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THE RESEARCH ON CREDIT RISK OF BUSINESS GROUPS WITH PERSPECTIVE OF RELATED PARTY TRANSACTION

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Abstract

Related party transaction is a very significant characteristic for the operations of business groups. A large number of literatures have discussed the effect for business groups by related party transactions but often concluded inconsistently. This paper further refines the research about the effect of credit risk of business groups by related party transaction based on the data of Chinese listed business groups with classical econometric model. Also, it also attempted to find the reasons behind that led the inconsistent result in previous studies. The results of this paper may provide a new perspective to consider the effect for credit risk of business groups by related party transactions and may also have some revelations for the further research.

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1. Introduction

Related party transaction is the transaction which occurs between the related parties that can be usually divided as fair related party transactions and non-fair related party transactions. The non-fair related party transactions can be further divided into behavior of tunneling [1] and propping [2]. As the related structure of business groups, the related party transaction is a significant characteristic of business groups which is very important for its credit risk. The empirical result of Ming and Wong [3] shows that the business groups are more prone to related party transactions than the single companies. The numbers of previous literatures had discussed the effects of related party transactions with different perspectives. However, these previous literatures just concluded inconsistently. Many scholars connected the related party transactions with internal capital market although its different concepts essentially. They considered the related party transactions as a mechanism which can partially substitute the imperfect external market. From their opinion, the related party transactions can improve the operational efficiency through the internal capital market so that it can increase the total value of business groups [4]. So the related party transactions decrease the credit risk of business groups. In fact, the related party transactions do decrease the credit risk of business groups in some specific circumstance, i.e., business groups can transfer funds to help its internal affiliated corporate to ride out of storm [5].

But most scholars agree that the related party transactions are accompanied by tunnel effect and embezzlement. There are many literatures which support the conclusion of tunnel effect by related party transaction just like Gordon et al. [6, 7], etc. Also there are many studies considered the related party transaction as a result of week corporate governance or caused by problem of principal-agent [8]. All these previous studies concluded that the related party transactions reflect the ulterior motives of actual controller of business groups. It decreases the value of business groups. So at last the related party transactions increase the credit risk of business groups.

On the other hand, most of the discussions in previous studies focused on

"if the related party transactions affect to the credit risk" and "the related party transactions increase or decrease the credit risk of business groups". Few of them considered the problem that how the related party transactions affect to the credit risk of business groups. It is so, this paper will study further detailed and attempt to understand how the related party transactions affect to the credit risk of business groups. In order to circumvent the impact of different models, this paper chooses the classical econometric model logistic model as the analysis method. There are at least three reasons to choose this model. First, the logistic model has an extensive explanatory; second, the logistic model has broad applicability with binary classification problem; third empirical studies have shown that the logistic model is very applicable to the research of credit risk [9]. So this paper chooses the Logistic model to analyze the credit risk of business groups with perspective of related party transaction.

This paper can be mainly divided into four parts: the first part is the introduction of this paper. The second part answers the question that if the related party transaction affect to the credit risk of business groups based on both logistic model and support vector machine model. After this discussion, the paper will detail the research and try to answer the question that how the related party transaction affects the credit risk of business groups in the third part. In this part, it analyzes the effect for credit risk by related party transaction with three control variables respectively, i.e., the scale of the business groups, the industry of business groups and the type of business groups. The last part is the conclusion of this paper.

2. Indicators, Samples and Factor Analysis

2.1. Indicators

The credit risk of business groups can be reflected by some indicators directly or indirectly especially the financial indicators. In the previous researches, the indicators are different in most papers as the different paper discussed with different perspectives. In this paper, it follows four basic principles to select the indicators, i.e., objectivity, integrity, operability and

sensitivity. Thence it chooses 18 indicators which can be divided into five categories. The specific indicators of credit risk of business groups are shown in Table 1.

Table 1. Indicators of business groups' credit risk

Indicators of solvency	Quick ratio X_1	Indicators of operating	Inventory turnover rate X_5
	Current ratio X_2		Total assets turnover X_6
	Asset-liability ratio X_3	Indicators of development	Growth rate of income X_{12}
	Interest Coverage ratio X_4		Growth rate of assets X_{13}
Indicators of profitability	Return on assets X_7		Growth rate of net profit X_{14}
	Net profit on total assets X_8		Growth rate of fixed assets X_{15}
	Return on net assets X_9	Indicators of cash flow	Cash debt ratio X_{16}
	Net profit rate of income X_{10}		Cash rate of income X_{17}
	Earnings per share X_{11}		Cash of sale X_{18}

The indicators in Table 1 include the main indicators in the previous papers which can complete reflect the credit risk of business groups. It can be easily known that the indicators in Table 1 do not describe the characteristic of related party transactions of business groups. In this way, this paper adds the characteristic indicators which can reflect the related party transactions of business groups and considers that if the related party transactions affect the credit risk of business groups. The indicators which reflect the characteristic of RPT (related party transactions) are listed in Table 2 as follows.

Table 2. Indicators of related party transactions

Indicators of related party transactions	Number of RPT X_{19}
	Amount of RPT X_{20}
	Number of affiliates X_{21}

Table 1 and Table 2 together constitute the indicator system of credit risk of business groups in this paper. From this indicator system it can discuss the effect by related party transactions to the credit risk of business groups.

2.2. Samples

This paper selects the Chinese listed business groups as the research samples. It defined the high risk business groups as the ST business groups which ST for the following reasons. First, the recent two fiscal years audit shows that the net profit is negative. Second, the recent fiscal year audit shows that the net asset per share is lower than the net value. Third, the certified public account cannot express an opinion or negative opinion on the recent fiscal year financial report.

The samples that selected by this paper are 50 ST business groups in A-share market and 50 non-ST business groups in the same market which can matching the 50 ST business groups from 2004 to 2010. The specific matching rules are as follows:

(1) Consistent study period, e.g., if a sample of ST business groups is in 2005, then there is a sample of non-ST sample that also in 2005.

(2) The matching samples and the ST samples are in the same or similar industry.

(3) The size of total assets of matching samples is the similar as the size of total assets of the ST samples.

(4) The marching samples and the ST samples have the same time to market.

(5) Excluding the missing data business groups.

So there are totally 100 samples selected by this paper. The research data in this paper is from CCER databases.

2.3. Factor analysis

KMO test and Bartlett test are two most commonly statistical indicators that used to measure the effectiveness of factor analysis model. The results of

KMO test and Bartlett test of the samples in this paper are shown as in the following table.

Table 3. KMO test and Bartlett test

Kaiser-Meyer-Olkin measure of sampling adequacy		0.846
Bartlett's test of sphericity	Approx. Chi-square	993.30
	Df	378
	Sig.	0.000

It can easily know from Table 3 that the value of KMO test is 0.846. There is high correlation between the samples. The significance of Bartlett test is 0. This result rejects the null hypothesis of correlation matrix is the unit matrix. To sum up, Table 3 illustrates that the samples selected in this paper are suitable for factor analysis.

Then this paper uses the method of principal of component analysis to factor analysis. The eigenvalue and contribution rate of common factor are shown in Table 4.

Table 4. Eigenvalue and contribution of factor

Factor	Eigenvalue	Contribution
F_1	5.235	26.234
F_2	4.367	18.453
F_3	2.065	9.305
F_4	1.964	8.946
F_5	1.943	7.935
F_6	1.432	7.392
F_7	1.025	5.045

From Table 4, it is easy to see that the eigenvalues of the seven factors are all more than 1. The contribution rate of this seven factors are 26.23%, 18.45%, 9.30%, 8.94%, 7.93%, 7.39%, 5.04%. The cumulative contribution rate of these seven factors is nearly 83%. So these seven factors can almost include the information of all indicators. In order to better explain the economic meaning of the common factor, this paper uses method of VARIMAX to whirl the factor loading matrix. From the factor loading matrix as shown in Table 5, it can be known that:

The factor F_1 mainly explains X_1, X_2, X_4, X_5, X_{16}. Its meaning constitutes by quick ratio, current ratio, interest coverage ratio, inventory turnover rate and cash debt ratio. This factor reflects the solvency of business groups.

The factor F_2 mainly explains X_4, X_7, X_8, X_{11}, X_{16}. Its meaning constitutes by inventory turnover rate, return on assets and net profit on total assets, earnings per share and cash debt ratio. This factor reflects the profitability of business groups.

The factor F_3 mainly explains X_6, X_{10}, X_{12}, X_{16}, X_{17}. Its meaning constitutes by total assets turnover, net profit rate of income, growth rate of income, cash debt ratio and cash rate of income. This factor reflects the profitability and mobility of business groups.

The factor F_4 mainly explains X_{19}, X_{20}, X_{21}. Its meaning constitutes by the indicators of characteristic of related party transactions. The factor F_4 reflects the related party transactions of business groups.

The factor F_5 mainly explains X_3, X_{14}, X_{18}. Its meaning constitutes by assets-liability ratio, growth rate of net profit and cash of sale. This factor reflects the solvency, capacity of development and mobility of business groups.

The factor F_6 mainly explains X_6 and X_9. Its meaning constitutes by total assets turnover and return on total assets. This factor reflects the profitability and operating capacity of business groups.

The factor F_7 mainly explains X_6, X_9, X_{13}, X_{15}. Its meaning constitutes by total assets turnover, return on total assets, and growth rate of assets and growth rate of fixed assets. This factor reflects the capacity of development of business groups.

Table 5. Factor loading matrix

	F_1	F_2	F_3	F_4	F_5	F_6	F_7
X_1	0.36	–0.79	–0.58	0.20	0.19	–0.02	0.11
X_2	0.36	–0.68	–0.20	0.09	0.07	–0.01	–0.03
X_3	–0.40	0.54	0.31	–0.12	0.24	0.12	0.29
X_4	0.36	0.16	0.16	–0.01	–0.34	–0.33	–0.25
X_5	0.45	–0.28	0.58	0.30	0.18	0.07	0.09
X_6	0.29	0.08	0.67	0.11	–0.22	–0.01	–0.21
X_7	0.25	0.26	0.73	0.14	0.12	–0.20	–0.16
X_8	0.95	–0.01	0.00	0.04	–0.08	0.04	0.04
X_9	0.91	0.07	–0.10	–0.03	–0.10	–0.03	–0.04
X_{10}	0.78	0.25	–0.12	–0.09	–0.13	–0.06	–0.01
X_{11}	0.84	0.33	–0.28	–0.21	0.18	0.14	–0.07
X_{12}	0.71	0.37	–0.12	0.00	–0.15	–0.04	–0.04
X_{13}	0.36	0.41	–0.03	0.28	–0.16	–0.23	0.44
X_{14}	0.02	0.36	0.24	0.11	0.04	–0.24	0.33
X_{15}	0.12	0.14	–0.05	–0.06	0.30	0.29	0.37
X_{16}	0.16	–0.03	–0.21	–0.21	–0.45	–0.08	0.54

X_{17}	0.71	–0.52	0.06	0.16	0.23	0.13	0.06
X_{18}	0.69	0.32	–0.27	–0.25	0.26	0.18	–0.08
X_{19}	–0.20	–0.01	–0.09	0.01	–0.29	0.08	0.16
X_{20}	–0.04	0.29	–0.10	0.36	–0.01	0.25	–0.17
X_{21}	–0.02	0.22	–0.13	0.49	0.29	0.05	0.09

3. Models and Detail Discussion

3.1. Basic model

In this section, this paper will first attempt to answer the traditional basic question that "if the related party transactions affect the credit risk of business groups". For this reason, the paper will use two classical models to answer this question, i.e., logistic model and support vector machine model.

First, it uses the logistic model to do the factors regression. The values of explanatory variables 1 and 0 represent the ST business groups and non-ST business groups, respectively. Formula (1) shows the result of the regression:

$$f = \frac{1}{1+\exp[-(1.42 - 2.35F_1 - 1.88F_2 - 0.94F_3 - 1.64F_4 - 1.31F_5 - 0.64F_6 - 1.53F_7)]}. \quad (1)$$

The result of the regression of the factor F_4 which represents the factor of related party transactions of business groups is shown in Table 6.

Table 6. Regression of factor F_4

Factor	Coefficient	*Z*-statistics	Sig.
F_4	–1.64	–2.3502	0.026

From Table 6, the factor F_4 has a significant impact for the credit risk of business groups. Because the factor F_4 describes the related party transactions, so Table 6 tells that the related party transactions affect the credit risk of business groups significantly.

Further, in this paper, it divided the samples into two parts. One part is the training samples include 70 samples and the other part is the testing samples include 30 samples. The training samples and the testing samples are selected randomly. This paper uses training samples to train both logistic model and support vector machine (SVM) model. Then it uses the testing samples to test the accuracy of both models. The accuracies of both models with indicators X_{19}, X_{20}, X_{21} and without indicators X_{19}, X_{20}, X_{21} are shown from Table 7 to Table 10.

Table 7. Logistic model without RPT indicators

Testing samples	Prediction and classification		Prediction accuracy
Non-ST	Non-ST	11	76.67%
	ST	4	
ST	Non-ST	3	
	ST	12	

Table 8. Logistic model with RPT indicators

Testing samples	Predicted and classification		Prediction accuracy
Non-ST	Non-ST	13	80%
	ST	2	
ST	Non-ST	4	
	ST	11	

Table 7 and Table 8 show us that adding in the indicators which explain related party transactions of business groups improves the prediction

accuracy of the credit risk of business groups based on the method of logistic model. Table 9 and Table 10 show us that adding in the indicators which explain related party transactions of business groups improves the prediction accuracy of credit risk of business groups based on the SVM model.

Table 9. SVM model without RPT indicators

Testing samples	Predicted and classification		Prediction accuracy
Non-ST	Non-ST	13	86.67%
	ST	2	
ST	Non-ST	2	
	ST	13	

Table 10. Logistic model with RPT indicators

Testing samples	Predicted and classification		Prediction accuracy
Non-ST	Non-ST	14	96.67%
	ST	1	
ST	Non-ST	0	
	ST	15	

Table 7 to Table 10 tell us the related party transactions do include some information of credit risk of business groups. The RPTs do affect the credit risk of business groups. And adding the indicators which represent the characteristics of RPTs may improve the prediction accuracy of credit risk of business groups. This result may answer the question that it proposed in the beginning of this section that if the RPTs affect the credit risk of business groups.

3.2. Detail discussion

After the discussion in Subsection 3.1, it can be very assured that the

related party transactions do affect the credit risk of business groups. Then a natural question follows that how the related party transactions affect the credit risk of business groups. In this section, this paper may attempt to answer this question with a perspective. To detail the discussion, it may conclude some meaningful results.

Specifically, this paper may detail the discussion with two perspectives. First, it will control the variable of group size to discuss how the related party transactions affect the credit risk of business groups. Then it will control another variable, group property, to discuss how the related party transactions affect the credit risk of business groups. With the discussion of these two perspectives, it may answer the question that how the related party transactions affect the credit risk of business groups to some extent.

Now this paper first focuses on how does group size affect the credit risk of business groups. For this reason, the paper classified the business groups according to group size. To simplify the discussion, it uses the total share capital to measure the group size. In accordance with the size of the total share capital, this paper divided the samples of business groups into “small business groups”, “middle business groups”, and “large business groups”. After the partition, the “small business groups” includes 26 samples, the “middle business groups” includes 58 samples, and the “large business groups” includes 16 samples. Then it regresses with the indicators of RPT in each category business groups respectively. The results of the indicators X_{19}, X_{20}, X_{21} are shown as follows from Table 11 to Table 13.

Table 11. Regression result of small business groups

Factor	Coefficient	Sig.
X_{19}	1.08	0.063
X_{20}	2.14	0.072
X_{21}	–1.29	0.059

Table 12. Regression result of middle business groups

Factor	Coefficient	Sig.
X_{19}	0.92	0.029
X_{20}	2.53	0.048
X_{21}	–0.69	0.035

Table 13. Regression result of large business groups

Factor	Coefficient	Sig.
X_{19}	1.21	0.018
X_{20}	2.33	0.007
X_{21}	–1.75	0.015

From Table 11 to Table 13, it is easy to see that the impact of related party transactions to the credit risk is more and more significance with the size increasing of the business groups. In Table 11, the indicators of RPTs are significant in 10% significance level. In Table 12, the indicators of RPTs are significant in 5% significance level. But in Table 13, the indicators of RPTs are significant in 2% significance level. So the RPTs play the largest role in the biggest size business groups. The reason for this result may be interpreted as that the larger business groups have more complex internal structure, it easier to use RPTs between the internal subsidiaries to transfer assets. So the RPTs may play more significant role to larger business groups.

Then this paper will discuss how group property affects the credit risk of business groups. Follow the classification of property of business groups of CCER databases. This paper divided the samples into three parts. The first part of the samples is the state-owned business groups which includes 54 samples. The second part of the samples is the private-owned business groups which includes 28 samples. And the last part of samples is the collective-owned business groups which includes 18 samples. Table 14 to

Table 16 show the regression result of indicators that represent the characteristics of RPTs of state-owned business groups, private-owned business groups and collective-owned business groups, respectively.

Table 14. Result of state-owned business groups

Factor	Coefficient	Sig.
X_{19}	1.58	0.039
X_{20}	1.42	0.024
X_{21}	–0.94	0.045

Table 15. Result of private-owned business groups

Factor	Coefficient	Sig.
X_{19}	–0.74	0.294
X_{20}	–1.10	0.331
X_{21}	–0.65	0.285

Table 16. Result of collective-owned business groups

Factor	Coefficient	Sig.
X_{19}	0.84	0.088
X_{20}	1.65	0.047
X_{21}	–1.09	0.095

From Table 14 to Table 16, it can be seen clearly that the RPTs in both state-owned business groups and collective-owned business groups have significant impact to the credit risk of business groups in 10% significance level. But the RPTs in private-owned business groups are not significant to its credit risk. As the collective-owned business groups also have a certain state-owned nature, this phenomenon may explain as the absence of actual holders of state-owned business groups in a certain sense.

On the other hand, compare the coefficients from Table 14 to Table 16. The impact of RPTs to credit risk is contrary with state-owned nature business groups and private-owned nature business groups. The positive coefficients of Table 12 and the negative coefficients of Table 14 and Table 16 may illustrate that the main purpose of RPTs for private-owned nature business groups is to improve the value of the business groups. But the RPTs for state-owned nature business groups may not just only on economic purpose. It may also have some social purpose. These discussion in Subsection 3.2 may answer the question that how the RPTs affect the credit risk of business groups in a certain sense.

4. Conclusions

The related party transactions (RPTs) are the main characteristic for business groups. “If the RPTs affect the credit risk of business groups” and “How the RPTs affect the credit risk of business groups” are two main questions for the research of credit risk of business groups. There are a number of previous literatures that had discussed the credit risk of business groups based on RPTs. But these researches almost have two main defects. On one hand, the previous researches mainly only focused on the negative effect of RPTs such as tunnel effect. And on another hand, the previous researches almost only analyzed “if the RPTs affect the credit risk of business groups” and ignored the second question that “How the RPTs affect the credit risk of business groups.”

For this reason, this paper discussed the problem of credit risk of business groups based on RPTs with two steps. The first step of analysis attempts to answer the first question of if the RPTs affect the credit risk of business groups. And the second step of analysis attempts to answer the second question of how the RPTs affect the credit risk of business groups. In the first step, this paper uses two classical methods including Logistic model and SVM model to test that the RPTs do have some significant impact to the credit risk of business groups. The result shows that the RPTs affect the credit risk of business groups significantly. The RPTs contain some information that can describe the credit risk of the business groups. The

research may answer the first question that if the RPTs affect the credit risk of business groups. Then in the second step, this paper attempts to answer the second question that how the RPTs affect the credit risk of business groups. In this way, it discussed in detail the effect with two perspectives. With group size perspective, this paper considers the relationship between the effect and the group size. The result shows that the larger the business group size is, the more significant the effect of RPTs to credit risk of business groups is. Then this paper considers the relationship between the effect and the group property. The result shows that the purpose of private-owned nature business groups may improve its own value by RPTs. But the purposes of RPTs of state-owned nature business groups may not only on economic purposes. This result may explain the actual holder absence of business groups in a certain sense. Also this result may answer the question that how the RPTs affect the credit risk of business groups to a certain extent.

On the other hand, as the lack of data, the result of this paper is based on small samples. For this reason, the reliability and stability of the result of this paper should be examined. The analysis of this paper is rough. It is thought that the analysis for the second question that how the RPTs affect the credit risk of business groups is incomplete. So the discussion for the effect to credit risk of business groups by RPTs based on large samples is necessary.

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