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"Application of Altman Z Score Model on Selected Indian Companies to Predict Bankruptcy"

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ABSTRACT: *The Altman Z score is used to predict bankruptcy of companies two years prior to the happening of the event. The main objective of this paper is to check the efficiency of this model in predicting bankruptcy of Indian companies three years prior to the occurring of the event. Seven companies have been selected to check the efficiency and accuracy of this model. As per this model, bankruptcy of these companies could be predicted three years prior to the occurring of the event in India. In conclusion, Altman Z score can be applied for Indian companies; however the same is not 100% accurate.*

KEYWORDS: *Altman Z score, Bankruptcy, Efficiency, Accuracy*

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I. INTRODUCTION:

Every business undertaking is carried out with an objective of making profit. All the stakeholders of the company or the business organization will want to know whether the organization will do well in future in order keep their interest in tact with that organization. For example, Banks before providing financial assistance to any organization predict the risk of bankruptcy to provide such financial help. Predicting if the business will do well or go bankrupt, before they actually do is quite fascinating to know. Many theories and tools have come up in this regard. Business failure has been a major reason for developing theories and tools in respect of bankruptcy. Business failure is a situation where the organization is unable to cover its expenses and debts with the revenue earned.

Forensic accounting is one of the forms of investigative accounting that helps to examine the financial records. It is a speciality area which involves the skills of accounting, auditing, and investigation to analyze the information suitable for use in the court of law. There are many tools under forensic accounting that helps us to analyze the financial records of the company with respect to fraud and distress.

Bankruptcy is the legal status of a person who is unable to repay the debts to the creditors. "Bankruptcy" has been defined under Insolvency and Bankruptcy Code, 2016 as the state of being bankrupt. The Insolvency and Bankruptcy Code, 2016 defines bankrupt as

a) A debtor who has been adjudged as bankrupt order under section 126
b) Each of the partners of a firm, where bankruptcy order under section 126 has been made against the fire. Or
c) Any person adjudged as an undischarged insolvent.

Altman Z score, a forensic accounting tool is one such model that helps to measure the financial distress or bankruptcy. It was published by Edward I Altman in the year 1968. The Z score model is mainly designed to measure the financial health of the company in terms of financial distress or bankruptcy. The model helps to measure the credit worthiness of the organization. Initially, this model was applicable only to public manufacturing companies. However, later this model was redeveloped to be made applicable to other companies as well. The model uses the formulae based on the information found in the profit and loss account and balance sheet of the organization. The original Z score model used five financial ratios to calculate a single Z score in order to indicate the likelihood of the company to go bankrupt. The Altman Z score model has three set of formulae that would help in identifying the stage of the company in terms of its financial distress.

II. REVIEW OF LITERATURE:

1. Journal Article

This journal article speaks about the Business failure, regular changes that were undertaken in the Altman Z score model over the period from 1968 to 1993 and the comparison between various models developed in respect of bankruptcy. It states that the model is widely identified as the "predictor of bankruptcy". It states that Altman Z score model can safely be applied to the modern economy to predict bankruptcy two to three years before the bankruptcy case was revealed. (Anjum, 2012)

2. Journal Article

The main objective of this article was to find out whether the two forensic accounting tools that is the Altman Z score model and the Beneish M score model would predict the corporate failure and financial manipulation of Enron Corporation. The researcher of the said article has accomplished the objective of and has stated that both Altman Z score model and Beneish M score model should be used simultaneously for the purpose of audit.(MacCarthy, 2017)

3. Journal Article

The article speaks about the role played by the textile industries in Pakistan and the problems faced by that industry in the said country. The article contains an empirical analysis of 21 textile companies listed in Karachi stock exchange form the period 2000 to 2010 by using Altman Z score model. The article concludes that the Altman Z score model provides accurate results when it comes to the textile industry of Pakistan and recommends the use of the same as a tool for financial decision making.(Hussain, Ali, Ullah, & Ali, 2014)

4. Research paper

The objective of the above mentioned research paper was to find out the accuracy of Altman Z score model on the five FMCG companies selected from the period 2011 to 2015. The article has a detailed explanation with respect to the liquidity analysis. And, it concludes that the Z score model is effective in predicting the bankruptcy of the FMCG companies and recommends the use of the same by the financial investors. The study also suggests that the companies should regularly estimate Z-score for making strategies to improve their financial position. (Bal, 2015)

5. Journal Article

The article speaks about various techniques used for measuring financial health of a business firm but out of them Altman Z score is proved as a reliable tool. This article contains about a study conducted in an company raysut cement company and for this they had taken the financial data of the past 8 years and the study revealed the company and subsidiary companies are financially sound as their z score is higher than benchmark (2.99). This article concludes that Altman Z score can be used to stock holders for investing options and for managers to make financial decisions. (mohammed, 2016)

III. RESEARCH DESIGN

Statement of Problem

Change is inevitable. It is very important to understand that the only thing that is constant in the world of business environment is change. An organization that is going on well might ignore to introspect themselves on a timely manner. It is very important for the investors, creditors, underwriters, credit rating agencies, banks, auditors and the organization itself to analyze the financial position for their interest. Though, a basic analysis with regard to the financial position is made it is very important to apply the proven models under forensic accounting in order to understand the ranking of the organization.

When a stakeholder shows his/her interest in the organization there are chances that they might face the following problems, namely:

- Investor: There is always a risk that the investor can incur losses when invested without proper analysis or non awareness of the methods available to analyze the financial records of the company.
- Banks: Banks are required to measure the risk of bankruptcy of the organization before lending. The risk involved here is that many banks have recorded NPAs as there was no accurate model to measure the risk of bankruptcy.
- Auditors: In spite of carrying out many audit plans and procedures it is not possible to predict whether the company will do well in the future. If the auditor can predict the bankruptcy prior to its revelation it would help to secure the interests of the public in general.
- Organization: Apart from the above stakeholders, the organisations tend to over exaggerate their ability to repay their debts, with this model the companies can get an insight about their position and their ability to repay the debts.

Considering the above mentioned problems, this research is trying to resolve it to a great extent by examining the accuracy of a forensic accounting tool named Altman Z score model which would predict the bankruptcy two to three years prior to its revelation. This would help the stakeholders to protect their interest with regard to the company/organization and the organization to improve their financial position.

Objective

The objective of the study is to verify the accuracy and effectiveness of the Altman Z score model in order determine whether it is optimal in predicting the financial distress or bankruptcy using 7 public companies of India.

IV. METHODOLOGY

- The data is collected solely from the secondary source.
- The data collected consists of the financial statements of the 7 Indian companies on whom the bankruptcy case is going on or has been declared bankrupt.
- The financial statements are collected from moneycontrol.com
- In order to check the accuracy of the model the financial statements of 7 companies have been taken 3 years prior to the year in which the bankruptcy case was filed.
- The data analysis is carried out in MS Excel.

Limitations:

- Negative working capital, the Altman Z score model pays high preference to this working capital as this will indicate whether the company is in financial trouble or not in financial trouble so if the values taken for working capital are already negative then there is no need for any test as the company is already facing a trouble.
- The Altman Z score model completely ignores the cash flow statement in spite of it being an important part of the financial statements of an organization.
- The accuracy of the Altman Z Score model gets highly affected if the financial statements are manipulated.

V. DATA ANALYSIS AND INTERPRETATION:

There are three sets of formulae under the Altman Z score model and there are specific zones given for each set of formula that helps us to interpret the position of the company in terms of financial distress or bankruptcy. However, we are focusing only on two models of the Altman Z score whose formulae and the ranges are as follows.

Formulae:
Public Manufacturing companies
$Z = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + 1.0X5$
Public Non Manufacturing companies
$Z = 6.56X1 + 3.26X2 + 6.72X3 + 1.05X4$

Ranges:
Public Manufacturing companies

$Z > 2.99$	Safe Zone
$1.81 < Z < 2.99$	Grey Zone
$Z < 1.81$	Distress Zone

Public Non Manufacturing companies

$Z > 2.6$	Safe Zone
$1.1 < Z < 2.6$	Grey Zone
$Z < 1.1$	Distress Zone

Where the ratios are as follows:

Variables	Formulae
X1	Working Capital / Total Assets
X2	Retained Earnings / Total Assets
X3	EBIT / Total Assets
X4	Market value of equity / Total liabilities
X5	Sales / Total Assets

The data analysis and interpretation of the 7 Indian companies selected are as follows:

Bhushan Steel Limited: Manufacturing Company

Year	Particulars							
	Current Assets	Current Liabilities	Retained earnings	Sales	EBIT	Market Value of Equity	Total Assets	Total Liabilities
2016-17	579,529	2,753,910	(766,487)	1,502,730	130,168	158,560	6,046,340	6,046,340
2015-16	200,723	2,127,349	-408,207	1,312,407	40,714	91,738	6,002,472	6,002,472
2014-15	1,166,582	1,208,986	-124,270	1,064,577	123,908	99,893	5,290,752	5,290,752

Year	Ratios				
	X1	X2	X3	X4	X5
2016-17	(0.36)	(0.13)	0.02	0.03	0.25
2015-16	(0.32)	(0.07)	0.01	0.02	0.22
2014-15	(0.01)	(0.02)	0.02	0.02	0.20

By applying the Altman Z score model to the above data we obtained the resultant scores as

-0.27 for 2016-17, -0.23 for 2015-16 and 0.25 for the year 2014-15. On applying Altman Z Score on Bhushan Steels we have found that the company has been in the distress zone since 2010-2011. The distress zone indicates that the company's financials are weak and the company can be declared bankrupt in the near future. We have also obtained further confirmations regarding the weakness of the financials by applying liquidity ratios.

The company has been declared bankrupt in the year 2017 as per the prediction of this model which concludes that the model has been accurate and effective under the given situation.

Kingfisher Airlines Limited: Non Manufacturing Company

Year	Particulars						
	Current Assets	Current Liabilities	Retained earnings	EBIT	Market Value of Equity	Total Assets	Total Liabilities
2010-11	297,383	416,685	134,345	(20,784)	104,783	1,362,121	1,362,121
2009-10	245,710	354,813	8,022	(132,141)	176,032	1,192,134	1,192,134
2008-09	203,323	354,022	8,022.19	(190,747)	168,054	965,702	965,702

Year	Ratios			
	X1	X2	X3	X4
2010-11	-0.09	0.10	(0.02)	0.08
2009-10	-0.09	0.01	(0.11)	0.15
2008-09	-0.16	0.01	(0.20)	0.17

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By applying the Altman Z score model to the above data we obtained the resultant scores as -0.27 for 2010-11, -1.17 for 2009-10 and -2.14 for 2008-09. On applying the Altman Z score on kingfisher we have come to know that the company Z score has been improving since 2013-2014 though the score has always been in the distressed zone. However, the company's license was cancelled in the year 2012 on account of non- payment of its financial obligation thereby proving the accuracy of the model.

ABG Shipyard Limited: Manufacturing Company

Year	Particulars							
	Current Assets	Current Liabilities	Retained earnings	Sales	EBIT	Market Value of Equity	Total Assets	Total Liabilities
2015-16	801,963	888,817	(431,146)	3,427	(286,696)	16,317	1,109,225	1,109,225
2014-15	909,765	717,052	(60,674.92)	39,213	-38,111	38,872	1,235,460	1,235,460
2013-14	867,760	748,238	29,575	162,500	38,489	509,218	1,218,777	1,218,777

Year	Ratios				
	X1	X2	X3	X4	X5
2015-16	-0.08	(0.39)	(0.26)	0.01	0.00
2014-15	0.16	(0.05)	(0.03)	0.03	0.03
2013-14	0.10	0.02	0.03	0.42	0.13

By applying the Altman Z score model to the above data we obtained the resultant scores as -1.48 for 2015-16 and 0.07 for 2014-15.On applying the Altman Z Score on ABG Shipyard we have found out that the company has been in the distressed zone since 2009-2010, yet has been able to sustain itself throughout the next 6 years. The Altman Z score for the above company has been deteriorating over the years and was finally pushed into the insolvency proceedings in the year 2017 by which we can prove that the model has been accurate and effective in the given situation

Jyoti Structures Limited: Manufacturing Company

Year	Particulars							
	Current Assets	Current Liabilities	Retained earnings	Sales	EBIT	Market Value of Equity	Total Assets	Total Liabilities
2015-16	536,801	505,754	(38,722)	249,243	5,753	10,734	597,900	597,900
2014-15	455,878	299,908	11,613	278,173	10,023	17,634	513,022	513,022
2013-14	387,795	310,641	39,019	332,576	27,262	32,622	4,205,932	4,205,932

Year	Ratios				
	X1	X2	X3	X4	X5
2015-16	0.05	(0.06)	0.01	0.02	0.42
2014-15	0.30	0.02	0.02	0.03	0.54
2013-14	0.02	0.01	0.01	0.01	0.08

By applying the Altman Z score model to the above data we obtained the resultant scores as 0.43 For 2015-16, 1.02 for 2014-15 and 0.14 for 2013-14. On applying the Altman Z score on Jyoti Structures we have come to a conclusion that the company has been in the distressed zone 2013-2014, the deteriorating EBIT and Retained earnings provides the user additional evidence to the weak financials. The company was pushed into bankruptcy in the year 2017 thereby proving the accuracy and effectiveness of the model.

Lanco Infratech Limited: Non Manufacturing Company

Year	Particulars						
	Current Assets	Current Liabilities	Retained earnings	EBIT	Market Value of Equity	Total Assets	Total Liabilities
2016-17	661,903	806,672	(60,637)	39,568	37,116	1,904,650	1,904,650
2015-16	773,521	896,549	(16,137)	(4,507)	88,400	2,049,052	2,049,052
2014-15	758,865	769,617	51,911	(33,136)	145,913	1,918,157	1,918,157

Year	Ratios			
	X1	X2	X3	X4
2016-17	-0.08	(0.03)	0.02	0.02
2015-16	-0.06	(0.01)	(0.00)	0.04
2014-15	-0.01	0.03	(0.02)	0.08

By applying the Altman Z score model to the above data we obtained the resultant scores as-0.44 for 2016-17 and -0.39 for 2015-16. On applying the Altman Z score on LancoInfratech we come to a conclusion that the company has been in the distressed zone since 2013 -2014. The current assets to total assets ratio has also been declining in case of the company under review which proves that the liquidity of the company has been deteriorating which is again one of the ways to prove that the company might be forced in bankruptcy, however the bankruptcy proceeding for LancoInfratech had been initiated in 2018, thereby proving the accuracy and effectiveness of the model.

Jaypee Infratech Limited: Non Manufacturing Company

Year	Particulars						
	Current Assets	**Current Liabilities**	**Retained earnings**	**EBIT**	**Market Value of Equity**	**Total Assets**	**Total Liabilities**
2015-16	752,833	376,395	26,415	57,195	102,781	1,830,148	1,830,148
2014-15	985,286	732,976	45,244	132,241	177,645	2,057,431	2,057,431
2013-14	958,275	614,280	35,244	12,447	297,926	2,036,025	2,036,025

Year	Ratios			
	X1	**X2**	**X3**	**X4**
2015-16	0.21	0.01	0.03	0.06
2014-15	0.12	0.02	0.06	0.09
2013-14	0.17	0.02	0.01	0.15

By applying the Altman z score model to the above data we obtained resultant scores as 1.67 for 2015-16, 1.40 for 2014-15 and 1.36 for 2013-14.On applying the Altman Z score on Jaypee Infratech we observe that the company has been in the grey zone since 2013-2014 to 2015-2016 which means that the company has a tendency of going bankrupt in the near future, however the financials for the year 2016- 2017 were not available due to which the Z couldn't be calculated and the analysis on whether the model is effective and accurate cannot be predicted. The company under review went bankrupt in the year 2017

Gitanjali Gems Limited: Manufacturing Company

Year	Particulars							
	Current Assets	**Current Liabilities**	**Retained earnings**	**Sales**	**EBIT**	**Market Value of Equity**	**Total Assets**	**Total Liabilities**
2016-17	1,164,774	925,657	165,847	1,046,477	51,683	81,015	1,302,576	1,302,576
2015-16	790,955	596,529	122,481	860,363	43,784	57,775	951,215	951,215
2014-15	779,588	583,715	117,605	715,793	54,219	40,622	943,200	943,200

Year	Ratios				
	X1	**X2**	**X3**	**X4**	**X5**
2016-17	0.18	0.13	0.04	0.06	0.80
2015-16	0.20	0.13	0.05	0.06	0.90
2014-15	0.21	0.12	0.06	0.04	0.76

By applying the Altman Z score model to the above data we obtained resultant scores as 1.406 for 2016-17, 1.568 for 2015-16 and 1.407 for 2014-15.On applying the Altman Z score on the financials of Gitanjali gems we have come to know that the company has been in the distressed zone since 2014-2015, however the bankruptcy had been initiated in the year 2017 thereby proving the accuracy and effectiveness of the model.

VI. CONCLUSION:

On the basis of the study conducted, by applying the Altman Z score on 7 companies listed on the Bombay Stock Exchange, we conclude that the model is 85% accurate and effective for three years prior to the occurrence of the event of bankruptcy. We also recommend that the Altman Z score could be widely used by the stakeholders of the company so that their financial interest remains protected.

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