

Predicting business failures using the rough set theory approach: The case of the Turkish banks

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Abstract—Predicting business failures before they actually take place is very important in order to be able to take necessary preventative measures. Such predictions are especially important in the banking sector that plays a key role in any economy. This paper focused on the Turkish banking sector, and after reviewing a number of quantitative tools, selected to apply the Rough Set Theory (RST) approach to analyze the failures of banks during the 1995-2007 period. The data for the financial ratio analysis for the 41 banks investigated from the publicly available sources. The results showed that early warning systems based on statistical models can effectively be used to predict bank failures. In this study, low capital ratios were found to be important variables in discriminating between failed and successful banks in Turkey. Also low and medium assets quality and profitability ratios were the leading indicators in predicting potential failures. The overall results showed that RST model is a promising alternative to the conventional methods for failure prediction.

Keywords—Bank failure, financial ratios, prediction, rough set theory.

I. INTRODUCTION

The banking sector, because it plays a key role in any economy, is highly regulated. Such control is especially important in transition economies since the banking infrastructure and the needed legal framework is not well established yet. Thus, mismanagement of financial and human resources and sometimes corruption lead to bank failures leading to economic crisis. Examples of such bank failures include: Chile, Argentina, and Mexico (1980s); Thailand, Malaysia, Korea, Philippines, and Indonesia (1997); Russia (1998); and Turkey (1994, 2000, and 2001). Key reasons for the collapse of a particular bank include poor banking practices, insufficient revenue diversification, inadequate capital, inability to assess credit risk, and lending to connected enterprises. The resulting nonperforming loans

typically lead to crises that require government intervention. This might take in the form of creating new regulatory agencies and/or new laws. In some cases, public money is injected into the failing as a short-term solution. In other cases, the failing banks are liquidated and closed, merged with other banks or sold to other domestic or foreign banks.

The main goal of government regulatory agencies is to create a safe banking system that the investors could trust. Therefore, they are very much interested in establishing an “early warning system” that they can use to predict potential bank failures and prevent bankruptcies. Such models could use publicly available data and hence minimize the need for on-site examinations. Such analysis has a long history dating back to 1960s. For example, one of the early researchers on this topic, Altman proposed that firms with certain financial structures have a higher probability of failure within the next period than firms with opposite characteristics [1]. He used multivariate discriminant analysis to predict failing banks using five key financial ratios. Many other predictions techniques were introduced and tested with real data in later years.

The Rough Set Theory (RST) was introduced by Pawlak as one of those techniques that can be used in determining potential success/failure of a particular business [2]. The main objective of this study is to apply this theory to the Turkish banking sector for the 1995-2007 period to find out whether many of those bank failures could have been predicted using the publicly available financial data for these banks. Thirty six key ratios were used for the analysis.

This paper is organized as follows: Section 2 will be devoted to a literature review on bank failure models. Section 3 will provide a brief overview of RST. In section 4, an overview of the Turkish banking industry with special reference to reasons for the failure of certain firms and current regulatory system will be provided. Section 5 will introduce the methodology used and Section 6 will be devoted to the discussion of the empirical findings. The paper will be completed with a discussion of the conclusions and suggestions for further research.

II. LITERATURE REVIEW: BANK FAILURE PREDICTION MODELS

Academic researchers have devoted a great deal of time and effort in bank failure prediction models since late 1960s. Most of the earlier models were built using classical statistical techniques, such as multivariate discriminant analysis [3],

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