The checking of Hazard models Comparison with the traditional view of bankruptcy prediction in the Tehran Stock Exchange with using ROC curves and table

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ABSTRACT

The present study examines the risk model comparison, the conventional wisdom predicting bankruptcy, the Tehran Stock Exchange, with the curve and the ROC, is paid. In this study, the performance model risk, in the face of conventional wisdom predicting bankruptcy, with a comprehensive exam, and using a full database of companies listed on the main Tehran Stock Exchange between 2011 to 2014, with curve and the ROC, we tested. In this study, risk models are of two types. 1. The risk model based on accounting information, and (2) risk model based on market information. And traditional bankruptcy prediction models, as well as two types, 1. Z concession model, only the use of accounting information, and (2) provided that the claim based model, in equity, as an option to decide on assets looks. The population of this research, companies listed on the Tehran Stock Exchange. The population of this study, which is now number 342, 95 of them are bankrupt and the sample number, company number is 246, 67 of them are bankrupt. In this study, the software brings new 3, Excel and SPSS (spss) is used. The individual results of each test curve ROC (receiver operating characteristics), and the ROC suggests that the ability to predict bankruptcy risk models better than the traditional approach.

Introduction

The rapid growth and increasing science and technology, in the present age, the complexity of human relations, especially economic and trade relations, has been sent. The progress of science and technology, economy and trade, turned into a new phase, so that small business firms and last, become public companies, and even multinationals around the world has been. This transformation of economy and trade, has caused the one hand, small firms out of the race, and the other big companies that can compete with other companies in your industry are not, the problem is to stop activity or financial crisis, and eventually face bankruptcy. On the other hand the competition cycle, the more your extended operating companies (in terms of number of shareholders, expanding the size and scope) was the gap between the suppliers of funds (shareholders, investors, creditors and lenders), and corporate management in terms of control and direct oversight, the company has more.

Research models, including traditional forecasting models, and models predict the risk is that risk models including two models, traditional models are two models, a total of 4 models bankruptcy prediction, this study investigated Compare placed: it should be noted, different risk models, based on accounting data and the market, they are independent variables.

The aim of this study was to identify the best bankruptcy prediction model applied in Iran. Considering that the aim of this study was to compare the predictive power of each of the above are 4 models to compare their performance, the following methods are used:

Statement of the problem

Currently, businesses in highly variable and competitive work environment. Rapid response and correct the changing market conditions, firm position plays an important role. Management Board, on all aspects of business, such as production, marketing and sales activities and support services, such as training and information processing is involved. To carry out this responsibility, the majority of firms are widely used information and financial reports. Financial statements, the main product of financial reporting, and the main tool of accounting information to people outside the organization. Financial reporting should provide information about economic resources, obligations and provide equity capital. This information helps managers, investors, creditors and other related parties, identify strengths and weaknesses in the context of the entity's financial, liquidity measure, to pay the Debts and evaluate the performance of the entity during the period helps. Financial ratios, an assessment tool by investors and business unit management tool, to assess the current status, as well as forecast future commercial units.

Or the financial index, a measure to assess the financial condition and performance of a company is used, the analysis and interpretation of various financial ratios by qualified and experienced analysts, useful information can be obtained from the company's financial position , if this information can not be directly extracted from financial statements.

Analytical models

The following people work achieved	Equation of Model	Type Of each model	Research models
Chava and Jarrow (2004 (and Campbell et al. (2008(and Shumway (2001) we use.	$P_{i,t} = \dfrac{1}{1 + e^{-\alpha_t - \beta X_{i,t}}}$	A) risk model, based on accounting information.	Hazard models
Chava and Jarrow (2004(and Campbell et al. (2008) and Shumway (2001) we use.	$P_{i,t} = \dfrac{1}{1 + e^{-\alpha_t - \beta X_{i,t}}}$	B) risk model, based on market information.	
Agarwal and Toffler (2007)	$Z = 3.3 + 12.18X_1 + 2.5X_2 + 1.6X_3 + 0.69X_4$	A) z scores model	The traditional model
That Merton framework, (1974) and Black and Scholes(1973) runs. And Bharathand Shumway,(2008)it will be expressed as follows.	$P_{nive} = N(-DD_{nive}) = N\left(-\dfrac{\ln\left(\frac{E+D}{D}\right) + \left(r_{i,t-1} - .5\sigma_{A,nive}^2\right)T}{\sigma_{A,naive}\sqrt{T}} \right)$	B) contingent claims	

In recent years, financial analysts have concluded that a set of financial ratios, can be used to predict the continuation of the company's financial activities, used, and with the help of the model, to predict certain events in the future pay (Kadkhodaie, 2003, p. 25) 1. Bankruptcy prediction models, is actually a combination of financial ratios that, by analysts with experience, over many years, in various parts of the world, tested, and have been introduced to the world of science and knowledge. Springate, Zmijewski's and Ehelson, using scientific methods, to create a successful bankruptcy prediction models, to design models in this context that, in their name known. In recent years, the use of risk models, using accounting and market information, has become an art in predicting bankruptcy.

Table 1. Studies, in relation to bankruptcy.

Description	Year	Author or Authors
-Introduction of basic standard option pricing in Europe, to calculate the default probability of the company. -Solving nonlinear equations necessary for the valuation of options (output: volatility of the company, the company's value, default probability.(-The exercise price of the model is equivalent to the nominal value of corporate debt. -1 -year default probability it provides. -Shares a function of the value of the company and time. -Volatility of the company, according to the company's stock volatility (the result of Ito's lemma.(-Option value visible function of four variables (risk-free rate, time to maturity, the price of the underlying asset and the exercise price), and another variable (volatility) that must be estimated.	1973&1974	Black & Shultz-Merton
- The initial value for the volatility consider: $\sigma_A = \dfrac{\sigma_E V_E}{V_E + B}$ - Using historical data log of daily returns on assets, volatility estimate the company. - The system of simultaneous equations Black- Sholtz- Merton, use.	2004	Vassallo and xing
- Expansion of the Merton model, the hazard model (Hazard Model), is known. - Solving nonlinear equations Black- Sholtz- Merton, instead of the r-D of µ (percentage change in the company's value over two consecutive terms), to calculate expected returns are used. - The name of approach, HKCL is.	2004	Hyljist et al.
- Expansion KMV- Merton model, without solving simultaneous equations. - Estimate the volatility of the debt using the linear relationship, with the company's stock volatility. - Company volatility calculated using the weighted average volatility of stock and debt - BhSh approach is called.	2004	Bars and Shamo
- Using risk models, Merton default probability model, with other variables related to the prediction of default, were combined. - Concluded that the possibilities Merton model, a relatively small share of power projection.	2008	Campbell et al.
- The standard distance Merton default, worked. - The simultaneous equations to estimate default probability, did not use. - Approach Naive, for Merton model developed. - Naive approach your statistical and economic importance of the criteria looked at Merton DD. - Basic model default probability BSM, a good test is to predict default. - Use of Function Points Z which, implicitly Merton model in their Naive approach, is obtained, the ability to predict increases.	2008	Bars and Shamo
- Compare predictive ability HKCL approaches and BhSh, with a rating of Z in the UK. - Mapping the points Z, the probability of default probability of bankruptcy compared with HKCL and BhSh, (very little difference in precision projection).	2008	Agarwal and Toffler
- A model for redefining the border with optimal default, provided KMV-Merton approach. - Borderless approach defaulting KMV-Merton (the equivalent of short-term debt, plus half of long-term debt was), challenged. - It was his his idea, border optimal default, the exercise price, the option pricing model, should one country to another and vary from industry to industry. - He is your model, GA-KMV called, and to estimate the optimal coefficients default border (coefficients of long-term debt and short term debt) payments.	2011	Lee
- Sensitivity analysis on parameters option pricing model (border of default, the expected return on assets, and the volatility value). - Accuracy of the model has little dependence on the brink of default (coefficient of long-term debt), does more to volatility assets, and the expected return depends on the company. - Things to improve the accuracy of the model proposed, such as using historical stock market returns rather than returns.	2012	Efik et al.

There is a vacuum, comprehensive comparison of the performance of risk models, with traditional theory on the basis of accounting, or conditional claims, related literature is felt. With a complete database of companies listed on the Tehran Stock Exchange between 2011 to 2014 and, ROC curve analysis show that, if risk models, are superior to the other alternatives? So at the next table, studies in relation to bankruptcy, is expressed.

Research Hypothesis

1. hazard model, based on accounting data, compared to traditional forecasting models, better performance.

(2) risk model, based on market data than traditional forecasting models, better performance.

Samples:

The population of this research, companies listed on the Tehran Stock Exchange, so that our society is now number 342, 95 of them are bankrupt. In this study, to fit patterns predicted bankruptcy, bankrupt and non-bankrupt companies need to learn two groups there.

Due to lack of access to accurate information financial statements bankrupt companies, and non-bankrupt outside the Tehran Stock Exchange, statistical population, among the listed companies in Tehran Stock Exchange, had been selected. In this study, the sample is taken equal population. Thus, all companies that are members of the population, the following criteria were included in the sample:

1 – year of Corporate Finance, to the end of March.

2 - during the years 2011 to 2014, the financial year and the change is not active.

3 Co-investment and not financial intermediation (Banks - insurance companies - Holding Company)

Financial information, in order to categorize companies into two categories bankrupt and non-bankrupt, the default is to use article 141 of the Commercial Code, under this Article: "If as a result of losses incurred, at least half of the company's capital, eliminate the Board of Directors shall immediately take stock owner, invited to the extraordinary general meeting, subject to liquidation or survival of the company, the passion and the vote will be. "

Thus, if the company in the period from 2011 to 2014, under Article 141 of the Commercial Code, the bankrupt, otherwise non-bankrupt companies. Available required. In this study, the sample was selected in accordance with the above, so our sample is 246 companies, 67 of them are bankrupt. In this study, the software brings new 3, Excel and SPSS (spss) was used

Variables

NITA: the ratio of net income available to common shareholders, the Company's total assets, the book value of the company. TLTA: the ratio of total assets, the book value, minus the company's common stock, the total assets of the company's book value. EXRET: abnormal return equal to the logarithm of the Company, and SIGMA: annual standard deviation of daily returns three months ago. RSIZE: logarithm of the company's stock market value, and NIMTA: the ratio of net income available to common shareholders, the total debt of the company, and the company's stock market value. TLMTA: the ratio of total assets, minus the book value of the company's common stock, the total debt of the company, and the company's stock market value. And CASHMTA: the ratio of cash and cash equivalents, to total corporate debt, and the company's stock market value. BM: the ratio of the book value of common stock, preferred stock minus the market value of common stock. PRICE: equal to the stock price X1: equal

profit before tax, the total debt of the company, and X2: current assets to total debt of the company, and X3: equal to or more than the current debt, the total assets of the company . X4: equal to (quick assets - current liabilities), divided by ((sales - earnings before tax, minus depreciation) divided by 365). E: equal shares. A: The total value of company assets. rf: risk-free rate of return equal. D: the nominal value of all liabilities. N (0): equals the cumulative standard normal distribution (whatever is inside ()), the purpose of research, this study is an applied research, and in terms of data collection and field libraries, because this study deals with aspects of performance bankruptcy prediction models, thus resulting in the acquisition of knowledge, manuals and instructions will be for scientific activities. In terms of the method and nature, this study is correlational.

Analytical framework, and ways of measuring variables.

Research models, including traditional forecasting models and models predict the risk is that risk models including two models, traditional models are two models, a total of 4 models to predict bankruptcy, in the present research Compare placed:

1. hazard model

Risk models, market data and accounting, the company uses to assess the risk of bankruptcy. As a result, risk models (Hazard models) that includes two models which, one is based on accounting information, and the other is based on market information. And the dependent variable models are risks bankruptcy.

Generic risk model, is as follows:

  Model   Number   (1):

=Perhaps bankruptcy i, t is the year that is equal to 1, if the company is bankrupt in 12 months, otherwise the number is considered 0.

Pit dependent variable is a binary form, the continuation or bankruptcy in t + 1. , Following the activities of Chava and Jarrow, (2004), and Campbell et al., (2008), we identified the possibility of bankruptcy, the time t is denoted as Formula 1.

$$P_{i,t} = \frac{1}{1 + e^{-\alpha_t - \beta X_{i,t}}}$$

$X_{i,t}$ =Is a matrix of independent variables, and column vector β is estimated coefficients, and α purpose of this model is to calculate the hazard rate is. We feature in Shumway, (2001), and Campbell et al (2008) we use.

According to the presentation, because we have two types of risk models to calculate each of the models has its own independent variables must be defined, and based on this variable vector x is calculated, and the model number (1) put a.

1-1 first model risk, based on accounting data:

Risk model, based on accounting data, risk models (Hazard models) is that, at the Pit in the form of binary dependent variable, the continuation or bankruptcy in t + 1, by following the activities of Chava and Jarrow, (2004), and Campbell et al., (2008), we identified the possibility of bankruptcy, the time t in the formula (1) are identified.

$X_{i,t}$ =Is a matrix of independent variables, and column vector β is estimated coefficients, and α purpose of this model is to calculate the hazard rate is. We feature in Shumway, (2001), and Campbell et al (2008) we use.

Independent variables of this model are:

NITA: the ratio of net income available to common shareholders, the company's total assets book value of the company

TLTA: the ratio of total assets, minus the book value of the company's common stock, the total assets of the company's book value.

EXRET: abnormal return equal to the logarithm of the Company

SIGMA: annual standard deviation of daily returns three months ago.

RSIZE: logarithm of the company's stock market value

2-1 The second risk model, based on market data:

According to data from market risk models, risk models (Hazard models) is that, at the Pit in the form of binary dependent variable, the continuation or bankruptcy in t + 1, by following the activities of Chava and Jarrow (2004) and Campbell et al., (2008), we identified the possibility of bankruptcy, at time t is denoted as formula 1.

$X_{i,t}$ =Is a matrix of independent variables, and column vector β is estimated coefficients, and α purpose of this model is to calculate the hazard rate is. We feature in Shumway, (2001), and Campbell et al (2008) we use.

Independent variables of this model are:

NIMTA: the ratio of net income available to common shareholders, the total debt of the company and the company's stock market value.

TLMTA: the ratio of total assets, minus the book value of the company's common stock, the total debt of the company, and the company's stock market value.

CASHMTA: the ratio of cash and cash equivalents, the total debt of the company and the company's stock market value.

BM: the ratio of the book value of common stock, preferred stock minus the market value of common stock

PRICE: equal to the stock price

2. – third model with scores model z (one of the approaches bankruptcy prediction forecast):

The model is based on accounting Altman (1968), a characteristic broad, in anticipation of bankruptcy. His model, distinguishing review, to identify which uses a linear combination of financial fitness, the best among the companies go bankrupt and non-bankrupt distinguishes, Toffler (1983) of the cases, similar, for example Great British model Uses. Z-score full version, published as the first model, the Agarwal and Toffler (2007) for (3).

Model No. (3):

$$Z = ٣.٢ + ١٢.١٨X_١ + ٢.٥ \cdot X_٢ + ١٠.٦٨X_٣ + ٠.٠٢٩X_٤$$

X1: equal profit before tax, the total debt of the company

X2: current assets, total liabilities

X3: equal to or more than the current debt, the total assets of the company.

X4: equal to (quick assets - current liabilities), divided by ((sales - earnings before depreciation minus taxes) divided by 365)

- The fourth model, with contingent claims (one of the approaches bankruptcy prediction forecast):

The fourth model, we use a model based on simple conditional demands that the framework Merton (1974) and Black and Scholes, (1973) runs. These models are considered in default, and it's likely bankruptcy, using a condensing function converts volume. Pricing formulas, requires two assumptions: the total value of a company that follows the Brownian activities, and a final debt reduction in the time T is a contract

Model No. (4):

$$P_{nive} = N(-DD_{nive}) = N\left(-\frac{ln\left(\frac{E+D}{D}\right) + (r_{i,t-١} - ٠.٥٠\sigma_{A,nive}^٢)T}{\sigma_{A,naive}\sqrt{T}}\right)$$

$$\sigma_{A,naive} = \frac{E}{E+D}\sigma_E + \frac{E}{E+D}\sigma_D$$

$$E = AN(d_١) - e^{rfT}DN(d_٢)$$

E = equal shares

A = the value of the total assets of the company

rf =equal to the risk-free rate of return

D = the face value of all the debts of the company

N (0) = equals the cumulative standard normal distribution (whatever is inside () is)

$$d_١ = \frac{ln\left(\frac{A}{D}\right) + (r + ٠.٥٠\sigma_A^٢)T}{\sigma_A T}$$

T = equal to the discounted bonds

$$d_٢ = d_١ - \sigma_A\sqrt{T}$$

Evaluation of Model

The aim of this study was to identify the best bankruptcy prediction model applied in Iran, using receiver operating characteristics (ROC) is.

Executive Profile acceptor

ROC is a way for an appropriate assessment of predictive parameters, that is, widely used in the medical field (Hanley and McNeil, 1982) is used, and established a good tool to assess ratings, and credit models bankruptcy prediction is (for example, Sobehart and Keenan model, 2001, Vassalou and Xing, (2004) and Agarwal and Taffler, 2008a). ROC curve method for each year of the sample companies, the possibility that up and down. Let X be an integer between zero and 100. For every integer x, the highest risk companies, by default (x%) is. We calculated the percentage of bankrupt companies. We also have figures for the period were calculated. Project x% of the highest-risk companies, the percentage of insolvent companies ROC curve there. Sobehart and Keenan, (2001) argued that, area under the curve ROC (AVC) indicator of decision-makers, the ability to predict model. Following the Hanley and McNeil (1982), we have AVC, were calculated using Wilcoxon. Hanley and McNeil (1982) showed that, for 11 AVC standard error is presented.

$$se(A) = \sqrt{\frac{A(1-A) + (n_F - 1)(Q_1 - A^2) + (n_{NF} - 1)(Q_1 - A^2)}{n_F n_{NF}}}$$

Formula (11)

Where A is the area under the ROC curve. Nf number of bankrupt companies, and nNF number of non-bankrupt companies. Q1 for A / (2-A) and Q2, for (2A ^ 2) / (1 + A) is defined. Statistics for 12 tests.

Formula (12)

$$z = \frac{A}{se(A)}$$

For comparison of the two models (1 and 2), Hanley and McNeil (1983) formula proposed formula (13)

$$z = \frac{A_1 - A_2}{\sqrt{(se(A_1))^2 + (se(A_2))^2 - 2rse(A_1)se(A_2)}}$$

Engelmann et al., (2003) in the framework of the ROC curve correctly AR was dense, and showed that the area under the curve ROC, contains the same information is AR. They found that AR, area under the ROC curve is a linear transformation.

Formula (14)

$$AR = 2(A - 0.5)$$

In addition to the ROC, we test content, bankruptcy prediction models used to evaluate the explanatory power. Following the article Hillegeist et al., (2004), we used the following discrete hazard model.

In addition to the ROC, we test content, bankruptcy prediction models used to evaluate the explanatory power. Following the article Hillegeist et al., (2004), we used the following discrete hazard model.

Formula (15)

$$P_{i,t} = \frac{e^{\alpha_t + \beta x_{i,t}}}{1 + e^{\alpha_t + \beta x_{i,t}}}$$

So that Pi, t is equal to, if i go bankrupt in the next 12 months, at the main fault (identified through analysis of one-year default rate), xi, t matrix of independent variables, and B is a column vector of estimated coefficients . To check the content of hazard information, models based on contingent claims and accounting, we opposed the failure of any bankruptcy model, the independent variables we used, xi, t recorded to accompany the model assumptions, we Hillegeist and colleagues (2004) have followed, and the probability of default, the contingent claims and risk models at a scale of Records moved 0.15

Formula (16)

$$score = \ln(\frac{p}{1-p})$$

For all models, we took a typical probability between 100001 and 0/99999.

data analysis

For all models, we took a typical probability between 100001 and 0/99999.

Data Analysis

In order to analyze cross-listed, frequency distribution, descriptive statistics, such as mean, variance, and .... will be used. In this section tries that, using descriptive statistical techniques, we provide the possibility to investigate variables. Summary Table accounting statistics, and market variables for the years 2011- 1394 stock offers. This table shows that bankrupt companies are less profitable. (Less cash) and higher side. (TLMTA, TLTA) higher. The higher BM bankrupt companies

Table 2 variables predicted the bankruptcy of non-financial firms listed in the Tehran Stock Exchange, reports. Variables at the end of March each year, from 2011 to 2014, respectively. The latest accounting information, with at least five-month delay between the end of the fiscal year, and the stock is done. Market data, in the form of shares to be used.

NITA income, that is, to all shareholders (NI), through the registration of the final asset value (TA), is available. NIMTA for NI, debt divided by the value of the final registration, in addition to the normal capital market (MTA) is. CASHMTA cash and cash equivalents compared to the MTA. TLTA, as distinct from the shareholder TA (TL), compared to (TA) is. TLMTA for TL, is divided by the MTA. BM registered shareholder value, minus preferred stock and necessity, than the conventional capital market value (SIZE Million Rials), RSIZE registered regulating capital market value, rather than market value, FTSE All-share index is. PRICE for the share price (in pounds). Additional EXRET was recorded, compared to the FTSE All-share index during the two months prior to the formation of a stock. SIGMA SD, for std.Dev stated. All variables are marked in the 5% level.

Analysis and test hypotheses, using curves and the ROC:

First hypothesis: "risk model based on accounting data, compared to traditional forecasting models, better performance.".

Statistical hypothesis is as follows:

H0: hazard model based on accounting data, compared to traditional forecasting models, better performance.

H1: risk models based on accounting data, predictive models than the traditional, not better.

$$\begin{cases} H_0 : \mu_1 \geq \mu_3 \cdot \mu_4 \\ H_1 : \mu_1 \leq \mu_3 \cdot \mu_4 \end{cases}$$ Accounting information on the risk

model, the ability to predict bankruptcy = μ_1 Market risk model basic information on bankruptcy, predicting ability = μ_2

Bankruptcy Z Score model, predicting ability = μ_3

Contingent receivables bankruptcy model, predicting ability = μ_4

To investigate this hypothesis, in the years 2011 to 2014, the use of risk models, based on accounting data, and models and models based on z- score will pay contingent claims, and success models to critically examine: To build curves ROC, each year the sample, the more likely it up and down. Let X be an integer between zero and 100. For any integer, x highest risk companies, by default (x%) is. We now bankrupt percent, were calculated. We also calculated the figures for the final period. Project x% of the highest-risk companies, the percentage of bankrupt companies, the ROC curve there.

Sobehart and Keenan, (2001) argued that, area under the curve ROC (AVC) indicator of decision-makers, the ability to predict model.

A risk model based on accounting information.

Table statistics goodness of the model is examined critically, in the table (2) H0 is rejected on the chi-square test, at a significant level 05.

Table 2. Summary statistics variables accounting model and market model.

	Mean All	Std. Deviation	Mean Non-faild	Mean-faild	تفاوتNf-F	t stat
NITA	0.34	2.63	0.17	-0.11	0.28	
TLTA	0.65	3.96	0.57	1.23	-0.66	
EXRET	1.02	0.56	0.89	1.43	-0.54	
SIGMA	3.5	8.7	1.91	5.81	-3.9	
RESIZ	6.18	0.75	12.67	11.24	1.43	
NIMTA	0.07	0.18	0.11	0.14	0.25	
TLMTA	0.45	0.26	0.44	0.72	-0.28	
CASHMTA	0.45	0.27	0.48	0.46	0.02	
BM	1,081	8.6	1.81	4.81	-3	
PRICE	-	0	0	0	0	
RICE	-	0	0	0	0	

((Sig <.05 indicated that the independent variables in explaining the variance dependent, have been successful, and simply put the correct premise is accepted.

The results of ROC curve graph shows. The level drop ROC, risk models based on accounting data relative to the reference line diameter, and Z models and models conditional demands higher.

The results of the ROC, for the risk model on the basis of accounting information, as follows. (Area under the curve of 0/96.6, and the standard error of 0/1.01, and the confidence interval (0/98.8 to 0/94.5))

(B) the z score

In Table (28-4), statistics surpasses model, criticized and investigated in the table (2) reject the hypothesis H0, the chi-square test, at a significant level 05. ((Sig <.05 indicates the independent variables in explaining the dependent variable, have been successful, and in simpler terms, assuming the correctness of the model is accepted.

The results of ROC curve graph shows. The level drop ROC, in the z score is higher than the reference line. But the lower diagonal hazard model is based on accounting data. And no different than the conditional demands.

The results of the ROC, for the z score is as follows. (Area under the curve of 0/63.1, and the standard error of 0/5.06, and the confidence interval (0/75.9 to 0/50.2))

C - contingent claims model

In Table (28-4), statistics surpasses model, criticized and investigated in the table (2) reject the hypothesis H0, the chi-square test, at a significant level 05. ((Sig <.05, indicating that the independent variables in explaining the dependent variable, have been successful, and to simply assume the correctness of the model is accepted.

does not have .

The results of the ROC, for the z score is as follows. (Area under the curve of 0/69.6 and standard errors 0/60.0, and the confidence interval (0/81.4 to 0/57.8))

Diagonal segments are produced by ties.
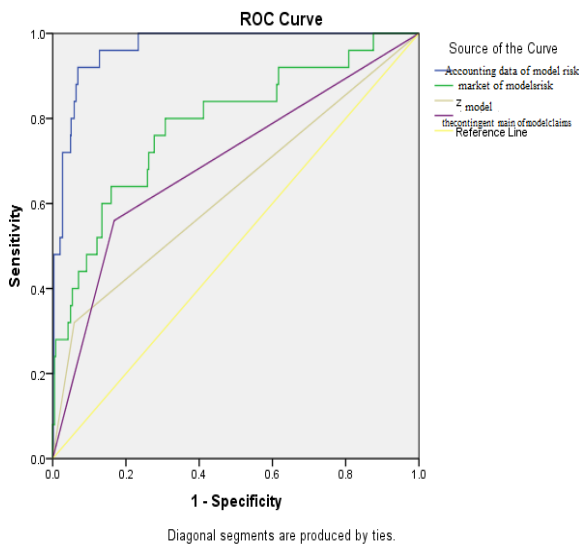
2-3-4 analyzing and testing the second hypothesis, using curves and the ROC

The second hypothesis: "risk model, based on market data than traditional forecasting models, better performance.".

Statistical hypothesis is as follows:

H0: hazard model, based on market data than traditional forecasting models, better performance.

H1: risk models based on market data, predictive models than the traditional, not better.

$$\begin{cases} H_0: \mu_2 \geq \mu_3 \cdot \mu_4 \\ H_1: \mu_1 \leq \mu_3 \cdot \mu_4 \end{cases}$$ Accounting Information in bankruptcy

based on the risk model, predicting ability = μ_1

Market risk model basic information on bankruptcy, predicting ability = μ_2

Z Score model, the ability to predict bankruptcy = μ_3

Contingent claims model, the ability to predict bankruptcy = μ_4

To investigate this hypothesis, in the years 2011 to 2014, the use of model risk models, based on accounting data and model z- score, and the model based on contingent claims will be dealt with, and success models to critically examine:

A risk model, based on market information.

In Table (3), statistics surpasses model, criticized and investigated in the table (29-4) H0 is rejected by the chi-square test, at a significant level 05. ((Sig <.05, indicates the independent variables in explaining the dependent variable, have been successful, and to simply assume the correctness of the model is accepted.

The results of the graph curve ROC, shows. The level drop ROC, risk models based on market data, reference diameter of the line, and higher contingent claims model Z model.

The results of the ROC, for the risk model on the basis of accounting information, as follows. (Area under the curve of 0/78.7, and the standard error of 0/05.2, and the confidence interval (0/88.8 to 0/68.6))

(B) the z score

In Table (2), statistics surpasses model, criticized and investigated, in Table 3 H0 is rejected by the chi-square test, at a significant level 05. ((Sig <.05, indicates that the variables independent, in explaining the dependent variable, have been successful, and to simply assume the correctness of the model is accepted.

The results of the graph curve ROC, shows that the drop ROC, in the z score, relative to the reference line diameter is higher, but lower than the risk model, based on market data is no different than the conditional demands .

The results of the ROC, for the z score, as follows. (Area under the curve of 0/63.1, and the standard error of 0/06.5, and the confidence interval (0/75.9 to 0/50.2))

C - contingent claims model

In Table (3), statistics surpasses model, criticized and investigated, in Table 3 H0 is rejected by the chi-square test, at a significant level 05.

Table 3.The area under the curve ROC, for the first hypothesis.

Area Under the Curve

Test Result Variable(s)	Area	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
Hazard model accounting information	.966	.011	.000	.945	.988
z model	.631	.065	.027	.502	.759
contingent claim Model	.696	.060	.001	.578	.814

The test result variable(s): z models, the main contingent claim has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased.

a. Under the nonparametric assumption

b. Null hypothesis: true area = 0.5

Table 4.The area under the curve ROC, for the second hypothesis.

Test Result Variable(s)	Area	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval	
				Lower Bound	Upper Bound
Hazard model accounting information	.966	.011	.000	.945	.988
Market risk models	.787	.052	.000	.686	.888
z model	.631	.065	.027	.502	.759
Model of contingent claim	.696	.060	.001	.578	.814

The test result variable(s): z Models, the main contingent claim has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased.

a. Under the nonparametric assumption

b. Null hypothesis: true area = 0.5

((Sig <.05, indicates that the variables independent, in explaining the dependent variable, have been successful, and to simply assume the correctness of the model is accepted.

The results of the graph curve ROC, shows that the drop ROC, contingent claims model is higher than the reference line diameter, the lower the risk model, based on market information.

Denounces the z-point model, is no different.

The results of the ROC, for the z score, as follows. (Area under the curve of 0/69.6 and standard errors 0/60.0 and the confidence interval (0/84.1 to 0/57.8))

Conclusion

In this section, the analysis results, the first and second test hypotheses, using the methods described Roc and Roc table.

The analysis of the first hypothesis test results

In testing the first hypothesis researcher has claimed that, "risk model, based on accounting data, compared to traditional forecasting models, better performance."

To investigate this claim, the ROC method used, as well as the ability to detect, according to the curve ROC, and the ROC decided.

A) for detectors capable model, based on the benchmark curve ROC: via charts ROC, the model has better performance, which is higher than the reference diameter, and placed other models. But if two curves meet, diagonal cut above the reference line, between the ability of the two models, there is no difference in predicting bankruptcy

Consequently, given that the hazard model, based on accounting data, to the point z, and contingent claim above the reference line diagonally, and other models are, then claim self in the first hypothesis, at 0/95 approved place.

B) the ability to recognize, on the basis of the ROC: Mighty model based on the "area under the curve ROC", "standard error", and "95 percent", are decided. Of the three standard model, the standard error is smaller, the percentage of area under the curve ROC, and the percentage is 95 percent larger, better results will show.

1. hazard model, based on accounting data, models point to z, and standard error is smaller contingent claim, according to Table (2), the hazard ratio for models, based on accounting data, points z, respectively contingent claim (0/01.1, 0/06.56.0/0.0) is.

(2) risk model, based on accounting data, compared to the models of rating models z, and the area under ROC curve is larger contingent claim, according to Table (2), the percentage of risk models based on accounting data, points z, contingent claim respectively (0/96.6, 0/63.1 ,0/69.6) is.

3. hazard model, based on accounting data, compared to the models of rating models z, and a 95 percent larger contingent

claim, according to Table (2), the percentage of risk models based on accounting data, points z, contingent claim respectively ((0/98.8, -0/94.5), (0/75.9, -0/50.2), (0/81.4-0/57.8)) is.

As a result, given that the hazard model based on accounting data, to the point z, and contingent claim the standard error is smaller, the percentage of area under the curve ROC, and the percentage of 95 percent is larger, therefore, claim researchers in the first hypothesis , at 0/95 is approved.

Analysis of the results of the second hypothesis

In the second hypothesis, the researchers claim that, "based on information about market risk models, performance is better than traditional models predict.".

To investigate this claim, the ROC method used, as well as the ability to detect, on the basis of ROC curves and the ROC, are decided.

A) for detectors capable model, based on the benchmark curve ROC: via charts ROC, a model that has better performance than the reference diameter, and placed other models. But if two curves intersect each other at the top of the diagonal reference line, between the two models' ability to predict bankruptcy, there is no difference

Consequently, given that the hazard model, based on accounting data, to the point z, and contingent claim above the reference line diagonally, and other models are, then claim self in the first hypothesis, at 0/95 approved place.

B) to detect capable model, based on the criteria ROC: Mighty model based on the "area under the curve ROC", "standard error", and "95 percent", are decided. Of the three standard models, the standard error is smaller, the percentage of area under the curve ROC, and the percentage is 95 percent larger, better results will show.

1-hazard model, based on market data, models point to z, and standard error is smaller contingent claim, according to Table (2), the hazard ratio for models based on market data, points z, claims subject to respectively (0/05.2, 0/06.5 , 0/06.0), is.

2-hazard model, based on market information, models of the points z, and the area under ROC curve is larger contingent claim, according to Table (2), the percentage of risk models based on market data, points z, contingent claims respectively (0/78.8, 0/63.1, 0/69.6), is.

3. hazard model, based on market information, models of the points z, and is contingent claim has a 95 percent greater, according to Table (2), the percentage of risk models based on market data, points z, contingent claims thus ((0/88.8 -0/68.6), (0/75.9-0/50.2), (0/81.4- 0/57.8)) is.

As a result, given that the hazard model, based on market information, to the point z and contingent claim, the standard error is smaller, the percentage of area under the curve ROC,

and the percentage of 95 percent is larger, so claims a researcher at the second hypothesis , at 0/95 is approved.

Conclusion In this study, to compare the capability of risk, based on accounting data, models risk based on market data, the points z, the contingent claim for bankruptcy prediction, listed companies in Tehran Stock Exchange, in the time span of 2011 to 2014 was discussed. For this purpose, two main hypotheses put forward, and to test the statistical hypothesis H0 and H1 on each of the two assumptions, we define Consequently, in both hypotheses H0 is approved, and assuming in both hypothesis H1 hypothesis was rejected groups. Thus, according to the results of two hypotheses models, the first assumption hazard model, based on accounting data, and predictive models than traditional, more efficient, is to predict bankruptcy. Finally, given that both hypothesis, were approved, it can be concluded that, assuming that the H0 hypothesis acceptable, risk models based on accounting data, compared to traditional forecasting models, better performance, and H1 rejected at a confidence level assuming 95/0, and according to the number of samples, according to the operational definition study tested is maintained.

The main hypothesis in the second, according to the results of the test, which was described by ROC methods, analysis models were performed. As a result, assuming H0, in both the hypothesis is confirmed, and assuming in both hypothesis H1, the Group hypothesis was rejected. Thus, according to the results of two hypotheses models, the first assumption of risk models based on market data, predictive models than traditional, more efficient method is to predict bankruptcy. Finally, given that, in both methods, hypothesis, confirmed the conclusion, that the first hypothesis H0 accept that, risk models based on market data than traditional forecasting models, better performance and H1 rejected the assumption, at a confidence level 0/95, and according to the number of samples, according to the operational definition of research is maintained tested.

References

Persian sources

1- (fresh review of the global insurance), Basel 3, and its impact on international trade finance and credit insurance Author: Katayun Valizadeh - Mehdi Mohammadi Kahurin, MA in English Literature, University of Science and Technology, Master of Business administration, Islamic Azad University)

2. develop a culture of investment management, Tehran Stock Exchange, www.tse.ir.

3- Standards of Accounting and Auditing, 2014

4. Journal of Financial Accounting, the proprietor: research and Isfahan University of Technology, 2008 International Standard Number: 7691 Year 4. Number 1, Serial (11) (- Spring 2012 scientific - research)

5. Application of prediction models, 1. "(Ebrahimi Kordlar, Ali; AErabi, Mehran. (2011)

6. Application of bankruptcy prediction models, Altman, Falmer, Springate, Zmijewski's and Shirata) in predicting default credit facilities to companies in Tehran Stock Exchange ", (Case Study: Bank Sepah) Accounting Research, Issue 12. Page (1 to 14)

7. Bayazidi, Ebrahim; Oladi, Behnam. Abbasi., Narges. (2011). The results of a questionnaire, help, SPSS, Tehran, Abed.

8. Pey. Novo, Raymond (2002), financial management Volume II, translation Jahankhani, Ali; Parsaeian, Ali, Tehran, publisher of Samt.

9. Rostami, Mohammad-Reza Fallah Shams Mir Feiz mortality; Eskandari, Farzaneh. "Distress evaluation of listed companies in Tehran Stock Exchange": A Comparative Study between data envelopment analysis, and logistic regression).

10 Journal of Management lecturer in Iran, Humanities, Volume 15, Number 3, Page 129 to 147

11. Rasoulzadeh, Mahdi. (2001). »Check carbide Altman's model, in anticipation of bankruptcy, the companies listed on the Tehran Stock Exchange) monthly stock," Annex Research 3, p. 75.

12. Soleimani Amiri, Gholamreza. (2010), "Performance Evaluation of financial distress prediction models for listed companies in Tehran Stock Exchange", Journal of Accounting, Vol. I, No. 2, pp. 139-158,

13. Ghadiry Moghaddam, Abolfazl; gholampoorfard, Mohammad Masood, Nassir Zadeh, Farzaneh. (2009). "Tvanyhay review and Ahlsvn Altman bankruptcy prediction, the prediction business bankruptcies Tehran Stock Exchange", Journal of Knowledge & Development, Issue 28, S.220-193

14. Kordestani, Gholamreza, Qayur, Farzad; Ashtab, Ali (2011). "Comparing the Performance of financial ratios, based procedares cash and accrual method, in predicting financial distress in listed companies in Tehran Stock Exchange quarterly exchange securities, Volume 4, Issue 15, pp. 20-191.

15. Moradi, Mohsen; Shafiee Sardasht, Morteza., Ebrahimpour, Malihe (2012) predict corporate financial distress, by the SVM model, and multiple discriminant analysis ", Journal Stock Exchange, No. 18, S136-113.

16. Mehrani, Sasan; Mehrani, Kaveh., Monsefi, Yashar, Karami, Gholamreza. (2005). "Zmijewski's bankruptcy prediction model to evaluate the application and Shyrata, in companies listed on Tehran Stock Exchange", Quarterly Survey of accounting and auditing, No. 41, pp. 105 131.

Latin resources

Agarwal, V., Taffler, R., 2008a. Comparing the performance of market-based andaccounting-based bankruptcy prediction models. Journal of Banking andFinance 32 (8), 1541-1551.

Agarwal, V., Taffler, R., 2008b. Does financial distress risk drive the momentum anomaly? Financial Management (Blackwell Publishing Limited) 37 (3), 461-484.

Agarwal, V., Taffler, R.J., 2007. Twenty-five years of the Taffler z-score model: does itreally have predictive ability? Accounting and Business Research 37 (4), 285-300.

Altman, E.I., 1968. Financial ratios, discriminant analysis and the prediction of corporate bankruptcy. Journal of Finance 23 (4), 589-609.

Avramov, D., Chordia, T., Jostova, G., Philipov, A., 2010. Anomalies and FinancialDistress. Working Paper.

Basel Committee, 2011. Basel III: A Global Regulatory Framework for More ResilientBanks and Banking Systems. Basel Committee on Banking Supervision.

Beaver, W.H., 1966. Financial ratios as predictors of failure. Journal of ccounting Research 4 (Supplement), 71-111.

Begley, J., Ming, J., Watts, S., 1996. Bankruptcy classification errors in the 1980s: An empirical analysis of Altman's and Ohlson's models. Review of Accounting Studies 1 (4), 267-284.

Bharath, S.T., Shumway, T., 2008. Forecasting default with the Merton distance todefault model. Review of Financial Studies 21 (3), 1339-1369.

Black, F., Scholes, M., 1973. The pricing of options and corporate liabilities. Journalof Political Economy 81 (3), 637-654.

Bl chlinger, A., Leippold, M., 2006. Economic benefit of powerful credit scoring. Journal of Banking and Finance 30 (3), 851-873.

Burgt, M.J., 2007. Calibrating low-default portfolios using the Cumulative AccuracyProfile. Journal of Risk Validation 1 (4), 1-17.

Campbell, J.Y., Hilscher, J., Szilagyi, J., 2008. In search of distress risk. Journal ofFinance 63 (6), 2899-2939

Charalambakis, E.C., Espenlauby, S.K., Garrett, I., 2009. Assessing the Probabilityof Financial Distress of UK Firms. Working Paper.

Chava, S., Jarrow, R.A., 2004. Bankruptcy prediction with industry effects. Review ofFinance 8 (4), 537-569.

Christidis, A.C., Gregory, A., 2010. Some New Models for Financial Distress Prediction in the UK. Working Paper.

Dimson, E., 1979. Risk measurement when shares are subject to infrequent trading.Journal of Financial Economics 7 (2), 197-226.

Engelmann, B., Hayden, E., Tasche, D., 2003. Testing Rating Accuracy. Risk, o.January.

Hanley, J.A., McNeil, B.J., 1982. The meaning and use of the area under a receiveroperating characteristics (ROC) curve. Radiology 143, 29-36.

Hanley, J.A., McNeil, B.J., 1983. A method of comparing the areas under receiveroperating characteristic curves derived from the same cases. Radiology 148 (3), 839-843.

Hillegeist, S.A., Keating, E.K., Cram, D.P., Lundstedt, K.G., 2004. Assessing the probability of bankruptcy. Review of Accounting Studies 9 (1), 5-34.

Keasey, K., Watson, R., 1988. The non-submission of accounts and small companyfinancial failure prediction. Accounting and Business Research 19 (73), 47-54.

Keenan, S.C., Sobehart, J.R., 1999. Performance Measures for Credit Risk Models.Moody's Risk Measurement Services, Research Report 1-10-10-99.

Mensah, Y.M., 1984. An examination of the stationarity of multivariate bankruptcyprediction models: a methodological study. Journal of Accounting Research 22 (1), 380-395.

Merton, R.C., 1974. On the pricing of corporate debt: the risk structure of interestrates. Journal of Finance 29 (2), 449-470

Ohlson, J.A., 1980. Financial ratios and the probabilistic prediction of bankruptcy.Journal of Accounting Research 18 (1), 109-131.

Pope, P.F., 2010. Bridging the gap between accounting and finance. The British Accounting Review 42 (2), 88-102.

Reisz, A.S., Perlich, C., 2007. A market-based framework for bankruptcy prediction.Journal of Financial Stability 3 (2), 85-131.

Russell, H., Dwyer, D., Tang, Q.K., 2012. The effect of imperfect data on default prediction validation tests. The Journal of Risk Model Validation 6 (1), 77-96.

Saunders, A., Allen, L., 2002. Credit Risk Measurement: New Approaches to Value atRisk and Other Paradigms, second ed. Wiley Finance, New York.

Shumway, T., 2001. Forecasting bankruptcy more accurately: a simple hazardmodel. Journal of Business 74 (1), 101-124.

Sobehart, J., Keenan, S., 2001. Measuring Default Accurately. Risk, no. March, pp. 31-33.

Stein, R.M., 2005. The relationship between default prediction and lending profits: integrating ROC analysis and loan pricing. Journal of Banking and Finance 29,1213-1236.

Taffler, R.J., 1983. The assessment of company solvency and performance using astatistical model. Accounting and Business Research 13 (52), 295-307.

Vassalou, M., Xing, Y., 2004. Default risk in equity returns. Journal of Finance 59 (2), 831-868.

Zmijewski, M.E., 1984. Methodological issues related to the estimation of financialdistress prediction models. Journal of Accounting Research 22, 59-82.