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Exploring Intellectual Capital

Creation and Application of Expert System Framework in Granting the Credit Facilities

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Abstract

This study investigated the development of a knowledge base for expert system for credit risk assessment of bank's legal customers. It analyzed the customers' credit risk based on experts' financial ratio analysis. Financial ratios were derived from financial statements of customers; however, the knowledge that helps banking experts to determine the relationship between customers' credit risk and financial situation has been derived from these laws. In this study, expert system considered customer financial ratios as input and prediction of credit risk level as the output. This study was a descriptive-case study research. The population consisted of credit experts of Tejarat bank who were the member of bank's credit Committee and had the right to vote for facilities approval and the individuals whose main task was providing reports for granting facilities and monitoring the use of facilities. After an initial interview and determining the evaluation criteria for facilities and determining the items for each of the criteria, a questionnaire was designed using Likert scale. Data normality test was conducted to ensure the accuracy of the collected data. T-test was performed to realize the selected criteria are important. Then, experts were asked to determine the minimum score for providing the facility to the applicant in each section of the questionnaire. The laws of expert system were provided based on determined minimum scores.

Keywords: Risk Management, Credit Risk, Expert System

Introduction

Credit rating is a technique helps some organizations, such as commercial banks and credit card companies to determine whether the consumer is granted credit on the basis of predefined criteria. [15] Credit ratings can be divided into two distinct types. The first type is practical rating where credit applicants are classified as good or bad. The data used for the model is composed of general financial and demographic information about loan applicants. In contrast,

the second type deals with the transactions with existing customers and other information. Payment history information is also used here that is different from that of the first type; because it depends on the refund method of customer. Credit rating is a number that provides a person's credit based on quantitative analysis of his credit history and other criteria; it describes the probability of refunding the loan by the borrower.

Following a good model for the evaluation of new applicants is an important element in achieving this goal. In the credit rating, the process is composed of two procedures: 1) to apply quantitative techniques to previous customers - both loyal and defaulting customers- to explore the relationship between credit ratings and the set of criteria, 2) using the discovered relationship between credit ratings of existing applicants and evaluating the new applicants as good or bad (Yu,2009).

There are different models for credit rating. Banks and organizations that are involved in granting credits use one of the models based on their circumstances and the surrounding communities. In this section, we will first give a brief introduction of the most popular credit ratings models.

Based on the theories and methods, credit ratings models can be divided into two main groups [Gorbani & Tajali,2005)]:

A - Parametric credit ratings models:
Linear Probability Model
Porbit and Logit Models
Discrimination Analysis- Based Models
B – Nonparametric credit ratings models:

Mathematical Programming

Classification Trees (Recursive Partitioning Algorithms)
Nearest Neighbours Model
Analytical Hierachy Process
Expert Systems
Artificial Neural Networks
Evaluating the validity of a company is a complex process that requires the analysis of financial and economic indicators such as:

1. Income and cost structure indicators
2. Business performance indicators
3. Business profitability indicators
4. Payment of debts indicators
5. Supplementary indicators (lever)
6. Credit ratings has both financial and non-financial aspects. However, this study is limited to evaluate the financial performance of bank Customers.(Pourdarab,etal.,2011)
7. Potential benefits of credit ratings
8. Reducing Costs
9. Systematic evaluation systems such as credit rating reduce the role of human (impact of human error) in the evaluation and thus potentially reduce the risk and cost of granting credit.

10. More accurate prediction

11. Along with improved rating systems, these systems will be more effective in predicting the actual performance of loans

12. Better products and marketing

13. Due to the shorter process of granting loans, customers will attract and the demand for credit will be increased.

14. General benefits of the rating system for banks and their customers can be summarized as follows:

15. For customers

16. Easier borrowing process

17. Response in a shorter time

18. Reduction of required information

19. Faster and easier access to credit when customers need it.

20. For banks

21. Reduction of loan assessment costs

22. Standard granting of loans in all banks

23. Increasing of loan granting efficiency allow the banks to carry out the loan granting process with more efficiency-due to the repeatability

24. Disadvantages of the system

25. Lower availability and attention to some aspects of lending

26. Applicants of loans with limited credit histories may be unable to obtain loans

27. Level of privacy

28. Rating systems with the customer database may increase the likelihood of violence to customer information

29. Lack of flexibility

30. Due to the use of past data and the lack of such historical changes, rating systems are not flexible enough in dealing with future shocks and structural changes

31. The results of a study showed that almost 20 percent of individuals who was granted based on traditional methods were granted in the credit rating methods,too.While, 20 percent of other individuals who was not granted based on traditional methods were granted in the credit rating methods.

Methodology

The present study is a fundamental research; because it aimed to explain the relationship between consumer credit and credit risk and add to the collective knowledge in this area. The study is a descriptive study; and Since the researcher wants to observe special aspects and interpret all aspects from holistic perspective , it is a case study. The population was consisted of credit experts of Tejarat bank who were the member of bank's credit Committee and had the right to vote for facilities approval and the individuals who their main task was providing reports for granting facilities and monitoring the use of facilities (N=25). 25 questionnaires were sent to reflect the opinions of the individuals; 19 cases completed the questionnaires. The demographic characteristic of questionnaires were analyzed using descriptive statistics including frequency tables, percentages and drawing diagrams.

After encoding the questionnaires and computing the descriptive indicators, Shapiro test and the Kolmogorov - Smirnov test (for ensuring the accuracy of the results) and T-test -using SPSS software- was used for statistical hypothesis testing and generalization of the results to the research community.

Findings

Prioritizng companies or institutions from the lowest risk

Priority order (from lowest risk)	Average (Score from 1-5)	total score (Score from 1-95)
1. Public stock	1.95	37
2. Joint Stock	2.37	45
3. Partnership	2.63	50
4. Cooperative	3.11	59
5. Limited liability	4.32	82

The minimum score for acceptance of any of the facilities

The applicant's personality and credit competency	7<=x<10	Excellent
	5<=x<7	Good
	0<=x<5	Average
	-5<=x<0	Bad
	-10<=x<-5	Very bad
Economic analysis (descriptive or qualitative study of activity)	6<=x<12	Excellent
	4<=x<6	Good
	0<=x<4	Average
	-6<=x<0	Bad
	-12<=x<-6	Very bad
Technical and operational analysis of activity (business activities)	10<x<14	Excellent
	5<x<10	Good
	0<x<5	Average
	-7<x<0	Bad
	-14<x<-7	Very bad
Technical and operational analysis of activity (production activities)	12<=x<20	Excellent
	7<=x<12	Good

	0<=x<7	Average
	-10<=x<0	Bad
	-20<=x<-10	Very bad
Technical and operational analysis of activity (service activities)	7<=x<14	Excellent
	5<=x<7	Good
	0<=x<5	Average
	-7<=x<0	Bad
	-14<=x<-7	Very bad

Row	Applicant's personality and credit competency	An economic analysis (descriptive or qualitative analysis of activity)	Technical and operational analysis of activity (business activities)	production activities	service activities	Acceptance or rejection
1	Excellent	Excellent	Excellent	Very bad	Very bad	Accept
2	Excellent	Good	Excellent	Very bad	Very bad	Accept
3	Good	Excellent	Very bad	Good	Very bad	Accept
4	Excellent	Good	Good	Very bad	Very bad	Accept
5	Excellent	Good	Very bad	Very bad	Good	Accept
6	Very bad	Very bad	Very bad	Very bad	Very bad	Reject
7	Very bad	Bad	Bad	Bad	Bad	Reject
8	Very bad	Very bad	Average	Bad	Bad	Reject
9	Very bad	Very bad	Bad	Average	Bad	Reject
10	Very bad	Very bad	Bad	Bad	Average	Reject
11	Average	Very bad	Bad	Bad	Bad	Reject
12	Very bad	Average	Bad	Bad	Bad	Reject
13	Average	Very bad	Bad	Bad	Average	Reject
14	Average	Very bad	Bad	Average	Bad	Reject

15	Average	Very bad	Average	Bad	Bad	Reject
16	Average	Very bad	Average	Very bad	Very bad	Reject
17	Average	Very bad	Very bad	Average	Very bad	Reject
18	Average	Very bad	Very bad	Very bad	Average	Reject
19	Very bad	Average	Very bad	Very bad	Average	Reject
20	Very bad	Average	Very bad	Average	Very bad	Reject
21	Very bad	Average	Average	Very bad	Very bad	Reject
22	Bad	Average	Average	Bad	Bad	Reject
23	Bad	Average	Bad	Average	Bad	Reject
24	Bad	Average	Bad	Bad	Average	Reject
25	Average	Average	Bad	Bad	Average	Average
26	Average	Average	Bad	Average	Bad	Average
27	Average	Average	Average	Bad	Bad	Average
28	Average	Average	Good	Bad	Bad	Average
29	Average	Average	Bad	Good	Bad	Average
30	Average	Average	Bad	Bad	Good	Average
31	Good	Average	Bad	Bad	Average	Average
32	Good	Average	Bad	Average	Bad	Average
33	Good	Average	Average	Bad	Bad	Average
34	Average	Good	Average	Bad	Bad	Average
35	Average	Good	Bad	Average	Bad	Average
36	Average	Good	Bad	Bad	Average	Average
37	Good	Good	Bad	Bad	Average	Average
38	Good	Good	Bad	Average	Bad	Average
39	Good	Good	Average	Bad	Bad	Average

40	Good	Good	Good	Bad	Bad	Accept
41	Good	Good	Bad	Good	Bad	Accept
42	Good	Good	Bad	Bad	Good	Accept
43	Excellent	Good	Bad	Bad	Good	Accept
44	Excellent	Good	Bad	Good	Bad	Accept
45	Excellent	Good	Good	Bad	Bad	Accept
46	Good	Excellent	Good	Bad	Bad	Accept
47	Good	Excellent	Bad	Good	Bad	Accept
48	Good	Excellent	Bad	Bad	Good	Accept
49	Excellent	Excellent	Bad	Bad	Good	Accept
50	Excellent	Excellent	Bad	Good	Bad	Accept
51	Excellent	Excellent	Good	Bad	Bad	Accept
52	Excellent	Excellent	Excellent	Bad	Bad	Accept
53	Excellent	Excellent	Bad	Excellent	Bad	Accept
54	Excellent	Excellent	Bad	Bad	Excellent	Accept

Conclusions

In granting the facilities, identifing problems and constraints is very necessary and important. In the case of an active economy, current status and future activities and status in the market place will be predictable with economic studies and surveys. In economic investigations, with regard to the activity of customer, the scope and context of the investigations will be different. Based on the information reported by credit agencies, banks and credit card companies, credit rating primarily assesses the loan potential risk to minimize the risk of not refunding the loan. Lenders can use credit ratings in order to determine who is eligible to what sources of loan and to what interest rate. In the general perspective, the credit ratings of previous customers -both loyal and defaulting customers-is used to find the relationship between credit ratings and the set of evaluation criteria.

By inputs such as customer records, including audited financial statements, balance sheet, etc, credit rating measures all customers have different activities by different types of tests. These tests examine three basic categories: economic evaluation, human resource evaluation, and technical and operational evaluation. By these evaluations, in practice, the activity type and

executive power of economic unit that is applicant for facilities get clear; and their strengths and weaknesses get recognized.

Economic evaluation investigate the status of economic unit that is applicant for facilities at the regional, national or international level from the perspective of supply and demand of products or services. Determining how much capital of a firm should provide through equity and how much provide through long-term loans and long-term bank facilities is one of the main issues that will affect the success or failure of institutions. Finally, the risk situation of granting facilities to the customer is determined using the input data and the scores on each stage.

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