# Research on Performance of Trade Credit Risk Management by Factor Analysis and Pearson Correlation Analysis

**Min Cao, Bin Dai**
*Business School of China West Normal University, Nanchong, China*
*Email: daibin_2001@163.com*

**Abstract:** Based on survey data, a research on performance of trade credit risk management has been conducted with the methods of Factor Analysis and Pearson Correlation Analysis. The Research shows: "Credit Policy" is the most important among all factors which affect management performance of commercial credit risk. We should focus on this aspect to improve management performance.

**Keyword:** trade credit risk; management performance; credit policy

How to prevent and control the credit risk arising from "credit sale", and how to increase the capital turnover rate and the recovery rate of accounts receivable, such problems have been in front of many enterprises. However, the final Management effectiveness was not ideal in fact. In view of this, a research on performance of trade credit risk management has been conducted with the methods of Factor Analysis and Pearson Correlation Analysis, so as to find out the root of unsatisfied effect and provide suggestions for improvement.

## 1. Literature Review

In recent years, many scholars at home and abroad have conducted a great deal of research on "the Status quo of domestic Corporate Credit Risk Management" and related issues, such as Jianmin Jia (1999), SHI Xiao-jun, (2000), Allen N. Berger(2005), DAI Bin(2006) and so on. These papers help us understand the impact factors of corporate credit risk in the perspective of management, which target enterprises to take measures to control credit risk. At the same time we see, there are some logic errors and technical flaws when they relate to issues in the analysis, so the results are biased. Credit risk management is a complex process and a variety of impact elements intertwine. If the element-analysis has errors, or indicator-selection is improper or the interaction between variables is not eliminated, it can easily lead the regression equation or hypothesis testing of regression coefficients to be not significant.

From the previous analysis, we can see that the models used in those papers have certain problems. Therefore, it's necessary for us to amend the analysis model, to adopt more advanced methods and analyses related issues combined with up-to-date data.

## 2. Data collection and collation

### 2.1 Data collection

In April 2009, our team randomly selected 800 enterprises in 22 regions in China and conducted surveys on their credit risk management in 2008. Out of 800 questionnaires sent out, 512 copies were returned, of which 486 copies were valid. The effective return rate of questionnaires was 60.8 %. Effective samples covered 25 provinces and cities nationwide, and included the following: 128 state-owned enterprises, accounting for 26.3%; 187 private enterprises, accounting for 38.5%; 138 foreign-invested enterprises, accounting for 28.4%; other 33 enterprises, accounting for 6.8%. Samples represented the true situations basically.

### 2.2 Indicator selection

The original statistical indicators used in this paper are as follows: the proportion of relatively perfect enterprises in credit management functions (X1), the proportion of enterprises implementing analysis of days' sales in

receivables (X2) and the proportion of enterprises implementing analysis of account age regularly(X3), the proportion of enterprises prosecuting assessment of the customer credit (X4), the average credit period (X5), the average ratio of credit (X6) and cash rebate rate (X7). Next, we analyzed these seven indicators using factor analysis and Pearson correlation analysis.

## 3. Data Processing and Empirical Study

### 3.1 Factor analysis

It is clear that the seven indicators selected in the second part of this paper are not independent, such as X5, X6 and X7. So we should analyze them using factor analysis in order to identify the most important factor and avoid interference on the results of the analysis in terms of correlation between indicators. Factor analysis for the above-mentioned seven indicators was done in SPSS 12.0 Specific process is as follows:

#### 3.1.1 Suitability test

It's necessary to do a suitability test for indicators before factor analysis. This paper uses the KMO statistic and Bartlett's sphericity test for factor analysis. Test results are shown in Figure 1. For the KMO statistic is 0.802, this paper indicates that the effect of factor analysis is good. The significant probability of Bartlett's sphericity test is 0.001, so the correlation matrix is refused to the Unit matrix of null hypothesis.

| | | |
|---|---|---|
| Kaiser-Meyer-Olkin Measure of Sampling Adequacy. (KMO) | | .802 |
| Bartlett's Test of Sphercity | Approx. Chi-Square | 28.811 |
| | df | 9 |
| | siq. | .001 |

**Figure 1. KMO & Bartlett's Test**

#### 3.1.2 extraction of the common factor

This paper uses the principal component method as the extraction method of the common factor, and the extraction principle of the selected common factor is a cumulative contribution rate of more than 95%. Figure 2 shows eigen values λi of correlation matrix R and the contribution rate of variance.

| Componer | Extraction Sums of Squared Loading | | | Rotation Sums of Squared Loadings | | |
|---|---|---|---|---|---|---|
| | Total | % of Variance | Cumuative % | Total | % of Variance | Cumuative % |
| 1 | 2.742 | 54.552 | 54.552 | 1.587 | 36.339 | 36.339 |
| 2 | 803 | 22.653 | 77.205 | 1.511 | 31.547 | 67.886 |
| 3 | 741 | 18.562 | 95.767 | 1.458 | 28.085 | 95.971 |

**Figure 2 Total Variance Explained**

| | $X_1$ | $X_2$ | $X_3$ | $X_4$ | $X_5$ | $X_6$ | $X_7$ |
|---|---|---|---|---|---|---|---|
| Ini. Communnality | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Reg. Communnality | 0.975 | 0.953 | 0.913 | 0.966 | 0.894 | 0.932 | 0.918 |

**Figure 3 Communalities**

There are 3 common factors in Fig.2, of which the cumulative contribution rate of variance is over 95.767 and they are independent of each other, overcoming the multicollinearity impact of original indicators. So the


978-1-935068-12-9 © 2010 SciRes.

common factors can explain the object and provide the message which raw data expresses in detail. We can also observe from Fig.3 the common degree [0.894, 0.975] between the variables, which illustrates that the observation can be explained by the three common factors. Therefore, it reflects and represents the basic situation of samples.

**3.1.3 determination of the meaning of the common factor**

It's easy to make the significance of the common factor ambiguous and difficult to explain if the component matrix structure of the initial load is not simple enough and the representative variable of every common factor is not very prominent. It has to rotate the component matrix in order that the square value of the factor load differentiates to 0 and 1; that is, every variable has a high load on a common factor and only smaller loads on others. The usual rotation way is varimax. The matrix is rotated by this method as shown in Figure 4.

| | | $X_1$ | $X_2$ | $X_3$ | $X_4$ | $X_5$ | $X_6$ | $X_7$ |
|---|---|---|---|---|---|---|---|---|
| Component | 1 | 0.356 | 0.361 | 0.203 | 0.214 | 0.863 | 0.746 | 0.255 |
| | 2 | 0.322 | 0.906 | 0.847 | 0.124 | 0.245 | 0.266 | 0.487 |
| | 3 | 0.431 | 0.228 | 0.267 | 0.886 | 0.296 | 0.368 | 0.412 |

**Figure 4. Rotated Component Matrix**

The following analysis from the rotated factor loading matrix includes: ①Public factor 1 with a greater load in variables X5 and X6, and with a relatively small load in other variables, which is identified as the credit-policy factor because the meanings of the variables reflect credit policy in a corporation; ② public factor 2 with a larger load in variables X2 and X3, and with a relatively small load in other variables, which is identified as the accounts- receivable-management factor according to the meanings of the variables; ③ public factor 3 with the greatest load in the variable X4, but with a very small in the other variables, which is identified as the credit-evaluation factor because the meanings of variables reflect customers' credit ratings before the process.

## 3.2 Pearson correlation analysis

In this paper, we conducted Pearson correlation analysis for Sample-industries by Bivariate in SPSS 12.0. This included the following factors: relative credit risk (Y), the proportion of enterprises whose credit management function settings are relatively perfect (X1), the public factor (f1, f2 and f3) and comprehensive factor (F) of credit risk management. The results are shown in Fig.5.

| | | Y | $X_1$ | F | $f_1$ | $f_2$ | $f_3$ |
|---|---|---|---|---|---|---|---|
| Y | Pearson Corrdlation | 1.000 | 0.009 | -0.623 | -0.485 | -0.342 | -0.18 |
| | Sig.(1-tailed) | | 0.05 | 0.04 | 0.02 | 0.07 | 0.15 |
| | N | 22 | 22 | 22 | 22 | 22 | 22 |
| $X_1$ | Pearson Corrdlation | 0.009 | 1.000 | 0.286 | 0.072 | 0.245 | 0.45 |
| | Sig.(1-tailed) | 0.05 | | 0.05 | 0.04 | 0.15 | 0.03 |
| | N | 22 | 22 | 22 | 22 | 22 | 22 |
| F | Pearson Corrdlation | -0.623 | 0.286 | 1.000 | | | |
| | Sig.(1-tailed) | 0.04 | 0.05 | | | | |
| | N | 22 | 22 | 22 | 22 | 22 | 22 |
| $f_1$ | Pearson Corrdlation | -0.485 | 0.072 | | 1.000 | 0 | 0 |
| | Sig.(1-tailed) | 0.02 | 0.04 | | | 0.04 | 0.04 |
| | N | 22 | 22 | 22 | 22 | 22 | 22 |
| $f_2$ | Pearson Corrdlation | -0.342 | 0.245 | | 0 | 1.000 | 0 |
| | Sig.(1-tailed) | 0.07 | 0.15 | | 0.04 | | 0.04 |
| | N | 22 | 22 | 22 | 22 | 22 | 22 |
| $f_3$ | Pearson Corrdlation | -0.18 | 0.45 | | 0 | 0 | 1.000 |
| | Sig.(1-tailed) | 0.15 | 0.03 | | 0.04 | 0.04 | |
| | N | 22 | 22 | 22 | 22 | 22 | 22 |

**Figure 5. Pearson Correlation Analysis**

From these results of, we can see that: ① at a significance level of 0.04 (one-tailed), the correlation coefficient of integrated factor F and relative credit risk Y about corporate credit risk management is -0.623, indicating that there is a significant negative correlation between the two variables. ②At a significance level if 0.05 (one-tailed), the correlation coefficient of F and X1 is 0.286, indicating that there is low-level positive correlation between them. ③At a significance level of 0.05 (one-tailed), the correlation coefficient of Y and X1 is 0.009, which indicates that they are basically irrelevant. This result seems to mean that the function set of corporate credit risk management has no effect on relative credit risk Y. In other words, all the efforts on “improvement of the corporate credit function set" are in vain. Is that really so? I do not think so. The reasons which led to the aforementioned outcomes may be varied , for example: we have not done in strict accordance with company procedures, and a lack of mutual collaboration between the various sectors though the corporate credit risk management function is improved, which may result in "improved credit risk management function" cannot effectively reduce the "credit risk". Therefore, we should further improve credit risk management functions, and also streamline relationships between the various relevant departments and processes of credit risk management. That is to say, as a systems engineering task," we could have an overall grasp on enterprise credit risk management, and make a macro, wise decision-making; At the same time, it’s available to sort out the relevant departments, management factors and processes etc. one by one from the micro-level, to resolve or lower corporate credit risk ultimately by analyzing credit risk of every link in the qualitative and quantitative, "(Wang Kun, 2002). ④ At a significance level of 0.02 (one-tailed), the correlation coefficient of Y and the common factor f1 is -0.485, higher than the other two common factors, which means that common factor f1 has a greater impact on relative credit risk Y, indicating that "correct formulation of credit policy" is most important for the "effective control of credit risk", which points out the future focus for us. ⑤ the correlation between other variables is listed in Table 5 with the relevant data.

## 4. Conclusions and Suggestions

According to the results of our study, we make the following recommendations:

(1) The functions of enterprise credit risk management should be further improved and the relationship between the departments and processes rationalized. Establishing the special department of credit risk management and improving its functions. It also should straighten out the relationship between the departments and process, taking it as an integrated system engineering, integrating the factors inside and outside the enterprise credit risk management (such as: credit risk management organization, process, and environment), construction “the system of enterprise credit risk management”, to make the macro decisions about management.

(2) Credit policy-making in our credit risk management practices is most important, because the correlation coefficient between public factor f1 (credit policy factor) and relative credit risk is at a maximum, Nevertheless, national businesses are not good enough, but not because they do not know the importance of the credit policy. Rather, they do not have the relevant professional expertise to protect them in developing a scientific and rational credit policy. Therefore, we recommend that enterprises strengthen special personnel training in credit management, by the ways of "sending out and bringing in".

(3) The process of enterprise credit management is relatively complicated. It is divided into three parts (pre-, during and after) according to Xie's view. I think there should be a backbone as a special department for enterprise credit risk management. So it’s recommended to set up a special department for credit risk management when the corporation reaches a certain size. It should establish standard internal processes and use scientific techniques or methods to implement credit management function strictly and change the serious situation of out-control in the decision-making of sales and


978-1-935068-12-9 

management fundamentally.

## References

[1] Allen N. Berger, W. Scott Frame and Nathan H. Miller. Credit Scoring and the Availability, Price, and Risk of Small Business Credit. Journal of Money, Credit and Banking, Vol. 37, No. 2 (Apr., 2005), pp. 191-222.

[2] Jianmin Jia,James S.Dyer,John C.Buther.1999 Measures of Perceived Risk[M].Mang,SCI 45 519-532

[3] SHI Xiao jun. Empirical Analysis of China Corporations Credit Risk[J]. Journal of Finance and Economics, 2000(11): 9-16

[4] Chen Wei, Wu Lian can. A New Empirical Analysis on China s Corporate Credit Risk Management Performance[J]. Journal of Henan Business College,2006(3):1-7

[5] DAI Bin. “An Empirical Study of Corporate Credit Risk Actuality Change Tendency and Management Actuality,” Soft Science, 32 Jun. 2006, pp. 73-75