Decision Support System for Credit Risk Management: An Empirical Study

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ABSTRACT
Risk is an integrated part of the banking functions, which cannot be eliminated completely but it can be reduced by employing appropriate techniques. Credit processing is one of the core functions in the banking system, and its performance is closely related to management of the risks. The aim of this article is to develop a credit scorecard model which can be used as decision support system. A logistic regression with stepwise selection method is used to estimate the model parameters. The data that is used to construct the credit scorecard model is obtained from one of the pioneering banks in Turkish Banking Sector. The performance of the developed model is tested using statistical metrics including Receiver Operator Characteristic (ROC) curve and Gini statistics. The result reveals that the model performs well and it can be used as a decision support system for managing the credit risk by managers of the banks.

KEYWORDS
Credit Risk, Credit Scorecard Model, Gini Coefficient, Logistic Regression, ROC Curve

1. INTRODUCTION
Banks, as the most important elements of the finance sector, face many risks as part of the nature of the activities they do. In the economic cycle, banks take on the function of bringing together those who are in need and those who have fund savings.

In order for banks to be able to survive in today’s increasingly competitive financial system, they have to measure and manage their credit risk. Credit risk is defined by Banking Regulation and Supervision Agency of Turkey (BDDK) as: “...the potential that a bank borrower or counterparty will fail to meet in a correct manner depends on forecasting the potential risks and taking necessary actions in order to prevent risk occurrence...” Credit allocation process, in which credit applications are evaluated, is one of the most critical and core processes of the banks. This crucial process involves the stages of collecting the credit factors that are used in assessing credit applications, from the sources

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such as credit application forms, central bank data, credit bureau data, and the core internal data of bank, analyzing these collected credit factors, and giving final credit decision.

In traditional approach of evaluating credit applications, banks grant or reject the applications coming from commercial or retail customers in accordance with the credit allocation specialist’s opinions which are usually subjective. Another approach used in evaluating loan applications is the ‘credit scoring method’ or more commonly known as ‘Scorecard’. Scorecards are used to predict how likely an applicant is to repay the loan he/she has applied for and to answer the question of whether the loan will default or not in any specific time. A scorecard is developed by classifying the application as good or bad in terms of credit risk based on past statistical experience. Past credit applications are analyzed in order to define the characteristics that have significant effects on discrimination of good and bad applications in terms of credit risk (Anderson, 2007). The advantages of using scorecards in the process of credit allocation process can be summarized as: better decisions, more quickly and more cheaply, more consistent credit decisions, quantifiable risk management, and lower transaction costs.

The goal of this study is to develop a credit scorecard model, for the commercial customers of a bank operated in Turkey, based on the past studies in the literature and experiences of the bank with the previous credit decisions. Logistic regression technique is employed to estimate the critical factors of the scorecard model and their weights using the historical credit application data in the system. Once the model is developed, its reliability and validity are tested by using the new data set which is unknown to the model. The remainder of the article is structured as follows: Section 2 provides a background on credit scoring, section 3, methodology part, gives a brief outline of logistic regression, model development and the analytic results of credit scoring model using logistic regression. Finally, section 4 addresses implications and conclusions drawn from the study and discusses possible future studies.

2. LITERATURE REVIEW

Quality of bank’s loan portfolio is closely associated with the competitiveness and profitability of the bank. Quality of bank loan increases as the number of customers having high creditworthiness. Credit scoring is the most important decision support system which is utilized in evaluating the creditworthiness of the applicant. Therefore, it is possible to define the credit scoring as the process of modeling the creditworthiness of an applicant (Crook, Edelman and Thomas, 2007).

There are different definitions for credit scoring in the literature. In Anderson (2007), it is defined as the transformation of relevant credit factors into numeric measures by using statistical methods to be utilized as a guide in giving credit decision. In Malhotra & Malhotra (2003), it is described as an analytical model having constructed empirically based on past applications data used to predict credit-worthiness of applicant by utilization of probability of default.

In the 1930s, some mail-order companies started to use a scoring system in order to be able to reduce the inconsistencies among the credit analysts. Companies operating in the finance sector encountered difficulties in managing credit risk because of the compulsory military service obligation for credit analysts during World War II. As a result, there was a lack of credit risk experts. Hence, companies wanted the analysts to write down the rules that they used in credit granting decisions. These rules were used by non-experts in order to help companies in their credit decision systems which then leaded expert systems (Thomas, Edelman & Crook, 2002).

The academic literature on credit scoring goes back to the 1940s when Durand published the results of his works to find credit factors that have a significant influence on the classification of credit applications into good and bad classes, which was based on the idea of “…same characteristics could be used in separation of the groups within the same group…” Durand (1941).

Altman (1968) used a discriminate analysis method by using the data of the companies operating in the manufacturing sector in the USA. In his study, he developed a classification model that had an overall accuracy rate to predict the firm’s failure. The situation that banks are providing a wide range
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