Customers Credit Rating of the Banking System by the Use of AHP and TOPSIS methods

Case Study (Selected Branches of Tehran MASKAN Bank)

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Abstract- Customer rating, as a guideline for us to recognize important factors for recognizing customer situation and codifying suitable strategies in a trading or service providing organization, will lead to profitability. In the present paper, the real and legal customers of MASKAN bank branches were investigated. First, according to the second-hand resources and by the use of Logistics regression, the effect of the existing factors in clarifying the customers' situation was investigated. Then, the factors were weighted by the use of the AHP technique and the customers were prioritized by the use of the TOPSIS technique. The research results manifested the rating exactness for the real and the legal customers. The present paper is a kind of experimental research, according to the purpose and quickens the development of a quantifiable knowledge in the behavioral sciences.

Key words- Rating, AHP, TOPSIS

INTRODUCTION

Correct connection between financial and production systems in any country are the most important growth and economic development factors of that country. Banks as the main part of the financial system have the main role in providing the finance for producing, trading and consuming sectors and even the government. The same in Iran, according to the economic structure of the country and to the reasons like the non-expansion of the conventional and non-banking markets, providing the finance for the real economic sectors is upon the banking system of the country which unfortunately was not that much successful in reaching its goals. At present, the constant activity and survival of the most of the banks of the country is influenced by the governmental support. A great volume of the given facilities fail or the banks' pending reveal non-existence of suitable expertized models in the rating systems of the banking system (Rashidian, Sanaz, 2012). Evaluating and measuring the credit risks among the other risks the banks are facing in their vast performance area bears especial importance. Risk reduction and control are considered the effective factors in improving the credit offer and consequently banks' performance and has a basic role in constant facility offerings, profitability and the banks and financial institutions' survival. Studying the risk management field leads to facing various techniques, methods and tools which using them depends on the recognition of the risk type and in accordance measuring tools and risk management reduction. One of the suitable techniques in this field is using decision-making patterns and models. Using these techniques helps the banks a lot manage the crises and risks especially credit, liquidity, market, interest rate and profitability (Tehrani, 2010). Using multi-modal forecasting models and decision-making techniques are among the techniques and basic actions for risk management in credit institutes and the banks. The main function of these models is to forecast the customers' behavior of the banking system and to make decision for determining the customers' credit level (Rashidian, Sanaz, 2012). The traditional ways of decision-making for granting credit to the loan applicants, the same as what happens in our country which is based on the personal judgments; will not be respondent. The great volume of the banks' financial claims also reveals the matter. Consequently, according to the existing risk, the important issue that has ever been one of the important challenges of the financial institutions is to rate the customer, before granting the facility, from the point of the probability of delay or insolvency in order to choose the group that assures the payments on the due date. Performing this matter is possible by means of a comprehensive and structural system and choosing the suitable variables. The present paper also attempts to present expertized and technical solutions to solve this problem and ultimately to suggest a model which based on the choice-effective parameters and indexes to rate the credit applicants and to reduce the probability of the granted facilities' insolvency (Rashidian, Sanaz, 2012). In a market in which profit margin of the banks ,due to the intensive competition, is continuously decreasing and the ever pressure to decrease the costs is felt; the credit- risk models along with the forecasting the insolvency losses of the given loans are the relative advantages created for the banks and the financial institutions (Femandes, E, 2005).

RESEARCH GENERAL GOALS

Segmenting and describing the customers' groups, forecasting and managing customers' credit risks and discovering the existing patterns of the customers' information in the paper sample population of the Tehran MASKAN Bank branches.

RESEARCH MAIN HYPOTHESES

1. *There is a relationship between individuals' variables and the credit risks.*
2. *There is a relationship between the legal entities' variables and the credit risks.*

RESEARCH LITERATURE AND BACKGROUND

Evaluating the credit risks' history goes back to the invention and creation era of the money. Even in the past, individuals considered the financial capacities of the person while giving loans to different groups and individuals. Considering the limitation of the effective variables on the financial capacity of the people, the banks and credit- granting institutions gave loans according to the recognition background of their customers (Mousavi, Gholipour, 2010). Various studies have been done about the effect of the different variables on the credit borrowers' defaults. Part of these studies investigates the effective factors on insolvency of the granted loans and the other studies investigate the insolvency possibilities from the point of forecasting the companies' financial performance.

INTERNAL RESEARCHES

A "Real Customers' Credit Rating" research has been done by Mohammad Jalili and his colleagues in which by means of the Logit model and logistic regression investigates the real customers who have received credits from the banking system during the years 2002-2008 whose credit is still stable or paid and completed. The research variables are divided to two groups of internal variables including (gender, age, marital status, education, job, loan duration, facility amount, collateral, collateral value, credit purpose) and the external variables including (miscounting customers, 'customers with high credit risks' and good counting customers, 'customers with low credit risks). In this research, based on the supposed model , it assumed that the credit situation of banks' customers i.e. miscounting or good counting can be determined by means of a collection of the personal characteristics, demography and the credit status. Analyzing the credit status of 1000 customers revealed the relationship and the meaningful effect of some independent variables. The effect of the independent variables of age and education on the credit status i.e. miscounting or good counting is not proved but the effect of other variables such as gender, marital status, etc. on the credit status i.e. miscounting or good counting is proved. Therefore, based on the mentioned 8 characteristics, the probable credit status of the applicants can be forecasted.

The model, also, has been able to have a good forecast about the customers' credit status. Maryam Khalili Araghiand Mohammad Javad Asgharpour(2006) investigated the banks and the credit organizations based on the decision-making models and sought to improve the decision-making process for granting credit to the banks' customers. They could do credit rating for the banks by means of credit-risk management. Also, a great business volume of the financial institutions such as banks, insurance companies, retirement funds and finance-providing companies is to give loans and besides, for making more profits, they should be successful in taking back the complete loan. In other words, their credit risk must be low which in the case of ignoring the credit risk management and reducing the risk may lead to the behavioral risks. Another research is done about "The effective factors on the credit-risk of the banks' customers", case study of Keshavarzi Bank, by Abbas Arabmazar and Pouneh Ruyintan, in the year 2007. The research is undertaken to recognize the effective factors and to codify a model for evaluating the credit risk of the legal entities as the customers of Iran Keshavarzi Bank by means of the logit regression. For this purpose, the quality and financial information of an accidental sample of 200 companies which have received credit facilities from Keshavarzi Bank branches during the years 2000 to 2005 were investigated. At first, 36 describing variables such as quality and finance were investigated and by means of logit regression analysis, ultimately 17 variables among all the existing variables were chosen and the final model was investigated by means of them which had the meaningful effect on the credit risk and the segmentation of the two groups of the miscounting and good-counting customers. The research results prove the economic and financial theories in the field of the effective factors on the credit risks and also reveal that these factors on the credit risk of the legal entities as Keshavarzi Bank customers have a great share-point with the effective factors on the credit risk of the legal customers of the other banks (such as Mellat Bank and Export Development Bank).

OVERSEAS RESEARCHES

From the year 1910 that John Moody graded and rated the credit risks of the bonds, some of the researchers paid attention to the high similarity of the bonds and the given facilities and measured the insolvency risks of the total loans and their interests. Meanwhile, Phisher study, 1936, as the first evaluating system for credit application and the Durand study, 1941, by means of the "Audit Analysis" and relying on the Phisher results can be pointed out as the fundamental systems of credit rating at the present time. Boughs, 1967, was the first person who suggested the computer usage for investigating the big data collections from different aspects and tried to use complicated multi-variable statistical tools which leads to improve the exact credit-rating models more than before (Basel committee on banking, 2006).

RESEARCH METHOD

The present paper is a correlation research from the point of the relationship between the variables because it investigates the relationship between the dependent and independent variables. The logistic regression is used to investigate the correlation and the AHP and TOPSIS techniques are used to weigh the data and rate the miscounting and good-counting customers (Bhushan, 2004, Hwang, 1981).

STATISTICAL SAMPLE

The present paper evaluates both the individuals and the legal entities as the customers; therefore, the statistical sample of the individuals include about 985 credit files of the selected Tehran branches of MASKAN Bank during March 2011 to March 2013 who have taken the facilities from the bank for the amount of 50 million and more. In order to round the figures to the number of 1000, 15 more customers from the date before 2011 are chosen accidentally and segmented to two groups of miscounting and good-counting customers.

About the legal customers, the financial data of 210 companies during March 2011 to March 2013 at selected Tehran branches using facilities of 50 million and more are used as the research sample. These customers are also segmented to two groups of good counting (without pending facilities) and miscounting (with pending facilities) customers.

RESEARCH VARIABLES

In this paper, the credit risk of the customers are considered as the dependent variable and the following indexes are considered as the independent variables which as a whole are divided to two groups of the indexes of the individual customers and the indexes of the legal entities.

INDEXES OF THE INDIVIDUAL CUSTOMERS

Include: Applicant Income, Education, Job History, Kind of the Collateral, Collateral Value, Bank Contact Duration and the Average Amount of the Account.

INDEXES OF THE LEGAL ENTITIES

Financial proportion of an economic institution is divided in to 4 groups: the proportion of the Liquidity, the proportion of the Efficiency, the proportion of the Debt-Payment Capacity and the proportion of the Profitability.

RESULTS OF THE STATISTICAL ANALYSIS AND THE LEGAL ENTITIES RATING MAIN HYPOTHESIS

According to the analysis, the index and statistics of "Omnibus" shows less than 0.05 errors level (Table 3). Therefore, the whole model evaluation is acceptable. Cox and Snell R Square and Nagelkerke R Square is between 0.571 and 1 (Table 2) which reveals the distinguishing power of good and miscounting of the customers. In the logistic regression, the good-counting and miscounting customers are divided correctly (Table 1) which can be concluded that all the independent variables in this model are meaningful.

		Predicted		
		credit status		
	Observed	miscounting	good accounts	Percentage Correct
Step 1	credit status miscounting	150	0	100.0
	good accounts	0	850	100.0
	Overall Percentage			100.0

Table 1: classification Table

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	.000ᵃ	.571	1.000

Table 2: Cox and Snell

		Chi-square	Df	Sig.
Step 1	Step	845.418	7	.000
	Block	845.418	7	.000
	Model	845.418	7	.000

Table 3: Omnibus

SUBORDINATING HYPOTHESES

K Pearson correlation test is used to investigate the relationship between the dependent and independent variables. There is a relationship between the customers' income and credit status. The R amount is -0.814 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' income and the credit status. There is a relationship between the customers' education and the credit status. The R amount is -0.153 and is also meaningful on more than 1% level but it does not reveal the high relationship between the customers' education and the credit status. There is a meaningful relationship between customers' background and the credit status.

The R amount is -0.600 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' background and the credit status. There is a meaningful relationship between customers' kind of collateral and the credit status. The R amount is 0.697 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' kind of collateral and the credit status. There is a meaningful relationship between the customers' collateral value and the credit status. The R amount is 0.256 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' collateral value and the credit status. There is a meaningful relationship between the customers' bank contact duration and the credit status. The R amount is -0.607 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' bank contact duration and the credit status. There is a meaningful relationship between the customers' account average amount and the credit status. The R amount is -0.608 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' account average amount and the credit status.

AHP Results

After surveying the experts, the variables were weighted by means of the Expert Choice software. Figure 1reveals the output of the software for weighing the customers' rating indexes.

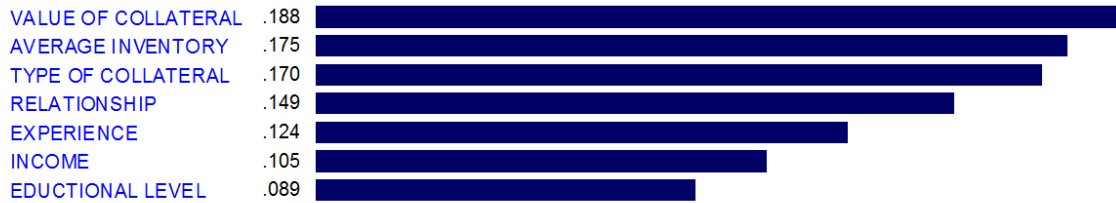Synthesis with respect to:
Goal: RANKING OF MASKAN BANK CONSUMER

VALUE OF COLLATERAL	.188
AVERAGE INVENTORY	.175
TYPE OF COLLATERAL	.170
RELATIONSHIP	.149
EXPERIENCE	.124
INCOME	.105
EDUCTIONAL LEVEL	.089

Figure 1. Results of weighing the variables

TOPSIS TECHNIQUE

After weighing the variables, the TOPSIS Technique codes were entered to the Excel software and all the steps of the technique were programmed for all the 1000 customers. The rating results considering the customers' status (good and miscounting) and the weighs of the experts' survey by means of the AHP technique in the graph1 shows that the research result in correct recognition of the good-counting customers is 97% and in recognition of miscounting customers is 74%. The existing error percentage in this rating is related to the real status of the customers considering the second-hand information and their discrepancies with the experts' weighing.
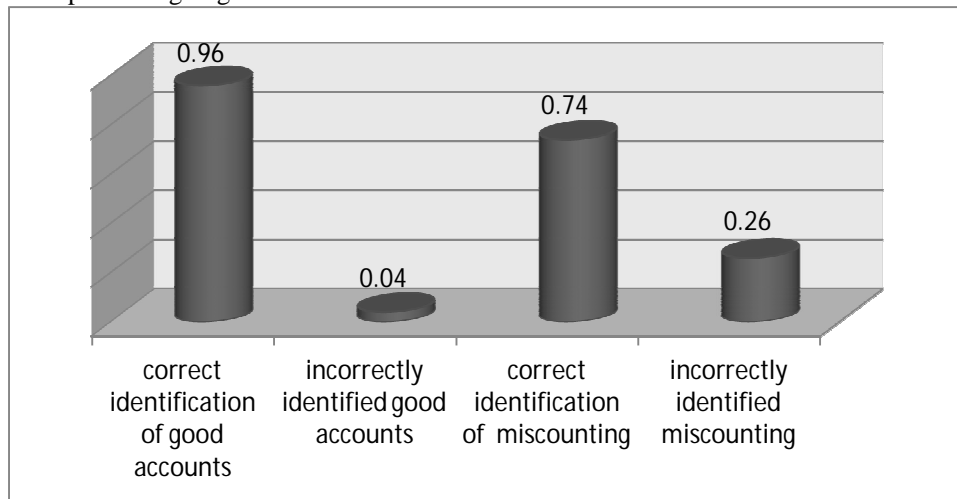
Graph 1.Bank MASKAN quality customer rating analysis

STATISTICAL ANALYSIS RESULTS AND RATING OF LEGAL ENTITIES- CUSTOMERS MAIN HYPOTHESIS

According to the analysis, the index and statistics of Omnibus shows less than 0.05 error level (Table 6). Therefore, the whole model evaluation is acceptable. Cox and Snell R Square and Nagelkerke R Square is between 0.518 and 1 (Table 5) which reveals the distinguishing power of good and miscounting of the customers. In the logistic regression, the good-counting and miscounting customers are divided correctly (Table 4) which can be concluded that all the independent variables in this model are meaningful.

			Predicted		
			credit status		
		Observed	miscounting	good accounts	Percentage Correct
Step 1	credit	miscounting	25	0	100.0
	status	good accounts	0	185	100.0
		Overall Percentage			100.0

Table 4: classification Table

Step	-2 Log likelihood	Cox & Snell R Square	Nagelkerke R Square
1	.000[a]	.518	1.000

Table 5: Cox and Snell

		Chi-square	df	Sig.
Step 1	Step	153.310	27	.000
	Block	153.310	27	.000
	Model	153.310	27	.000

Table 6: Omnibus

SUBORDINATING HYPOTHESES

There is a meaningful relationship between the customers' liquidity ratio and the credit status. The R amount is 0.602 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' liquidity ratio and the credit status. There is a meaningful relationship between the customers' leverage ratio and the credit status. The R amount is 0.617 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' leverage ratio amount and the credit status. There is a meaningful relationship between the customers' efficiency ratio and the credit status. The R amount is 0.788 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' efficiency and the credit status. There is a meaningful relationship between the customers' profitability ratio and the credit status. The R amount is 0.579 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' profitability and the credit status. There is a meaningful relationship between the customers' current ratio and the credit status. The R amount is 0.684 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' current ratio and the credit status. There is a meaningful relationship between the customers' quick ratio and the credit status. The R amount is 0.778 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' quick ratio and the credit status. There is a meaningful relationship between the customers' quick ratio to the current ratio and the credit status. The R amount is 0.763 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' quick ratio to the current ratio and the credit status. There is a meaningful relationship between the customers' debt ratio to the share-holders' rights and the credit status. The R amount is 0.663 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' debt ratio to the share-holders' rights and the credit status. There is a meaningful relationship between the interest coverage ratio and the credit status. The R amount is 0.573 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' interest coverage ratio and the credit status. There is a meaningful relationship between the customers' ownership ratio and the credit status.

The R amount is 0.791 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' ownership ratio and the credit status. There is a meaningful relationship between the customers' debt ratio and the credit status. The R amount is 0.791 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' debt ratio and the credit status. There is a meaningful relationship between the customers' capital ratio to the total property and the credit status. The R amount is 0.794 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' capital ratio to the total property and the credit status. There is a meaningful relationship between the customers' loan ratio to the final price and the credit status.The R amount is 0.783 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' loan ratio to the final price and the credit status.There is a meaningful relationship between the customers' receivable accounts' turnover ratio and the credit status.The R amount is 0.725 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' receivable accounts' turnover ratio and the credit status.There is a meaningful relationship between the customers' claims collections' average duration and the credit status. The R amount is 0.812 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' claims collections' average duration and the credit status.There is a meaningful relationship between the customers' inventory turnover and the credit status. The R amount is 0.805 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' inventory turnover and the credit status.There is a meaningful relationship between the customers' payable accounts' turn over and the credit status.

The R amount is 0.807 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' payable accounts' turn over and the credit status. There is a meaningful relationship between the customers' average inventory maintenance days and the credit status .The R amount is 0.687 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' average inventory maintenance days and the credit status.There is a meaningful

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relationship between the customers' payable accounts' settlement and the credit status.The R amount is 0.806 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' payable accounts' settlement and the credit status.There is a meaningful relationship between the customers' operation turn over duration and the credit status .The R amount is 0.816 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' operation turn over duration and the credit status.There is a meaningful relationship between the customers' cash conversion cycle and the credit status .The R amount is 0.792 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' cash conversion cycle and the credit status.There is a meaningful relationship between the customers' profit margin and the credit status .The R amount is 0.780 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' profit margin and the credit status.There is a meaningful relationship between the customers' gross profit and the credit status .The R amount is 0.804 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' gross profit and the credit status.There is a meaningful relationship between the customers' operating profit margin and the credit status .The R amount is 0.809 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' operating profit margin and the credit status.There is a meaningful relationship between the customers' property turnover ratio and the credit status .The R amount is 0.770 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' property turnover ratio and the credit status.There is a meaningful relationship between the customers' property efficiency and the credit status .The R amount is 0.749 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' property efficiency and the credit status.There is a meaningful relationship between the customers' credit status and the efficiency of the shareholders' rights .The R amount is 0.781 and is also meaningful on more than 1% level and it reveals the high relationship between the customers' credit status and the efficiency of the shareholders' rights.

AHP Results

After surveying the experts, the variables were weighted by means of the Expert Choice software. The figure 2 reveals the output of the software for weighing the customers' rating indexes.
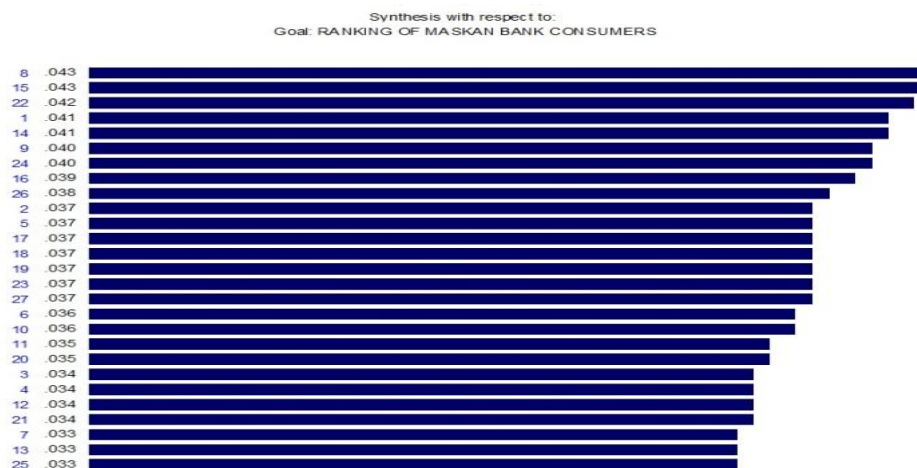

Figure 2. Results of weighing the variables

TOPSIS Technique

After weighing the variables, the TOPSIS Technique codes were entered to the Excel software and all the steps of the technique were programmed for all the 210 customers. The rating results considering the customers' status (good and miscounting) and the weighs of the experts' survey by means of the AHP technique in the graph2 shows that the research result in correct recognition of the good-counting customers is 100% and in recognition of miscounting customers is 100%. Such a rating power is related to in-discrepancy between the second-hand information and the experts' view and the high correlation between the independent and dependent variables of the legal customers proves this matter.
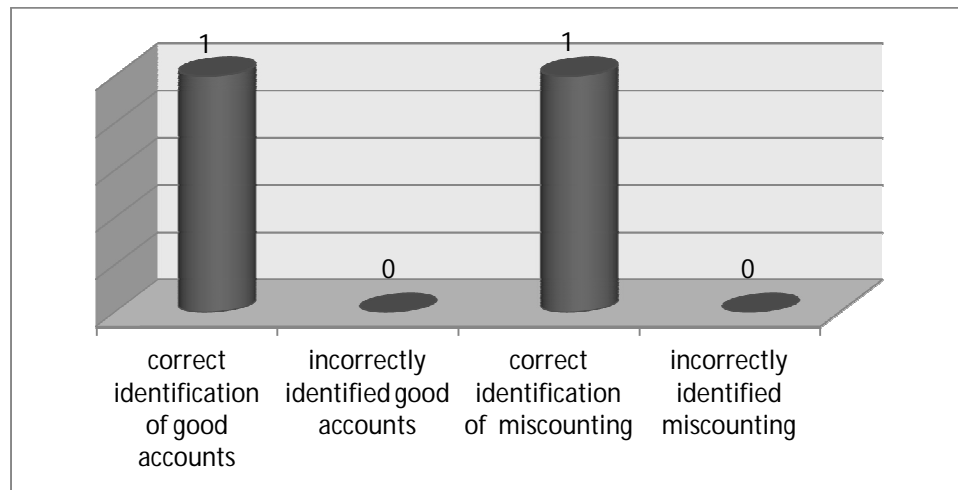
Graph 2. Quality rating analysis

CONCLUSION

In the present paper, considering the customers' status of good-counting and miscounting and regarding the number of 1000 for the individual and the 210 legal entities as the participant customers, it can be concluded that the appraisal factors for legal customers had a good revealing power in customer recognition. Except the education which did not have such a high relationship, the other factors can be considered as the fundamental factors for evaluating and prioritizing the customers. In the research by jalili and his colleagues (Legal Customers Rating in the Banking System)(2009), the effect of the in-dependable meaningful variables except the education variable have been recognized as the customers' distinguishing variables. In the rating by the use of TOPSIS technique, our performance in recognition of good-customers to miscounting customers was better. The existing error reason in the recognition was related to the discrepancy between the experts' view and the real customers' data which needs standardization considering the reality and brain storming with the experts' presence. Bank performance in policy making for forecasting the customers should use the factors which can surely be reliable. In the research by rashidian(Banking System Ranking Based on the Credit Risk by the Use of Forecasting and Multi-Variable Decision-Making Models)(2012), the non-recognition of the customers has happened. The situation of the legal customers is excellent. All the existing variables for distinguishing the good-counting customers from miscounting customers were very powerful in a way that all the customers in Logistic Regression were separated. The correlation between all the variables was very high and their meaningful effect on the dependable variables was obviously clear. These variables can be considered as the fundamental and standard variables in MASKAN Bank. The rating results, also, shows the zero error in recognition of good-counting and miscounting customers which reveals the compatibility of the experts' view and the real data of the customers.

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