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## **CREDIT RISK RATING ASSESSMENT THROUGH THE FACTOR ANALYSIS AND TOPSIS METHOD AND EVALUATING ITS RELATION WITH TRANSPARENCY RATING**

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### **ABSTRACT**

This study aims to identify companies' credit risk ranking indicators and use them to rank companies of chemical, food and vegetative industry which are accepted in Tehran Stock Exchange by using of TOPSIS method and transparency ranking published by the Tehran Stock Exchange. Despite the limitations of traditional analysis (Which only deals with the totality of the financial statements and analyze each group of financial ratios one-dimensionally) this study tries to lead an investor or creditor by multidimensional analysis of financial ratios group, in order to select the best company among these companies (i.e., companies with lower credit risks) and invest in them or give them a loan. For this purpose, risk indicators of companies and affective factors on companies' risks are identified through factor analysis method. Finally, companies are ranked based on the indicators obtained from factor analysis and TOPSIS method and transparency ranking. Results show that the ranking obtained from TOPSIS is reliable and meaningful and also there is a significant positive relationship among obtained ranks from TOPSIS method and transparency ranking and rank of each component of transparency ranking (including criteria of timeliness and reliability of financial reporting).

**Key Words:** *Credit Risk, the TOPSIS Method, Ranking, Transparency Ranking*

### **INTRODUCTION**

Banking system in Iran like other countries plays a very important role in the economy. Because, banks in addition to having intermediary role in money market funds, due to the inadequate development of capital markets have essential role in long-term and medium-term financing economic program (Khaleghi, 2005). Also, in our country, on one hand, because of low capital formation by the private sector and on the other hand due to the lack of market development, there isn't the possibility of capital formation which is needed in various sectors of the economy and obviously in this case, giving facility constitute an important part of each bank's operations (Batebi, 2004). In general it can be said that the most important activity of banks refers to collection of financial resources and allocate them to different economic sectors. But it should be noted that this financial resources on one hand, supply the needs of banks to give facilities and on the other hand banks should allocate their limited financial resources to production of goods and services optimally which means the activity of company is in efficient level. Because, in terms of economic theories, efficiency resulting from optimizing the production and allocation of resources (Khani, 2007). Therefore, banks are going to give their facilities to companies that have a low risk as well as having commensurate output with the profit of granted facilities. This will be achieved when the banks were able to identify their credit customers (including actual and legal) and be able to classify them based on their ability to repay obligations completely and timely. According to that these funds can be used as a financial source for giving next facilities, so, they have important role in promoting investment and economic growth and development. One of the ways of companies' credit rating refers to giving privilege to them (Oriyani, 2005). Statistical methods such as linear regression and logistic, mathematical planning, decision trees, neural networks and etc are used to develop these systems (Khani, 2007). One of the key drivers of the current study refers to important duties of analysts, media,

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investors and financiers in effecting on the full and timely information flow about the company to relevant beneficiaries including participants of the capital market. Investors have accepted the risk of bringing their investments to capital markets and rely on the information that is published by companies. They need valid, timely and understandable information. On the other hand, there are some concerns such as whether the more transparent financial statements of companies are effective on the creditor's decisions and reduce credit risk? Despite this ambiguity, this study attempts to introduce and subject discussing and considering the relationship between credit risk rating and clarity ranking and answer to the following questions:

- 1) Which are the credit risk ranking indicators of companies of chemical, food and vegetative industry accepted in Tehran Stock Exchange?
- 2) How is the credit risk rating of each of the companies of automotive, food and chemical industry accepted in Tehran Stock Exchange by using TOPSIS method?
- 3) Is there any relationship between credit risk ratings and transparency rankings?

### **Background Research**

Chiang (1997) in a study evaluates the transparency of financial information and signaling theory in Taiwan country. The findings of this study showed that transparency of the financial information in a company has direct relationship with its executive function. Hsiu (2006) conducted a research titled "The effect of financial information transparency on the shareholder's behavior in Taiwan Stock Exchange". He concluded that there is a significant and positive relationship between investor's perceptions of dimensions of information clarification and their behavior and among the dimensions of transparency; transparency of ownership structure has the greatest impact on investor's behavior. Gray and his colleagues (2006) in a research considered the effect of financial and industrial variables which are used in Poor's Standard institute on credit rating of Australian companies. Researchers utilized the probit model in research. Results of research showed that the leve and benefit coverage ratios have the greatest impact on credit ratings. Barth and his colleagues (2009) in their study considered the effect of accounting information transparency on cost of capital. The results showed that there is a significant and negative relationship between cost of capital and transparency of accounting information and on this basis, they concluded that the increase in the transparency of accounting information leads to reduction in cost of capital. DeBoskey and Gillett (2011) in their study evaluated the effect of transparency on credit rating and cost of capital. The results of research showed that there is a positive relationship between credit rating and information transparency. Chou (2012) in a study titled "The information content of credit ratings on the pricing of future earnings" evaluate this issue that if the credit rating has information about benefit and company's future revenues in capital markets or not. The results showed that the credit rating help the distribution of private information in order to reduce uncertainty of information about the future profitability of the company among market participants. Roin tan (2005) in his master's thesis entitled "evaluation of effective factors on credit risk of legal clients of bank (case study of Agriculture Bank)" by using Logistic Regression method, has considered the effective factors on 200 companies that receiving facilities from the Agricultural Bank. The results showed that the credit risk is influenced by company's activity type. Enhancement of cooperation history of company with banks and enhancement of company's flow assets reduces the credit risk, while having experience of deferred bet to bank and enhancement of company's flow debt leads to increase of credit risk. Sinai and Davoudi (2009) conducted a study entitled "Considering the relationship between the transparency of financial information and investments behavior in the Tehran Stock Exchange". They concluded that there is a relationship among the three dimensions of transparency; namely, the transparency of financial information, transparency of ownership structure and transparency of the Board Structure and the behavior of investors in the stock market and among these three dimensions, investors pay much more attention to the transparency of financial information. Danesh Shakib and Fazli (2009) in a study titled "Ranking of cement companies in Tehran Stock Exchange by using of (AHP-TOPSIS) approach" by using of two techniques of AHP and TOPSIS paid to the ranking of active companies in the cement industry that have been accepted in Tehran Stock Exchange. Based on

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the financial data of years 2001- 2007 and application of mentioned model, it was found that the Fars Cement Company has the highest ranking in terms of financial performance. Motameni and Javad Zadeh (2010) in a study entitled "Strategic performance evaluation of banks" by using of expert's opinion and library studies have rated the evaluation criteria of banks performance in both financial and non-financial level for the three banks, by using of the weighting method and finally, through the TOPSIS method. According to the results, the non-financial performance has more importance compared to financial performance. In evaluating financial performance, the share of resource criterion in terms of importance was ranked in the first rate and the criteria of profitability and return on assets were placed in the next rates. In evaluating non-financial performance, pricing criteria in terms of importance were ranked in the first rate and criteria of service quality and electronic banking were placed in the next rates. The results show that just by having good financial performance, it cannot be expected that, in general, the bank performance be improved. While in country, performance evaluation is mainly performed based on financial criteria and non-financial criteria are given less attention.

### **Research Hypotheses**

There is a relationship between the credit risk rate and transparency rate.

## **MATERIALS AND METHODS**

This study is a descriptive - quantitative research in terms of purpose and in terms of data analysis is a type of correlation research that are based on the analysis of collected data from the target population. On the other hand, it is a type of applied research, because the results can be used by banks and financial and credit institutions. The statistical population of this study refers to all accepted companies in Tehran Stock Exchange for the financial period ended 29<sup>th</sup> of Persian date Esfand 2011. The statistical sample of research also including the companies of chemical, food and vegetative industry accepted in Tehran Stock Exchange for the financial period ended 29<sup>th</sup> of Persian date Esfand. The number of these companies is 62. It should be noted that due to the belonging of about 26% of the companies to the mentioned financial period which are belong to these three industries, so are placed as a base of sample selection.

### **Variables and the Way of Measuring**

Studied variables in this research include:

#### **1. Transparency Rating**

To measure this variable, the ratings assigned to each company that are published by the Stock Exchange of Tehran and the statement of "The disclosure quality and proper informing" are used. The rate of transparency in the Stock Exchange refers to the amount of availability of information for the Stock Exchange and the shareholders and the lower the number the better. In fact, rate of transparency refers to transparency in financial reporting. Stock exchange conducted a rankings based on the timely reporting and the correctness rate of predictions and reliability of companies' reports which show them in report of transparency rating. Each company with better transparency rating encounters with less uncertainty for investment. Scores of disclosure quality of accepted companies in the Stock Exchange are calculated based on the weighted average of criteria of timeliness and reliability of disclosure information.

#### **2. Rank of Credit Risk**

Noting that in Iranian economy cannot be seen a regular process to determine credit risk. So, it is necessary, the variables to be considered to assess the credit risk rank and through their considering, the financial strength of companies and ultimately their credit rate can be determined. The following four steps are used to calculate the credit risk rank:

##### **A. Identification of Variables**

In this phase the main emphasis is on those financial ratios that are related to the prediction of bankruptcy and are applied to discriminatory of bankrupt companies from non-bankrupt companies in the Iranian capital market. Given that one of the symptoms of companies' bankruptcy refers to their inability to repay loan, so, these ratios can be used to measurement of credit risk. So at this stage of the investigation, 42

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effective financial ratios on bankruptcy will be extracted of the basic financial statements and ordinary general assembly of selected companies. These ratios are described in Table 1.

### B. Scale Less Building

The point that is proposed in indicators of a decision matrix is the existence of both positive and negative indicators in a matrix. Beside this issue, quantitative indicators has a particular dimensions, like Rails, kg, m, In order to use the different measuring scales, scale less building should be used and by which the amounts of different indicators were dimensionless and can be additive.

**Table 1: Effective ratios on corporate bankruptcies (farajzadeh, 2006)**

RO W	explanation	RO W	explanation
1	Profit before Interest and Tax to Total Assets	22	Accumulated Gains and losses to total assets
2	Net income to total assets	23	Sale to Received Accounts
3	Operating profit to total assets	24	Sale to Cash
4	Net profit to equity	25	Sales to Working Capital
5	operating profit to net sales	26	Sales to Total Assets
6	Gross profit to net sales	27	accumulated Gains and losses to equity
7	Net income to net sales	28	Sale of equity
8	Profit before tax to sales	29	Sale to Fixed Assets
9	share profit to net profit	30	Sales to Ongoing Assets
10	Cash to total assets	31	Interest expenses to gross income
11	Received Accounts and inventory to total assets	32	Interest expense to Earnings before interest and taxes
12	Received Accounts to inventory	33	Total debts to equity
13	Instant assets to total assets	34	Book value of debts to market value of equity
14	Ongoing assets to total assets	35	Total debts to total assets
15	Working capital to total assets	36	Ongoing debts to Equity
16	Market value of equity to book value of equity	37	ongoing debts to total debts
17	Equity to total assets	38	Ongoing debts to Cash and short term investments
18	Fixed assets to equity and long term debts	39	Ongoing debts to ongoing assets
19	Logarithm of total assets	40	Instant assets to ongoing debts
20	Fixed assets to total assets	41	Ongoing debts to Cash
21	paid Capital to equity	42	Long-term debts to equity

There are different ways for scale less building that one of them is fuzzy scale less building. In this way of scale less building, if the index has had positive aspect, the following formula is used:

$$n_{ij} = \frac{a_{ij} - a_i^{Min}}{a_i^{Max} - a_i^{Min}}$$

If the index has had negative aspect, the following formula is used:

$$n_{ij} = \frac{a_i^{Max} - a_{ij}}{a_i^{Max} - a_i^{Min}}$$

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In this type of scale less building, the obtained amount will be between zero and one. Therefore, considering that some of extracted ratios are skewed. So, through fuzzy scale less building we proceed to normalization of larger and smaller data.

### C. Factor Analysis

Considering that the mentioned variables are not related to the equal importance and priority, by using of factor analysis technique several criteria will be selected among various criteria. Factor analysis is a statistical technique which establishes a particular relationship by a theoretical model among a set of variables that are apparently unrelated. One of the main goals of factor analysis technique is reduction of data dimensions. The relationships between mentioned variables and their structure lead to selection of particular variables from set. Its main objective refers to the observance of the principle of economic or thrift through the use of smallest explanatory concepts, in order to explain the maximum amount of common variance in correlation matrix. In this part of research by using of factor analysis on 30 positive variables and 12 negative variables, will be proceed to the reduction of data dimension by using the SPSS software.

### D. Ranking of Companies Based on TOPSIS Method

TOPSIS model was proposed by Hwang and Yoon in 1981. This model is one of the multi-attribute decision models and it is used a lot. In this method, them option can be evaluated by n index. This technique is based on the notion that the choice should has the minimum distance from the positive ideal solution (best possible case) and the maximum distance from the negative ideal solution (worst possible case).

It is assumed that the desirability of each indicator is steadily increasing or decreasing. Problem solving with this methodology would require the following six steps:

1. Quantification and scale less building of the decision matrix (N): For the scale less building which is used for scale less building of Norm and in which each element of decision matrix is divided to squared sum of the squares of each column; namely:

$$n_{ij} = \frac{a_{ij}}{\sqrt{\sum_{i=1}^m a_{ij}^2}}$$

$n_{ij}$ , is the amount of scale less of option i, j is the index.

2. To obtain the weighted scale less matrix (V): The scale less matrix of (N) are multiplied in the diagonal matrix of weights ( $w_$  ( $n \times n$ )), namely:

$$V = N \times W_{n \times n}$$

3. Determine the positive ideal solution and negative ideal solutions: positive ideal solution and negative ideal solution is defined as follows:

The vector of the best amounts of each indicator of matrix V] = positive ideal solution ( $V_j^+$ )

[The vector of the worst amounts of each indicator of matrix V]= negative ideal solution ( $V_j^-$ ).

"Best amounts" for positive indicators is the largest amounts and for the negative indicators is the smallest amounts and for the "worst" positive indicators is the smallest amounts and for the negative indicators, is the largest amounts.

4. To obtain the distance amount of each item to the positive and negative ideals:

Euclidean distance of each item from the positive ideal ( $d_i^+$ ) and the distance of each item to negative ideal ( $d_i^-$ ), is calculated according to the following formula:

$$d_i^+ = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^+)^2} \quad i=1,2,3,\dots,m$$

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$$d_i^- = \sqrt{\sum_{j=1}^n (v_{ij} - v_j^-)^2} \quad i=1,2,3,\dots,m$$

5. Determine the relative closeness ( $CL^*$ ) of an item to the ideal solution:

$$CL_i^* = \frac{d_i^-}{d_i^- + d_i^+}$$

6. Ranking of options: Any option with bigger CL is the better (Momeni, 2006).

### Method of Research's Hypothesis Testing

In this study, in order to examine the relationship between rank of credit risk and transparency rank the Spearman's correlation coefficient test will be used. This test is conducted through SPSS statistical software and at the reliability level of 95%. Statistical hypothesis for this test is defined as follows:

$H_0: \rho_{xy} = 0$  there is no correlation between obtained ranking of two methods.

$H_1: \rho_{xy} \neq 0$  there is a correlation between obtained ranking of two methods

**Table 2: Factor loadings obtained from factor analysis for selected indexes**

0.939	Profit before tax to sales	X 8	Positive indicators of Positive indexes
0.928	Net income to net sales	X 7	
0.928	Net income to total assets	X2	
0.888	Profit before Interest and Tax to Total Assets	X1	
0.886	operating profit to net sale	X 5	
0.991	accumulated Gains and losses to total assets	X 22	
0.835	Gross profit to net sales	X6	
0.808	Operating profit to total assets	X3	
0.705	Equity to total assets	X17	
0.794	Operating profit to total assets	X3	Negative indicators
0.753	operating profit to net sale	X5	
0.718	Gross profit to net sales	X6	
0.707	Net income to total assets	X2	

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0.702

share profit to net profit

X 9

## Results obtained from TOPSIS model

Given that in this study the TOPSIS model is used and obtained results are shown in Table 4.

## Findings

### Factor Analysis

Given that the applied variables for prediction of credit risk do not deal with the same priority and importance, with the help of factor analysis technique among 42 effective ratio on companies' bankruptcy, 14 ratios (9 ratios among the 30 positive ratios and 5 ratios among the 12 negative ratios on companies' value) were selected.

**Table 3: results by TOPSIS method**

Results	Company Name	Results	Company Name	Results	Company Name
0.371	Irka Part Sanat	0.247	Sanaye Rikhtegri Iran	0.270	Pars Pamchal
0.317	Electric Khodro Shargh	0.442	Lent Tormoz Iran	0.495	Petroshimi Isfahan
0.256	Iran Khodro	0.278	Mehrkam Pars	0.337	Petroshimi Abadan
0.298	Iran Khodro Dizel	0.396	Mogandesi Nasir Mashin	0.729	Petroshimi Khark
0.344	Tolid Mehvar Khodro	0.150	Komak Fanarind Amin	0.398	Petroshimi Shazand
0.328	Ahangari Traktorsazi Iran	0.327	Rikhtegri Taraktorsazi Iran	0.479	Petroshimi Shiraz
0.179	Behnosh Iran	0.322	Zamyad	0.293	Petroshimi Farai
0.247	Biskoit Gorji	0.444	Goroh Bahman	0.656	Petroshimi Fanafaran
0.463	Pegah Azarbaijan Gharbi	0.367	Fanarsazi Khavar	0.150	Tolipers
0.199	Tolidi Mahram	0.293	Mehvarsazan Irankhodro	0.334	Tolid Somom Alafkosh
0.272	Dasht Moghan	0.318	Fanarsazi Zar	0.313	Dode Sanati Pars
0.346	Salmin	0.388	Charkheshgar	0.483	Sanayeh Petroshimi Kermanshah
0.357	Shahd Iran	0.373	Niromoharekeh	0.632	Sanayeh Shimiyayi Iran
0.387	Shir Pastorizeh Pegah Isfahan	0.142	Saipa Azin	0.354	Sanati Rangin
0.357	Shir Pastorizeh Pegah Khorasan	0.306	Mars Khodro	0.351	Sanayeh Shimiyayi Sina
0.361	Pars Mino	0.337	Saipa	0.363	Sanayeh Shimiyayi Fars
0.410	Keshto Sanat Piazar	0.314	Ringsazi Mashhad	0.323	Karbon Iran
0.257	Labaniat Pak	0.409	Sazeh Pooyesh	0.312	Kaf

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0.363	Labaniat Kalber	0.339	Radiator Iran	0.399	Loabiran
0.597	Nosh Mazandaran	0.253	Saipa Dizel	0.601	Madani Amlah Iran
		0.364	Motorsazan Traktorsazi Iran	0.659	Nirokolor

In performed factor analysis, the first and principal factor was selected by Euclidean method and the reliability coefficient of 9-fold positive indices, and 5-fold negative indices, is respectively, 0/652 and 0/759. It is necessary to explain that the criterion for selection of variables refers to their factor loadings that are all above 0/7. In fact, here the order of first factor refers to the selection of the most important variables which have high correlation and covariance with each other. Table 3 shows the credit risk indicators extracted of factor analysis associated with their factor loadings. According to this model, each company with bigger CL, is better. The results show that the Khark Petrochemical Company with 0/ 729 score, allocated the highest score to itself and indicate that for this company, the positive indicators are more positive than other companies and negative indicators are more negative than other companies. Results of credit ranking obtained from the TOPSIS model and ranking based on transparency rate for chemical, vegetative and food companies are described in Table 5.

**Table 4: Credit Rating by TOPSIS method and Companies Transparency Rank**

TOPSIS	Transparency Rank	Company Name	TOPSIS	Transparency Rank	Company Name
41	39	Fanarsazi Zar	52	17	Pars Pamchal
18	34	Charkheshgar	7	12	Petroshimi Isfahan
20	32	Niromoharekeh	34	29	Petroshimi Abadan
62	45	Saipa Azin	1	18	Petroshimi Khark
46	24	Mars Khodro	16	2	Petroshimi Shazand
35	55	Saipa	9	40	Petroshimi Shiraz
43	5	Ringsazi Mashhad	49	47	Petroshimi Farai
14	14	Sazeh Pooyesh	3	25	Petroshimi Fanafaran
33	13	Radiator Iran	60	11	Tolipers
55	58	Saipa Dizel	36	7	Tolid Somom Alafkosh
23	27	Motorsazan Traktorsazi Iran	44	15	Dode Sanati Pars
21	30	Irka Part Sanat	8	44	Sanayeh Petroshimi Kermanshah
42	35	Electric Khodro Shargh	4	38	Sanayeh Shimiyayi Iran
54	48	Iran Khodro	29	6	Sanati Ranguin
47	59	Iran Khodro Dizel	30	28	Sanayeh Shimiyayi Sina
32	51	Tolid Mehvar Khodro	25	43	Sanayeh Shimiyayi Fars
37	60	Ahangari Traktorsazi Iran	39	37	Karbon Iran
59	53	Behnosh Iran	45	23	Kaf
56	42	Biskoit Gorji	15	4	Loabiran
10	61	Pegah Azarbaijan Gharbi	5	1	Madani Amlah Iran
58	41	Tolidi Mahram	2	16	Nirokolor
51	62	Dasht Moghan	57	56	Sanaye Rikhtegri Iran
31	49	Salmin	12	20	Lent Tormoz Iran
28	9	Shahd Iran	50	54	Mehrkam Pars
19	19	Shir Pastorizeh Pegah Isfahan	17	26	Mogandesi Nasir Mashin
27	8	Shir Pastorizeh Pegah Khorasan	61	21	Komak Fanarind Amin
26	10	Pars Mino	38	52	Rikhtegri Taraktorsazi



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13	46	Keshto Sanat Piazar	40	33	Iran
53	50	Labaniat Pak	11	31	Zamyad
24	57	Labaniat Kalber	22	3	Goroh Bahman
6	22	Nosh Mazandaran	48	36	Fanarsazi Khavar
					Mehvarsazan
					Irankhodro

Based on the financial data of year 2011 and application of TOPSIS model, it was clear that the Kharg Petrochemical Company has the highest rate in terms of financial performance.

### Significant Assessment of Results from TOPSIS

Because it is possible that the TOPSIS method isn't sufficiently able to do reliable rank of the intended sample, so, at this stage the set of applied indicators in TOPSIS method are analyzed. Linear regression is applied as an accepted standard for assessment of reliability. So that the results of TOPSIS method are present in Table 4 as the dependent variable and 14 ratios of negative and positive refined indicators of factor analysis are considered as independent variables. If the relationship between variables isn't almost linear, application of regression model is not appropriate to measure the relationship between them. Thus, the statistical hypothesis of this test is as follows:

**H01:** There is not a linear relationship between the dependent variable and the independent variables.

**H1:** There is a linear relationship between the dependent variable and the independent variables.

Linearity test of the relationship between variables is done by using of F statistic. If the significant level be less than 5%, then the hypnosis H0 based on the lack of linear relationship (regression) between the variables is rejected and hypnosis H1 based on the existence of linear relationship between these variables is acceptable.

**Table 5: F distribution for ranking obtained from TOPSIS**

Model	Sig.	Durbin-watson	Adjusted R Square
TOPSIS	0	1.991	.936

Results of Table 5 show that ranking obtained from TOPSIS method is significant. Because significant level obtained from the TOPSIS method is less than 5%. So, the null hypothesis is rejected. One of the assumptions that are considered in regression refers to the autonomy of errors (the difference between the actual values and the predicted values by regression equation) with each other. If the hypothesis of autonomy of errors is rejected and errors are correlated with each other, there isn't any possibility for application of regression. In order to check the autonomy of errors with each other the Durbin-Watson test is used. Note that the Durbin-watson statistic is placed in the range between 1/5 to 2/5 for these two methods; there is no correlation between errors. Since the coefficient of determination in the form of total ratio explains the change of dependent variables (around its mean) that are done by changing of independent variables, or in other words, coefficient of determination indicates that the changes of independent variables to what extent explain the changes of dependent variables. In proposed model for credit risk rating of companies of chemical, food and vegetative industry by using of TOPSIS method, adjusted coefficient of determination is 0/94. This shows that the 94% of companies credit risk changes are explained by the use of changes of 14 ratios which increases the reliability of this method. Also, through this method the top companies can be identified in other industries in terms of credit risk and can be assisted to the investors to buy stock for assessment of their intended companies continuous activity and also to the creditors by giving facilities to reduce the risk of non-repayment of loans.

### The Results Obtained from Research Hypothesis Testing

In research hypothesis, it is predicted that there is a relationship between the rate of credit risk and the rate of transparency. To investigate the relationship between the rankings obtained from TOPSIS method and

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rate of transparency, the Spearman's correlation coefficients test were used and results obtained from research's hypothesis are presented in Table 5.

The results indicate that the significant level is less than 0/05 (0/006), so null hypothesis is rejected and there is correlation between these two methods. The correlation coefficient for 62 data is 0/346, and then there is a direct correlation between these two methods.

Given that the measurement criteria of transparency rating, based on the Tehran Stock Exchange refer to criteria of timeliness and reliability of submitted reports of accepted companies to the mentioned organization, so, for further analysis in present research the relationship between the rankings obtained from TOPSIS method and these two criteria of transparency ranking has been examined by using of Spearman's correlation coefficient test and obtained results are presented in Tables (7) and (8).

**Table 6: Results of the Spearman's correlation coefficient between the ranking obtained from TOPSIS method and rate of transparency**

			TOPSIS	Transparency ranking
Spearman's rho	TOPSIS	Correlation Coefficient	1.000	.346**
		Sig. (2-tailed)	.	.006
		N	62	62
	Transparency ranking	Correlation Coefficient	.346**	1.000
		Sig. (2-tailed)	.006	.
		N	62	62

\*\* . Correlation is significant at the 0.01 level (2-tailed)

**Table 7: Results of Spearman's correlation coefficients between the rankings obtained from TOPSIS method and timeliness of financial reporting criterion**

			TOPSIS	Timeliness criterion
Spearman's rho	TOPSIS	Correlation Coefficient	1.000	.390**
		Sig. (2-tailed)	.	.002
		N	62	62
	Timeliness criterion	Correlation Coefficient	.390**	1.000
		Sig. (2-tailed)	.002	.
		N	62	62

\*\* . Correlation is significant at the 0.01 level (2-tailed)

**Table 8: Results of Spearman's correlation coefficients between the rankings obtained from TOPSIS method and reliability of financial reporting criterion**

			TOPSIS	Reliability criterion
Spearman's rho	TOPSIS	Correlation Coefficient	1.000	.310**
		Sig. (2-tailed)	.	.014
		N	62	62
	Reliability criterion	Correlation Coefficient	.310**	1.000
		Sig. (2-tailed)	.014	.
		N	62	62

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The results show that the ranking of each components of transparency ranking has also a significant relationship with the ranking obtained from the TOPSIS method and also this relationship ( $r=0/39$ ) exists for timeliness criterion and for reliabilities criterion ( $r=0/31$ ) which indicates that the correlation degree obtained from the ranking of timeliness criteria and TOPSIS method is more than the correlation between TOPSIS method ranking and reliability criterion.

## CONCLUSION

Due to limited financial resources and available facilities for banks, assessment of borrowers' ability to repay before granting loans to them is one of the major challenges for country's banking system. In other words, the credit risk of each loan recipients should be considered before granting loan and then related to it appropriate decision should be made. whether it is appropriate to review. Therefore, determining the credit risk of the borrowers before lending is very important. In this study obtained results from TOPSIS method show that about 94 percent of companies' credit risk changes can be explained by the use of changes 14 ratio which increases the reliability of this method. Also, through this method, the top companies can be identified in other industries in terms of credit risk and can be assisted to the investors to buy stock for assessment of their intended companies' continuous activity and also to the creditors by giving facilities to reduce the risk of non-repayment of loans. The evaluation of relationship between credit risk rating and transparency rankings indicates that there is a significant correlation between obtained results from rating based on TOPSIS method and transparency ranking for research data which indicates that ranking based on the TOPSIS method according to the selected financial ratios for credit risk assessing has direct relationship with ranking base on the transparency rating and the correlation resulting of this relationship is 0/346. Given that companies with better credit risk rating have lower credit risk, so, it can be concluded that companies with lower credit risk rating have better transparency rating. Therefore, investors to make investment decisions and evaluate companies' credit situation, can use companies' transparency rating as an alternative criterion. The evaluation of relationship between rating obtained from TOPSIS method and criteria of timeliness and reliability of financial reporting of sample companies of research shows that the ranking of each components of transparency ranking has also significant relationship with the ranking obtained from the TOPSIS method and also this relationship is (0/39) for timeliness criterion and (0/31) for reliabilities criterion which indicates that the correlation degree obtained from the ranking of timeliness criteria and TOPSIS method was more and those companies that send their reports to stock exchange organization timely (by considering the ranking obtained from TOPSIS method) have low credit risks are low and it can be said that they have more qualification to receive credit and bank 's facilities.

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