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Failure Prediction of Chinese A-Share Listed Companies

--Comparisons Using Logistic Regression Model and Neural Network Analysis

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Abstract

This study compares the relative prediction accuracy of corporate failure between two prediction methods –logistic regression model and neural network analysis– based on a sample of 3598 observations and companies data obtained from the Chinese A-Share market during the period 1991 to 2002. Seven criteria have been set up to define failure according to attributes of Chinese listed companies. Using forty financial ratios and seven misclassification cost ratios of Type I and Type II error, two models achieve ranges of minimal misclassification cost at optimal cut-off points for two years prior to business failure; The logistic regression model is slightly superior to neural network analysis. Compared with random prediction, both models are efficient. In addition, the study points out that Total Asset Turnover (TATR), Cash Ratio (CASR), Earning per Share (EPS), Total Debt to Total Asset (TDTA), Return on Assets (ROA) and the natual log of Total Market Value (MVLN) could be significant financial indictors of corporate failure. Results of the study have important implications in credit evaluation, internal risk control and capital market investment guidelines.

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1. Introduction

The development of the Chinese stock market has made great gains since 1990s. At the end of December 2003, in the ShangHai and ShengZhen stock exchanges together, there were more than 1200 listed companies and the total market value reached RMB 4246 billion. However, as the number of listed companies is increasing, the quality is declining. Many Chinese investors blamed the phenomenon on the increasing number of loss-making firms and the declining overall performance of the market. Until November 2004, there were more than 140 listed companies that had been classified S.T. (special treatment), among them 15 companies were suspended trading and 14 companies had been delisted from ShangHai and ShengZhen Stock Exchanges.

Therefore, there is a growing demand to develop a procedure to give early warning of financial distress, and the analysis of corporate failure in China becomes more crucial and necessary. Corporate failure prediction has been a subject of study for 70 years worldwide. Accurate prediction of corporate failure is important to investors, creditors and auditors. It can help shareholders, creditors and governments to avoid heavy losses stemming from surprise bankruptcies; and using analytic tools and data from corporate financial reports, future financial performance can be evaluated and predicted.

Studies of failure prediction in China are still in the early stage; Shi and Zou (2001) studied the credit problems of Chinese A-share part list companies during 1999-2000 by means of canonical discriminate analysis. Li (2001) classified list companies by distinguishing function by using data from the Shanghai and Shenzhen Stock Exchange covering the period of 1997-1999. Most of these studies used discriminant analysis, but Zhang (2003) indicated that the Logistic Regression Model and Neural Network Analysis might be good choice for the Chinese market in predicting the corporate failure.

The major purpose of this paper is to compare the accuracy of Logistic Regression Model and Neural Network Analysis in predicting corporate failure. It is hoped to answer the following questions:

(1) Which method is better to predict the failure of Chinese listed companies?

(2) Which factors explain the corporate failure in China?

Compared with previous studies, this study is distinctive in that we set seven classify criteria to identify firms as failed or non-failed; the failed firms consist in the earlier phases of financial distress while the ultimate condition of either de-listing or bankruptcy is not known at the time of selecting. Hence, the failure predication derived from this study intends to develop an early warning system to help management to recognise the ailing of the firm, enable appropriate action to improve efficiency, and avoid the risk of de-listing or bankruptcy. Knowledge of the likelihood of failure would also assist investors in setting risk premiums and advocate a rational investment.

The preliminary results of this study indicate that both methodologies yield reasonable predictive accuracy across the range of cost ratios, with the logistic regression model performing slightly better than the neural network analysis. Compared with random prediction, both models are efficient. Additionally, the selected financial ratios indicate that firms with low operating efficiency, low cash flow, low profitability, high financial leverage and declining market value could have a high probability of failure.

The organization of this study is as follows: Section 2 reviews literature on business failure and prediction technique. Section 3 describes the data and methodology; section 4 presents and discusses the results. Conclusions and further research are formulated in section 5.