

The Creation Of Bankruptcy Prediction Model Using Springate and SAF Models

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Abstract. Regarding the recent bankruptcy of international big companies and prosperity of the stock exchanges in Iran, it seems that having some instruments for assessing financial power and status of companies is necessary. For this purpose, the researcher has examined and compared the ability of “Springate and SAF” expanded models using the ratios of cash flow notes. In this manner, the research includes 3 hypotheses. For classifying and ranking companies, we used the “Article 141” of business law to determine the bankrupt companies, as well as simple Q-Tobin to specify the solvent companies. We used statistical method of “Enter Logistic” to test the first and second hypothesis, and expressiveness test of divergence between two correlation coefficients, to examine the third hypothesis. Their expanded models are able to predict the bankruptcy or activity stop of approved companies in stock exchanges. We can’t refute the first and second hypothesis (one or two years before activity stop), but the third hypothesis is refuted.

Keywords: Bankruptcy Prediction Model, Financial Ratio, Springate Model, Saf Model, Logistic Regression

1. Introduction

From the late 1960s, available general financial information and data reports were tested for predicting bankruptcy in an active and effective way. This issue shows the importance of the subject to many economic agents in a dramatic way. Suppliers and financial institutions need to shape and develop their opinions and comments about a customer’s credit worthiness [11]. The purpose of this study is to test the ability of two patterns, Springat and SAF, and two developed patterns based on the original patterns using the cash flow ratios to predict occurrence of financial crisis and specially suspension of the activity of the approved companies in Tehran’s Stock Exchange. A famous scientist called Springat is one of the experts in this field has managed to design a model to predict bankruptcy [12]. Accordingly Springate’s developed model can increase the power of decision for investors and suppliers of financial resources to sustain financial markets (Security Exchange) for insuring the allocation of optimal financial resource. Also another model, SAF, has been developed by Cindy Yashika from university of Nihon in 2003 that has been widely known as one of the models for prediction bankruptcy in Japan. [4]

2. Theoretical Frameworks, Background Research and Hypotheses

Bankruptcy is a situation when a company or a natural person's financial positions low and weak. To the extent that in practice and legal way they are unable to pay their debts and fulfill their obligations. In 1968Altman used legal aspects of his studies to describe bankruptcy. Biverin 1966, Damphousse and Zapondis in 2000, and Tampson in 2000 defined bankruptcy from creditors’ point view [9]. They expressed that bankrupt companies are those companies that are unable to do their debt obligations to their creditors. Bankruptcy of a company is not only legal aspect; it is a situation of financial press and dilemma in its prior period.

In this research, there 3 hypotheses [10]:

First Hypothesis:

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Springates' expanded model has the ability to predict the cessation of activity in approved companies of the Tehran Stock Exchange.

Second Hypothesis:

SAFs' expanded model has the ability to predict the cessation of activity in approved companies of the Tehran Stock Exchange.

Third hypothesis:

There is a meaningful difference between Springates' expanded model and SAFs expanded model, in predicting the cessation of activity of companies.

3. Research Variables

Variables of Springate model:

$$Z = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4$$

$Z=0$ value if the activity stops and $Z=1$ value If the activity continues. X_1 = Working capital divided by total assets. X_2 = Earning before income and taxes (EBIT) divided by total assets. X_3 = Earning before income and taxes (EBIT) divided by Current liabilities. X_4 =Sales divided by total assets.

Variables of SAF's model:

$$Z = B_0 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8$$

X_5 = Retained earnings divided to total assets. X_6 =Inventory turnover During a financial period. X_7 = interest costs divided to sales. X_8 = Earnings before taxes (EBT) divided to total assets.

Variables of Springate expanded model:

$$Z = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_9X_9 + B_{10}X_{10} + B_{11}X_{11} + B_{12}X_{12} + B_{13}X_{13} + B_{14}X_{14}$$

X_9 = The cash received from customers divided by total sales. X_{10} =Net operating cash flows divided by average total assets. X_{11} = Net operating cash flows divided by Equity. X_{12} = Net operating cash flows divided by operating profit. X_{13} = Net operating cash flows divided by total liabilities. X_{14} = Net operating cash flows divided by cost of financial.

Variables of Springate expanded model:

$$Z = B_0 + B_5X_5 + B_6X_6 + B_7X_7 + B_8X_8 + B_9X_9 + B_{10}X_{10} + B_{11}X_{11} + B_{12}X_{12} + B_{13}X_{13} + B_{14}X_{14}$$

These model variables involve the second and third pattern variables.

4. Data

In this study, the companies make up the statistical communities who have presented their financial statements to Tehran Stock Exchange between 2001 and 2009. The research's samples are divided into two types [5].

Yields 60 firm-years over the period 2003-2011. This is the full sample that we use for testing research hypotheses. The research's samples are divided into two types.

The first group: This includes successful and going-concern companies with a sample of 30 companies. The main criterion for selection of these companies is the use of simple Tobin's Q index [1]

The second group: This includes unsuccessful and without going-concern companies with a sample of 30 companies. The main criterion for selecting companies for this group is Iran's Commercial Law Article 141. According to this unit of reform act of Iranian law, If a company's accumulated losses become more than half of the capital, the company must reduce its capital or to stop its activities.

5. Statistical Methods Used for Data Analysis

To separate the companies into two groups of successful and unsuccessful, Binary Logistic Analysis statistical method and Spss 15 software are used [2].

To separate the companies into two groups of successful and unsuccessful, Binary Logistic Analysis statistical method and Spss 15 software are used. To test the hypotheses for the second group that is the comparing ability of the modified models we use significance test of difference between two correlation coefficient [3].

6. Test Results of the Hypothesis

First hypothesis:

Relative effective variable of one year before activation stop that can explain prediction of companies activation stop are X_9 , X_{12} , X_{13} and X_{14} .

Springate's adjusted pattern based on the test that was done for one year before activation stop based on Relative effective variable are as following:

$$Y = \frac{e^{-4/279 x_9 - 0/632 x_{12}}}{1 + e^{-4/279 x_9 - 0/632 x_{12}}}$$

Table 1 has presented ability and accuracy of Springate's adjusted pattern according to the information that is one year before the activation stop.

Table 1

Types Of Companies	Predicted model				The overall accuracy	
	unsuccessful		successful		number	percentage
	number	percentage	number	percentage		
unsuccessful	26	93	4	13	30	93
successful	2	7	28	87	30	87
total	28	100	32	100	60	90

Relative effective variable of two year before activation stop that can explain the prediction of companies activation stop is X_3 .

Springate's adjusted pattern based on the test that was done for two years before activation stop based on Relative effective variable are as following:

$$Y = \frac{e^{8/031x_3}}{1 + e^{8/031x_3}}$$

Since variables of X_3 , X_9 and X_{12} in Springate's adjusted pattern has the test statistic of Errorless than 10%, As a result H_0 hypothesis is rejected and research hypothesis is accepted in 90% confidence level.

Second hypothesis:

There is no relative effective variable of one year before activation stop that can explain prediction of companies activation stop in an acceptable way.

Table 2 has presented ability and accuracy of SAF's adjusted pattern according to the information that is one year before the activation stop.

Table 2

Types Of Companies	Predicted model				The overall accuracy	
	unsuccessful		successful		number	percentage
	number	percentage	number	percentage		
unsuccessful	25	92	5	18	30	92
successful	2	8	28	82	30	85
total	27	100	33	100	60	88.5

Relative effective variable of two year before activation stop that can explain the prediction of companies' activation stop in an acceptable way is X_8 .

SAF's adjusted pattern based on the test that was done for two years before activation stop based on Relative effective variable are as following:

$$Y = \frac{e^{22/88 x_8}}{1 + e^{22/88 x_8}}$$

Since variable of X_8 SAF's adjusted pattern has the test statistic of Errorless than 10%, As a result H_0 hypothesis is rejected and research hypothesis is accepted in 90% confidence level.

Test results of third hypothesis:

For testing third hypothesis, at first we should calculate Z_{ri} . Table 5 represents the results of calculations.

Table 3

Description	Pattern	R^2	R	Z_{ri}
Springate's adjusted pattern	One year before activation stop	0.827	0.909	1.521
	Two years before activation stop	0.458	0.676	0.821
SAF's adjusted pattern	One year before activation stop	0.820	0.905	1.499
	Two years before activation stop	0.688	0.829	1.184

The results of testing the third hypothesis are as following:

Table 4

hypothesis	Two years before activation stop		Result of test	One year before activation stop		Result of test
	Calculated Z	Chart Z In 90% confidence level		Calculated Z	Chart Z In 90% confidence level	
Third hypothesis	0.08	1.645	H_0 hypothesis is not rejected	1.333	1.645	H_0 hypothesis is not rejected

Survey of validity of the modified models:

According to the presented results and forecast accuracy of research models, we can use the models for forecasting up to two years before the activation stop.

Table5

Model	One year before activation stop	Two years before activation stop
Springate's developed pattern	90	82
Saf's developed pattern	88.5	79

7. Conclusion

This article has investigated the bankruptcy models. We studied the Springate and SAF models using logistic regression method. The results show that the created models are able to predict the bankruptcy. Findings show that two model can predict bankruptcy but not all of its variables. Our Suggests for future research are:

- Developing financial crisis predicted models using macro or micro-economic indicators in this field. (Such as inflation, tax rate and)
- Providing a new model using only cash flow ratios, considering the economic situation in Iran

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