's financial performance under asset-light operation mode. National Circulation Economy (31), 81-84. (2022).

[5] Zhang Yujie. Research on Performance Evaluation of JY Real Estate Company Based on Factor Analysis (Master's Thesis, Henan University of Science and Technology) (2022).

[6] Mao xiaoli. Identification, prevention and control of financial risks in real estate enterprises. Enterprise Reform and Management (23), 120-121. (2020).

[7] Data, CSMAR, CSMAR (gtarsc.com).

[8] Dong Yumin. Financial Risk Analysis of shipping enterprises based on Factor Analysis 一 taking SIPG Group as an example. Operation and Management.

[9] Li Huijie & Cao Lidou. Research on Financial performance evaluation of listed companies in textile industry based on Factor analysis. Value Engineering (13), 134-135. (2012).

[10] Chen Wenquan. Corporate financial risk identification and Countermeasures Analysis. Fortune Times (10), 18-19. (2021).