Presentation a Model for Calculation of Credit Risk

Amirhossein Erza[1]
Member faculty of finance and banking, Allameh Tabataba'i University

Moslem Peymany
Member faculty of finance and banking, Allameh Tabataba'i University

Farnaz Sefi
Master of Allameh Tabatabaei University

Abstract

The credit risk is one of the foremost risks that may affect monetary and financial institutions. Thus, it is necessary to measure this risk for optimal allocation of resources the credit ranking enterprises are totally responsible for this task but due to absence of such enterprises in Iran, a model has been proposed in this study based on comment of experts and using structured equations to compute credit risk in the listed companies in Tehran stock Exchange TSE. With respect to the given results, the industry is the foremost effective factor in credit risk and then leverage, liquidity, and profitability ratios have devoted the maximum effect to it.

Introduction

The investment acts as a financial decision always includes two elements of risk and return and presents various compositions of investment. On the one hand, investors look for maximization of their profit of investment; and on the other hand, they are exposed to the uncertainty conditions governing over the financial markets where the latter factor exposes them to uncertainty in achieving of investment returns (Tehrani & Noorbakhsh, 2013). In financial markets, investors need to measure risk including credit risk of enterprises and publishers to make decision for acceptance of investment and rate of it (Murcia et al., 2014). Similarly, as an enterprise takes strategy for production, investment and growth, financing may play essential role. Access to financing at lower cost is deemed as the integrated part of economic feasibility in corporate development plans. The financing models have been changed and at the same time financing has been replaced with banking facilities through bonds and securities. Likewise, as the loaner lends to an individual or a company, it is unlikely that the borrower to commit fault in interest payment and repayment the original loan (Erza, Peymani & Seifi, 2017). The credit measurement and ranking enterprises play vital role and possess crucial position in developing of financing system because establishment of such institutes is led to optimal distribution of capital through the society, enhances speed and efficiency of in fund allocation and increases information transparency and efficiency. Unfortunately, Iranian capital market lacks such institutions and ranking

---

1-Corresponding Author

done by Industrial Management Institute is the only existing current ranking for enterprises and it publishes the list of hundreds of top enterprises every year (Anvari Rostami & Khotanloo, 2006). The credit ranking of enterprises is widely used in financial services for risk management, investment and decision making for financing (Doumpos & Figueria, 2018). Those ranking, which are exclusively based on financial data, may not show a proper image of corporate credit status because the corporate credit is determined according to the related internal and external factors. There are some studies that have discussed about financial ranking in listed enterprises in TSEO Organization and they have measured and ranked companies by different techniques that are only based on financial criteria often including financial ratios while they are not adequate criteria for ranking; however, most of the given enterprises were also included in active companies in industries of TSEO. What it deemed as important is that the qualitative factors should be also examined along with financial variables since regardless of them the corporate credit rank will not be reliable as well. Given the industry as one of qualitative parameters, ranking of all enterprises may be achieved. The literature of studies has been principally focused in ability of financial ratios for prediction of credit ranking and the empirical investigations indicate that such ratios may interpret noticeable part of credit ranking of enterprises but credit ranking is not adequate only based on quantitative factors. All available and efficient quantitative and qualitative factors in credit ranking should be examined to obtain a proper rank. Based on what it mentioned, it can be concluded that the studies have so far poorly acted in ranking task (Seifi, 2017).

Thus, the current study tends to identify efficient quantitative and qualitative factors in credit ranking by review on investigations and methodology of world ranking institutes and comment from experts. In other words, it is tried to consider the existing qualitative factors as well thereby to define quantitative parameters. Then the relationship will be interpreted among credit risk and the major and effective factors on this variable.

Theoretical framework and research literature

The today life is continued while uncertainty conditions have shed the light on all activities and transformed decision-making process. Approximately all individuals are typically familiar with risk concept in today concept and they acknowledge that the life is accompanied to the risk. In normal language, risk denotes a danger occurs due to uncertainty concerning incidence of an event in the future and as rate of such uncertainty is greater it is so-called the risk is higher (Ismaelnejad Ahangarani, 2012). The risk and return are always accompanied together in investment and financing and they may not be assumed separate from each other because the investment related decisions are always made according to the relationship among risk and return. The investors should always consider the risk in making of decisions about their investment (Tehrani & Noorbakhsh, 2013). The Webster Dictionary has defined term 'risk' as being exposed to the risk. The Investopedia Dictionary also assumes risk as potential loss of investment that is computable. In other words, risk is composed of the conditions including both of threat and opportunity. Perhaps, this definition can be deemed as one of the most perfect definitions of risk (Ismaelnejad Ahangarani, 2012). Risk includes various types; non-financial risks highly influence in financial risks namely either of non-financial risks are finally led to variations in financial variables. For example, the credit risk may occur for an organization if administrative problems take place (Ismaelnejad Ahangarani, 2012). The credit risk is also included in financial risks. As an investor lends loan to an individual or enterprise it is possible the borrower of loan to commit fault in payments of interests and repayment of the original repayment. The probability for non-payment of original loan and interest is called default risk. The default risk of an enterprise is a function of potential for creating of cash flows due to corporate operation and related financial accruals including payment of original fund and interests. The default risk is a function of amount of corporate liquidated assets as well in those companies with more liquidated assets in which they have more facilities to

pay for their accruals under critical circumstances. The following issues can be mentioned about default risk:

• Those enterprises with higher cash flow versus their financial accruals are less exposed to default risk than companies that possess less cash flow than their accruals. Therefore, the companies which possess noticeable current investments and create higher cash flows have lower default risk than ones that are not so.

• The more stable cash flow is led to lesser default risk in the given company. Those enterprises which act in predictable and table businesses experience less default risk than companies that work in cyclic and unstable businesses at the same liability level. The higher liquidity of corporate assets for all level of operational cash flows and financial accruals is led to lesser default risk in the company (Damodaran, 2013). Following to constant and dynamic development of credit industry, this industry plays more important role in national economy and in order to create and develop credit management process, credit providers try to formulate and design and present a model for methodology of credit risk along with world methodologies.

The investors are always exposed to uncertainty regarding future and making related decision. Such a uncertainty is the risk. Thus, those ones can reduce the risk due to uncertainty if they are able to improve their knowledge about progressive investments by proper planning and analyses and decrease the uncertainty caused by them. Therefore, as it is talked about risk management today, it is not intended to remove the risk, but it aims to identify and determine the relevant costs. Credit risk management is a part of Total Quality Management (TQM) and also control system. The credit risk may be assumed as one of the greatest risks because it is related to any active trade. The credit risk management aims to preserve productivity of in business activities and duration (Safari, Ibrahimi Shaghaghi & Sheikh, 2010). Following to quick development of financial services and products, credit risk assessment has been recently noticed in the field of financial risk management (Zheng, Wang, Lu, Wong & Ma, 2017) and in order to create

and develop credit management process, credit providers try to formulate and design and present a model for methodology of credit risk along with world methodologies. Mohenram (2004) used financial ratios for separation of prosperous companies from unsuccessful enterprises in a survey. The finding of this study suggests that the enterprises with higher ratio of book value to market price averagely possess higher return. These ratios have been utilized in various researches as the essential factors for determination of value of companies and separation of superior and successful companies versus unsuccessful ones. Gary, Mirkovic and Ragunathan (2006) explored the effect of industry on credit ranking issued by Standard and Poor's financial services for Australian enterprises. The results of their study indicated that industry centralization criteria might be important in determination of credit risk in Australia. Hwang et al. (2010) proposed a model to predict credit ranking using a Probit semi-parametric model. The offered model was tested for credit ranking of companies by means of 29 variables including market related variables, financial variables and type of industry and empirical results verified the new model had more utility than ordinary Probit models. Al-Khawaldeh (2013) examined relationship among credit risk and features of Jordanian enterprises. For this purpose, he used the ordinal logistic regression and variables of leverage (sum of liabilities to assets), profitability (net profit to sale), intensity of capital (the gross fixed assets to sum of assets) tendency to loss (it is 1 if profit is negative and otherwise 0), size of company (natural logarithm of total assets), growth opportunities (Q-Tobin), type of industry (it is 1 if company in financial sector and otherwise 0), and quality of auditor (it is 1 if it was assessed by four leading audit companies and otherwise 0). Dude and Thein (2013) presented a theoretical basis for value of credit risk according to mathematical theory i.e. fuzzy Logit. They examined and ranked 643 enterprises listed in Vietnamese Security and Exchange Organization using the reported financial ratios including liquidity ratios (current, quick and cash ratios), return ratios (turnovers of accounts

receivable, goods inventory, accounts payable, fixed asset, and assets and rights of stockholders), capital structure ratios and leverage (ratio of long-term liability to total assets, ratio of long-term liability to rights of stockholders, ratio of long-term asset to rights of stockholders, ratio of short-term liability to total liabilities, and interest coverage ratio), profitability ratios (asset return, return of rights of stockholders, gross profit margin, profit per stock, sale return, return before taxation and interest and depreciation to income, return before taxation and interest and depreciation to asset, return before taxation and interest and depreciation to rights of stockholders), final cost structure ratios (final cost of sale to income and administrative costs to income), asset structure ratios (current to total asset, current accounts receivable to current asset, and goods inventory to current asset and fixed asset to total asset), and growth rate (post- taxation income and profit). They claimed these financial indices might cover approximately all various aspects of operation in the trade unit. Murcia et al. (2014) determined determinant factors of credit risk in Brazil during period (1997-2011). They considered ten variables of leverage, profitability, size of company, financial coverage, growth, liquidity, corporate governance, control, performance of financial market, and international nature as the independent variables and the published credit by Standard and Poor's ratings for 153 observations as dependent variable.

Research Methodology
It necessitates for a series of variables to characterize credit risk for using of these criteria to screen the information and to enter the collected relevant data as inputs into (model) processing trend. As the used variables are stronger and better, they will be more compliant with the reality and the proper decision can be made for credit risk according to this output (Jalili, 2007).
If the main problem is which of variables play role in credit risk in enterprises and how can identify credit risk of enterprises based on these variables the first step is to define the variables that possess explanatory

significance to determine credit risk in enterprises according to theory and literature of the study. It is important to address quantitative and qualitative factors in determination of credit risk. Paying attention only to quantitative factors of the given work exposes this process to serious restriction because quantitative factors are mainly retroactive while it aims to propose an attitude for making prospective decision to be useful for beneficiaries.
Primarily, the related literature to credit ranking was studied including methodologies of ranking institutes and conducted studies on ranking and determinant factors of credit rank were extracted from them. A questionnaire was prepared to finalize effective parameters in credit risk and to identify the level of importance of parameters with respect to comment of experts based on Iranian environment. At last, the effective variables on credit risk were selected in Iranian setting as follows:

Ownership effects
This variable denotes stock at the hand of great investors e.g. banks, insurance companies, retirement funds, investment companies and other public enterprises.

Transparency
According to corporate governance principles of Organization of Economic Cooperation and Development (OECD), the framework of corporate governance should guarantee timely and accurate disclosure of all important subjects including financial status, performance, ownership and corporate governance. One of these cases is as follows:
a) Disclosure should include important information with reliability, but not only limited to it, and it should be disclosed timely. The annual ranking of TSEO organization was employed for calculation of reliability and timely information disclosure.

Presence of industry in international market
Compared to the active industries at international level, those industries that are active at national scene are more exposed to credit risk (Fitch Rating Inc., 2006). This variable has been derived by dividing of exportation sale of industry to their total sale.

Growth of industry

The growth of industry is also deemed as one of the influential factors in corporate credit (Standard & Poor's, 2001). Q-Tobin is a valuable sign of growth. The growth of industry had been calculated in this study based on q-Tobin as follows:

$$\text{Tobin's} - Q = (\text{Debts} + \text{MV}) / \text{Assets}$$

Where Debts denotes book value of corporate liabilities, MV is market values for rights of corporate stockholders, and Assets are the book value of total corporate assets.

Ratio of concentration of industries

Highly competitive industries include greater credit risk. Namely, they are exposed to fewer entry barriers (Fitch Ratings Inc., 2006). Herfindahl- Hirschman Index (HHI) is utilized to compute this ratio. This index is designated for each of industries as product of addition of sum of market shares for each of enterprises and given formula is expressed as follows:

$$\text{HHINDEX} = \sum_{i=1}^{N} S_i^2$$

Where S_i denotes sale market share for any enterprise in the given year and N is the number of sample companies present in industry. The sale market share of any enterprise is obtained by dividing of sale of any company to total sale of industry.

Barriers against entry into industry

The limitation of the new company to enter in industry may protect from interests of the existing enterprises and easiness for entry into industry is assumed as a threat for survival or profitable operation of enterprise. This variable has been calculated by division of corporate gross fixed assets to total assets of the given company.

Gap of supply and demand of corporate product

The difference among supply and demand of product is one of the factors that increase risk of industry. Due to difference between statistical measurement bases of product and sale of products, this variable has been derived from percent of variance among goods inventory at the end and beginning periods of activity of industry.

Size of company

The great-size companies have stronger position in the market and also they enjoy economies of scale and lesser default risk. As a result, it is expected for greater enterprises to devote better credit risk. This variable has been derived by calculation of natural logarithm of corporate market value.

Market share

One of the other factors that determine competitive status of a company is market share in enterprises. The company with greater market share can influence further in industry market; as a result, it is exposed to lesser risk. This variable has been derived by division of corporate sale to total sale of industry.

Current ratio

The current ratio indicates total liquidity of a company. This ratio shows solvency for current repayments out of current assets in the given institute. The aforesaid ratio is assumed as liquidity scale in short term. This ratio is derived from division of current asset to current liability.

Quick ratio

This ratio shows clearly how much that part of current asset with greater stability in terms of value and lower probability of reduction can be assumed as financial backing for short-term creditors (Mehrara et al., 2009). This ratio is obtained by division of current asset minus goods inventory to current liability.

Cash fund ratio

Based on this ratio, the cash and transactional bonds are used only in the case of deficit and therefore it is the best technique to determine what part of liabilities can be immediately and surely paid.

Average period for collection of claims

Postponement in collection of claims denotes weak activity. The period of collection of claims in a company can be compared with mean period of collection of claims in other enterprises at the given industry (Tehrani, 2013).

Liability ratio

This ratio is calculated by division of total liabilities to sum of assets and it indicates leverage status of company upon measurement of credit rank.

Interest cost coverage ratio

Concerning credit ranking, this criterion denotes corporate solvency to meet interest accruals for liabilities turnover and it is assumed it is positively related to credit rank.

Gross profit margin

The greater dross profit margin shows the company is more capable in sale of goods. The lower level of this ratio may lead the company to be under difficult condition in terms of competition. The gross profit margin is derived from dividing of gross profit to sale.

Net profit margin

The new profit margin shows profitability resulting from income and it is one of important corporate performance factors. Similarly, this ratio denotes return and efficiency of production and structure of final cost and corporate costs. This ratio is obtained by division of net profit to sale.

Net capital turnover

The difference between current assets and liabilities is called net capital turnover. The net capital turnover is usually positive in a company that properly manages their activities (Ross et al., 2010).

Financing policy

The financing policies are considered as a parameter for corporate risk tolerance with respect to liability potential of the given company and it is assumed as a tool for assessment of quality of management that influences in credit rank (Rom Ratings, 2008). The financial leverage has been employed as a parameter for calculation of this variable. The financial leverage is a financial risk index and computed as follows:

$$FL = \frac{\%\Delta EPS}{\%\Delta EBIT}$$

Percentage of variance of profit before taxation

This ratio denotes this point that how many percent profit before taxation has varied in comparison to last year. The greater positive variance of this ratio denotes better corporate performance than previous year and it can reduce concern about credit risk.

Variance of profit before taxation to variance of fixed asset

This ratio measures variance of profit before taxation to variance of fixed asset. The higher ratio expresses suitable status of company in terms of profitability and backing for various uses including fixed assets and if a company has suitable status in terms of this parameter, the lesser probable credit risk is assumed for the given company.

Variance of profit before taxation to variance of total liability

This ratio denotes variance of profit before taxation to variance of total liability. As this ratio is greater it shows variance and rise of profit less depends on liability and they are created more by main operation and activity of the company and on the other hand there is no possibility for negligence and default for fulfillment of accruals to the given liability.

Variance of net profit margin to total liability variance

Here ratio of variance of net profit margin to variance of total liability is measured and it denotes how much the net profit can be covered by increase or decrease in liability. The greater ratio suggests that corporate performance has been better than previous year with no tangible rise in liability and it reduces probability for credit risk.

Financial cost to net sale

This index denotes how much ratio of net sale is spent for payment of financial cost. The lesser index indicates the company less depends on external financing and the potential has not been restricted for using of facilities and it is possible to use these facilities under special conditions and alternately it shows the company act conservatively. Therefore, lower level of this index is also led to reduction of possibility for default risk.

Total book value of corporate financial facilities to market value of rights of stockholders

This ratio expresses the corporate assets may be lesser than liabilities of the company. As this index is greater, the enterprises are ranked as lower level. The index of total book value of corporate financial facilities to market value of rights of stockholders was utilized to measure this ratio.

The book value of rights of stockholders to the given market value

This index is derived by division of book value of rights of stockholders to the given market value. In fact, this index shows book value to market value in which book value of stocks is calculated by sum of rights of stockholders in balance sheet of company and market value of given stocks has been

also computed by number of published stocks at the hands of stockholders based on latest market price at the end of fiscal year.

Operational cash flow to total liability

Operational cash flow to total liability is used for determination of the existing cash fund for accruals. The much higher level of this index not only expresses adequate cash fund for repayment of the necessary liabilities, but it shows that further liability can be also accrued if necessary.

Ratio of long term financial facilities to total assets

This ratio is an index that shows rate of long term financial facilities to assets. As this index is greater the company should incur more financial costs and consequently profitability and consistency are reduced (Min & Lee, 2008). This index is derived by dividing long term financial facilities to assets.

Margin of operational profit

The profitability indices are assumed as important determinant factor in terms of credit protection. The operational margin is one of these ratios. The company with higher operational margin is capable for creating of internal capital, absorbing of external capital and resistance against business disabilities (Standard & Poor's, 2001). The operational margin of profit is derived by division of operational profit to sale.

Security margin index

It is called to division of the expected (current) sale difference from the sale at break-even point to the expected sale. It denotes how much corporate production and sale may be reduced while the company does not incur loss. This index is a criterion for risk measurement and as this index is greater,

the company has more secured status and will incur lesser risk and vice versa (Monajati, 2013).

Many efforts have been made to examine rigorously causal relations between variables in last decade. The structured equation model or multivariate analysis with hidden variables is one of these prospective techniques in this field. Howell (1997) implies this term refers to a series of general models regardless of the given numerous names or concepts including explanatory factor analysis, classic synchronous structural models, path analysis, multivariate regression, Analysis of Variance (ANOVA) or other statistical methods. The structured equation model is a comprehensive statistical approach for testing hypotheses about relations between the observed and hidden variables. One can test reasonability of theoretical models in specific population by this approach using correlation, non- pilot and trial data. The structured equation model is a correlation-based methodology. Lisrel model is a visual mathematical model in which this essence is revealed for any use. This is because the meaning of the involved elements differs in various models and applications. A visual Lisrel model includes a big group of models that can be employed according to necessity. The structured equation model was utilized to determine relationship among credit risk and related indices and effects of observed variables on hidden variables were analyzed. The framework of conceptual model for the current study is shown in Fig (1) based on approach of structured equation modeling. As a hidden variable, credit risk comprises of a few constructs called observable variables. It is as follows:
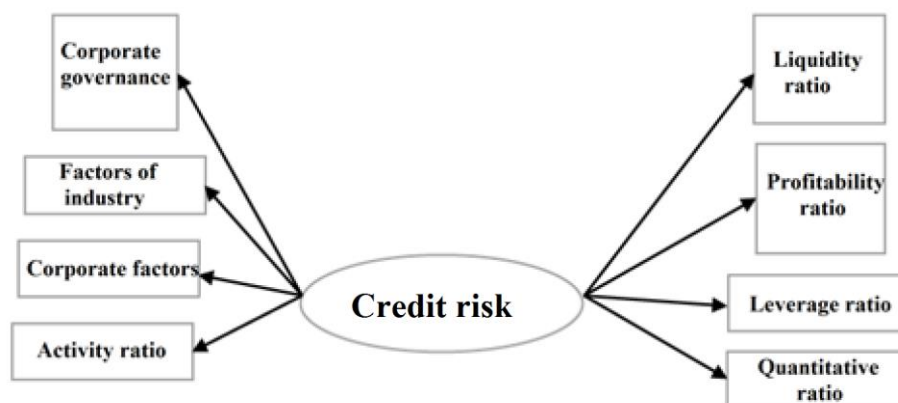

Fig 1: Conceptual model

7

Each of given main above-said variables includes sub-variables and due to multiple numbers of these sub-variables, we showed only major variables in above-said conceptual model.

Results Discussion

In order to identify determinant indices of credit risk, the literature relating to credit ranking was initially studied including methodologies of ranking and the conducted investigations regarding credit ranking. The effective indices are given for determination of credit risk in the following:

Table 1: The effective indices in determination of credit risk

	Indices
Corporate governance	Ownership effects
	Transparency (reliability)
	Transparency (timeliness)
Factors of industry	Presence of industry in international markets
	Growth of industry
	Ratio of concentration in industries
	Barriers against entry into industry
	Gap of supply and demand for product in industry
Corporate factors	Size of company
	Corporate market share
Liquidity ratio	Current ratio
	Quick ratio
	Cash fund ratio
Activity ratio	Average period for collection of claims
Leverage ratio	Liability ratio
	Interest cost coverage ratio
Profitability ratio	Margin of gross profit
	Margin of net profit
Quantitative ratios	Net capital turnover
	Financing policy index
	Percent of variance for profit before taxation
	The variance for profit before taxation to variance of fixed asset
	The variance for profit before taxation to variance of total liability
	The variance of profit margin to variance of total liability
	Financial cost to net sale
	Total book value of rights of financial facilities to market value of rights of stockholders
	The book value of rights of stockholders to market value of rights of stockholders
	Operational cash flow to total liability
	Long term financial facilities (liability) to total assets
	Margin of operational profit
	Security margin index

The Likert scale based five- choice questionnaire has been utilized as measurement tool in this study. The values were encoded from 1 to 5 based on importance level of indices ranging from very low to very high to rank credit risk determinant indices according to experts' viewpoint. Cronbach alpha coefficient was utilized to determine reliability of questionnaire after data collection for questionnaire. SPSS-19 software was used for conducting tests in this section.

Table 2: Cronbach alpha coefficient of questionnaire

Number of items of questionnaire	Number of respondents	Cronbach alpha coefficient
32	102	0.901

As Cronbach alpha coefficient more approaches to 1, the internal correlation and consistency is increased between questions and as a result these questions will be more homogeneous. The results of Table (2) show this test enjoys reasonable reliability.
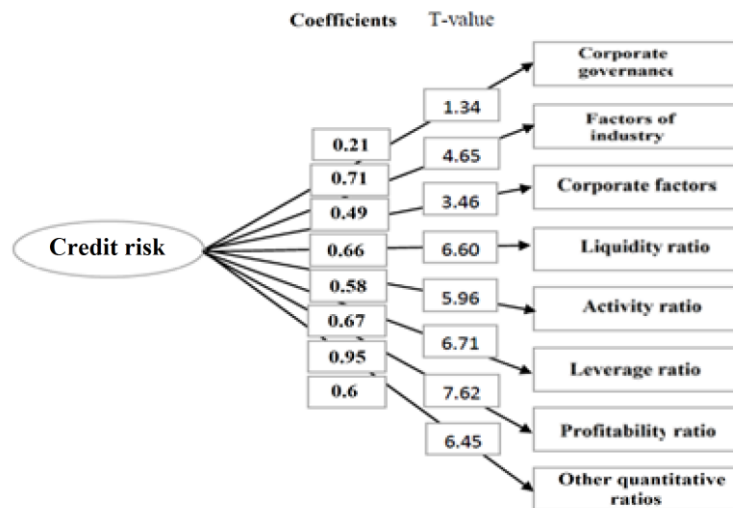
Research findings and results

Fig 2: The structured equations for credit risk along with values of coefficients and t-value

The initial results are given in structured equation model in the figure at above. Based on the given results from Fig (1), it indicates significance of the obtained coefficients and parameters from measurement of credit risk indices in the process of standard approximation with output (RMSEA = 0.012) for the model that suggests goodness of fit to this model. The acceptance range of this index has greatly varied. The values lesser than 0.06 (Hu & Bentler, 1999) or even values under 0.07 (Steiger, 2007) and among 0 to 0.05 have been considered as goodness of fit for the given model while the values greater than 0.1 show lower fit (Brown & Cudeck, 1993). The Chi-square index for lower values should be higher than 0.05. The sample size is also influential, of course (Barrett, 2007). The quantities of the given coefficients suggest direct effect of effective indices in determination of credit risk. The direct effect of each of indices is given in the following table.

9

Table 3: The effect of efficient indices on credit risk

Indices	Direct effect on credit risk
Corporate governance	21.0
Factors of industry	71.0
Corporate factors	49.0
Liquidity ratio	66.0
Activity ratio	58.0
Leverage ratio	67.0
Profitability ratio	0.95
Other quantitative factors	0.6

Table (3) shows direct effect of efficient indices in determination of credit risk. According to each of coefficients, we can see highest effect in parameter of profitability ratio; in fact, 95% of variance of credit risk is covered by indices of profitability ratio. After this parameter, the highest effect respectively belongs to indices of factors of industry, leverage ratio, liquidity ratio, profitability ratio, activity ratio. Corporate factors and at last corporate governance. According to the conducted investigations in this model, corporate governance has the least effect on credit risk. The standard factor loading and t-statistic are calculated for structured equations modeling. Generally, the following rule governs: The power of relationship between two factors (variables) is shown by factor loading. The factor loading is a value varies from -1 to +1. If factor loading is lesser than 0.3, the relationship is assumed as weak and ignorable. The value of factor loading is reasonable if it is among 0.3 to 0.6 and if this value is higher than 0.6 it will be very favorable. After determination of correlation between variables, the significance test should be done. The t-statistic or t-value is used for determining of significance of relationship between variables. Since significance is analyzed at error level (0.05) therefore if the observed value of factor loading is calculated smaller than 1.96 by t-value test, this relationship is not significant and this fact will be shown by red line in Lisrel software. Based on the given results from t-value statistic, the variable of corporate governance is not significant

Conclusions

As an investor lends loan to an individual or a company, it is unlikely the loan-taker to commit default and negligence in interest payment and repayment of the original loan (Erza, Peymani & Seifi., 2017). The investors are always exposed to uncertainty in relation to the future and making decision about it. Such a uncertainty is the risk. Thus, those ones who intend to reduce risk caused by uncertainty should increase their knowledge about progressive investments by proper planning and analyses and reduce their related uncertainty. Therefore, as it is talked about risk management today, it is not intended to remove the risk, but it aims to recognition and determination of the relevant costs. The credit risk management is a part of Total Quality Management (TQM) and also a part of control system. The credit risk may be assumed as one of the greatest risks because it is related to any active trade. The credit ranking companies are totally responsible for this task but due to absence of such companies in Iran, a model has been proposed in this study based on comment of experts and by means of structured equations for calculation of credit risk in the listed enterprises in Tehran stock Exchange TSE. With respect to the given results, the industry index is the most influential factor on credit risk and then indices of leverage ratio. Liquidity ratio, and profitability ratio have devoted the highest effect to their own. These findings are consistent with the results of studies done by Gary, Mirkovic and Ragunathan (2006), Wang et al. (2010), Dude and Thien , 2013), and results of factors of leverage ratio, liquidity ratio and profitability ratio are aligned with the findings from surveys of Al-khawaldeh (2013), Dude and Thein (2013) and Murcia et al. (2014).

The results of this study may be useful for credit ranking institutes. We will witness

presence of these institutes in Iran soon but the first problem they may encounter is to select variables based on which they should determine credit rank of the company. This study can contribute to the progressive credit ranking institutes to analyze research literature comprehensively and to receive comments of experts this survey may be employed as a basic model for credit ranking institutes. After establishment of a national credit ranking institute in Iran, this study may be assumed as a start point. With respect to feedback of results of this study in the future, this model can be revised of course and a national ranking system can be designed.

At the end, it is suggested using other models for calculation of credit risk in the future studies e.g. neural network and or fuzzy algorithms and comparing their results with each other. This study has only ranked enterprises. The future studies may separately rate credit in banks and insurance companies and investment companies where each of these groups includes their specific determinant indices to specify rank

References

[1]   Al-khawaldeh, Abdullah Ash-shu'ayree (2013), International Journal of Financial Research 4 (1), 120 – 131.

[2]   Barrett, Paul (2007). Structural equation modelling: Adjudging model fit. Personality and Individual Differences Volume 42, Issue 5.

[3]   Browne, M.W. & Cudeck, R. (1993). Alternative ways of assessing model fit. In Bollen, K.A. & Long, J.S. [Eds.] Testing structural equation models. Newbury Park, CA: Sage, 136–162.
Charles P. Johns (2013). Investment management. Transl. Dr. Reza Tehrani & Asgar Noorbakhsh, 11th Ed., Tehran: Negah-E-Danesh Press.

[3]   Damodaran, Aswat (2013). The advance corporate financing: An applied approach. Tehran: Nasr Press.

[3]   Doumpos, Michals. Figueira, José Rui. (2018). A multicriteria outranking approach for modeling corporate credit ratings: An application of the Electre Tri-nCmethod. Omega Available online 11 January 2018.

[3]   Dud, Vo Hong. Thien, Nguyen Dinh (2013). A new approach to determining credit rating & its applications to Vietnam's listed firms. Available on https://www.murdoch.edu.au

[3]   Erza, Amir Hossein & Peymani, Muslem & Seifi, Farnaz (2017). Calculation of credit risk and its effect on return in TSEO. Scientific- Research Quarterly of empirical studies in financial accounting, year 14, vol. 55. Pp. 169-196.

[3]   Fitch Ratings (2006). Corporate Ratings Methodology. Corporate Finance criteria report.1-7

[3]   Gray, S. Mirkovic, A. and Ragunathan, V. (2006). The determinants of credit ratings: Australian evidence. Australian Journal of Management. Vol. 13. N pp 333-354

[3]   Howell, D. C. (1997). Statistical Methods for Pschology. (4th ed) Belmont, CA: Wadsworth Publishing Company.

[3]   Hu, L. & Bentler, P. (1999). Cutoff criteria for fit indices in covariance structure analysis: conventional criteria versus new alternatives. Structural Equation Modeling, 6, 1-55.

[3]   Hwang and et al (2010). Predicting issuer credit ratings using a semiparametric method. Journal of Empirical Finance 17. 120–137

[3]   Ismaelnejad Ahangarani, Majid (2012). Principles and concepts of rsik management, Sina Bank Public Relations Press.

[3]   Jalili, Mohammad (2007). The Iranian comprehensive credit measurement system as the axis for behavioral transformation in Iranian Bank System. Iran ranking consulting Company.
Min, J.H. and Lee, Y.C. (2008). A practical approach to credit scoring. Expert Systems with Applications35(4). 1762–1770

[3]   Mohanram, P. (2004). Separating winners from losers among low book-to-market stock using Financial Statement Analysis, Columbia Business school.

[3]   Monajati, Reza (20130. Step-by-step training of financial management. Tehran: Negah-E-Danesh Pub.

[3]   Murcia, Flávia Cruz de Souza and et al (2014). The determinants of credit rating: Brazilian evidence. BAR - Brazilian Administration Review11 (2). 188-209

[3]   Ross, Stephen & Westerfield, Randolph & Jordan Bradford (2010). Modern financial management. Transl. Dr. Ali Jahankhani & Mojtaba Shori. 3rd Ed., Tehran: The organization for study and codification of humanities textbooks in universities (SAMT).

[3]   Safari, Saeed & Ibrahimi Shaghaghi, Marziyeh & Sheikh, Mohammad Javad (2010). Credit risk management for legal customers in trade banks by taking data envelope analysis approach (credit ranking). Journal of management studies in Iran, 28 (4). 137-164.

[3]   Seifi, Farnaz (2017). Calculation of credit risk and its effect on efficiency in Tehran Security and Exchange Organization TSEO. MA thesis. University of Allameh Tabatabaei, Faculty of Management and Accounting.

[3]   Steiger, J.H. (2007), "Understanding the limitations of global fit assessment in structural equation modeling," Personality and Individual Differences, 42 (5), 893-98.

[3]   Tehrani, Reza & Rahnama Falavarjani, Rouhollah (2008). Analysis of ratio of book value to market value as an alternative variable of risk using of leverage approach. Journal of accounting and auditing studies, 52: 37-54.

[3]   Zhang, Qi.Wang, Jue. Lu, Aiguo. Wang, Shouyang. Ma, Jian. (2017). An improved SMO algorithm for financial credit risk assessment – Evidence from China's banking. Neurocomputing Volume 272, 10 January 2018, Pages 314-325