MEASURING THE EFFECTIVENESS OF ALTMAN Z SCORE ON INDIAN COMPANIES

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Abstract: Finance is considered to be the most critical aspect of an organization. If the financial health and performance is not good of an organization than it cannot grow neither it can sustain for longer time phase, hence efficient management of financial resources is required further it requires proper attention in order to optimize the financial resources, this study have been undertaken to determine the effectiveness and accuracy of Altman's Bankruptcy Model on Indian companies. To do that, this paper examines the Altman Z score model on various bankrupt companies and studies the data of past i.e., 2 or 3 years from the date of filling legal bankruptcy, we will check whether this model helps us to give any indication before happening of an event. Further in the paper, Altman model have been applied to companies of NIFTY METAL index and will find out the financial position of the industry(company-wise) and will determine whether the company's financial health is not good and does it take part of distress zone. The findings of the paper indicate that Z score is not the prediction instead it is the likelihood, from company's financials, it may look likely that bankruptcy appears, but the management may well succeed in improving matters. However, for investor it is wise to keep an eye on company's solvency.

I. INTRODUCTION

What is bankruptcy???? Now someone will explain me the definition (when a company have to liquidate its assets and pay towards its financial obligations or when a company defaults in their fixed payments, i.e. when they are now able to pay off their creditors they have to liquidate their assets and make the settlement), but according me to its something deeper and more complicated. I would say it means that a company has made some mistakes in the past or have taken some wrong decisions because of it now they are obliged to payback its creditors. A company filling bankruptcy doesn't mean that its business model is not profitable/they don't know how to do business instead according to me they are smarter as they are ready to accept their mistake by filling the bankruptcy. This shows that they want to learn from their mistake and restructure their business in such a way that they are willing to comeback in the game with a greater strength and with more understanding of power of decision making. You all must be knowing Mr. Donald Trump, he is a successful business owner before becoming the president of United States, but you won't be knowing that his own company has filed bankruptcy 4 times in past ,which doesn't mean he don't have ability of being a successful business owner instead this also shows his willingness to succeed.

Manufacturing is one of the major categories where company goes bankrupt in huge number as they are not able to meet their loan obligations. Out of 1343 manufacturing companies 340(which is around 25%) have filed insolvency resolutions and have been referred for liquidation after finding no qualified buyer. Recently the number of insolvency cases surged 30.29% between October – December, 2019.

There have been many models and studies for understanding the financial health of the business and predicting the bankruptcies of the companies but the most successful of them is Altman Z Score Model which was developed by Edward I Altman in (1968). This Model is giving a positive result for more than 50 years. The original model was developed for manufacturing companies in 1968 and further in future it was revised for non-manufacturing firm, private firms and in emerging market.

II. LITERATURE REVIEW

Sanesh.C (2016) an assistant professor at Sri Vyasa Nss Colloge Wadakkanchery, Thrissur, India. has studied the Altman Z score of NIFTY 50 companies which concluded that Z score is not intended to predict when a firm will actually file for bankruptcy. Instead, it is a measure of how closely a firm resembles other firms that have filed bankruptcy, In the study of 50 companies most of the companies were in the safe zone while 9 of them were in grey zone and require special attention and whereas 5 companies were in distress zone, hence there is enough probability for financial embarrassment. According to the study the sector which performed poorly were electric generation, distribution, metals and oil & gas sector.

Dr. N.J. Untwal (2019) has studied the financial position of Wipro ltd by examining the Altman Z score of past 6 years from 2013-18. According to the findings Wipro was in safe zone in all of the years mentioned above, which clearly indicates that the top-level management had designed effective strategies for better control and management of financial resources which result in in win-win situation for both management and the investors and whereas for all stakeholders of the company.

Asha Harshavardhan Kittur (2019) has studied that does the Altman Z score model accurately capture the effects of Non-Performing Assets (NPA) in the Indian banking sector. The study was done on both Public and private sector banks with data spreading across 10 years from 2009-18 using two different Altman Z score models. After applying both the models the results were almost similar despite having different cut off limits and hence all of the banks were in safe zone. Other findings that we got from this study were that there were no major deviations from the Z score of the pre- NPA crisis period and regression test also concluded that the Z score cannot be regarded as the predictor of future NPA's.

Dr. M M Sulphey & Nisa. S (2013), this study was conducted to identify the solvency of 220 companies which were listed in the BSE small cap Index using Altman Z score model. The study showed that 79 companies out of 220 BSE small cap Index companies were under safe zone while 117 companies are in grey zone and require special attention and whereas 24 companies fall in distress zone. The study was conducted sector wise analysis of Z scores where information technology sector is having the greatest number of distress companies and Housing sector and FMCG sector have most number of companies in safe zones and getting and industry analysis.

III. RESEARCH METHODOLOGY

i. **RESEARCH PROBLEM:**

There is always been difficulty in the minds of investors and analyst that whether a model which was developed in foreign country will give positive results with same significance and accuracy in Indian context or not. Thus this paper studies the past data of companies which were bankrupt in 2017/2018 with the help of Altman Z score and we will try to find out the effectiveness and give relevant conclusion whether Z score helps to predict on Indian bankrupt companies, Further in this paper we will apply this model on NIFTY METAL companies as recently there was a surge in filling insolvency of this sector and will try to find out the current financial health of the companies of this index and will find that how many companies are part of distress zone.

ii. **SOURCE OF DATA:**

This study is based on secondary data and data which have been published by the companies. The data is collected from balance sheet, profit and loss statement, note to accounts and annual reports for the companies in their respective annual reports and online databases. An online database has also been referred (capitaline plus databases). The data have been collected of 7 companies which have gone bankrupt in 2017 and 2018 and of 15 companies consisting of NIFTY METAL index. All figures used for calculation are standalone figures of the company.

IV. DATA ANALYSIS AND TOOLS

ALTMAN Z SCORE:

Altman Z Score model was developed by Dr. Edward Altman in 1968 for manufacturing companies and later revised the model for non-manufacturing firms, emerging markets as well. This model is one of the most popular and most widely used bankruptcy prediction model. The formula uses a statistical technique called as multivariate analysis wherein he used the following five accounting ratios with whom he attempted to predict defaults.

The following multivariate formula estimated by Dr. Edward Altman (1968) is only used for manufacturing companies.

$$Z = 1.2A + 1.4B + 3.33C + 0.6D + 0.999E$$

Where,

A = Working capital/Total assets

B = Retained earnings/Total assets

C = EBIT (Earnings before interest and tax)/Total assets

D = Market value of equity (Market Capitalization)/Book value of Total liabilities

E = Sales/Total assets

Z = Overall Index.

Cut off limits:

Z > 2.99 - "Safe" Zone

1.8 < Z < 2.99 - "Grey" Zone

1.9 Z < 1.80 - "Distress" Zone

A (Working capital to total assets ration) – This ratio indicates the investment of working capital in comparison to total assets. Working capital can also be written as difference between current assets and current liabilities of the firm. If a company's working capital is increasing then it is seen as a positive sign, it shows that the companies short term credibility is improving over time. If a company's working capital is decreasing then it indicates that company's current liabilities are increasing which don't seems to be good for the company unless their efficiency is also increasing.

B (Retained earnings to Total assets) – This ratio helps to measure the extent to which a company relies on debt, or leverage. The lower the ratio, the more a company is acquiring assets by borrowing instead of through retained earnings which may again, increases the possibility of bankruptcy if the firm cannot meet its debt obligations.

C (Return on Total assets – EBIT to Total Assets) – This ratio measures a company's earnings before interest and taxes (EBIT) with respect to its total assets. It is considered to be an indicator of how effectively a company is utilizing its assets to generate its earnings. The higher the ratio the more a company is efficiently using its assets/resources.

D (Market value of equity to book value of total liabilities) – This ratio helps to add a market value dimension in the model as other studies fails to consider it. Equity is measured by the combined market value (market capitalization) of all share while debt includes both long term and short-term debt. This measure shows how much firms assets can decline in value (measured by market cap plus equity) before the liabilities exceed the assets and the firm become insolvent.

E (Sales to Total assets) – This is also known as capital turnover ratio it indicates the sales generation ability of the firm's assets and management capabilities in dealing with competitive conditions. This ratio used individually don't have much significance but after combining it with other ratios this gives us a lot of insights that how firm is performing in tough times.

V. LIMITATION

➢ The Altman Z score model provides accurate data only if the data input is reliable. Any prior manipulation of input data is not accounted for under this analysis.

➢ A company in distress zone doesn't mean it is going to be bankrupt in the near future, it only says that the company's current financial health is not good, so they may have chances of bankruptcy in near future.

➢ The company's management might at any point of time implement remedial measures and take effective and efficient decisions to overturn the fate of the company.

➢ From a company's financials, it may look likely that bankruptcy approach, but the management may well succeed in improving matters.

VI. FINDINGS

The study has been done by calculating the Altman Z score for the manufacturing companies that have gone bankrupt or have been taken over by other companies in past or recently to determine the efficiency and accuracy of Z score on Indian companies. The company chosen include – Lanco Infratech, Bhushan Power and steel, Alok Industries, Era Infra Engineering, Electrosteel Steels, Jyoti Structures and facor steel. After finding the accuracy and effectiveness of Z score, 15 companies that constitutes of NIFTY METAL index have been selected to predict the financial health companies and of industry in general.

1. Lanco Infratech Ltd. – This company was a huge Indian conglomerate involved in construction, power and several other segments. In 2010 company was listed among the fastest growing companies in the world and in 2011 the company became the largest private power provider in India. Now the declining stage of the company started in 2013 where they starting defaulting in arrears of interest and principal payments and finally in August 2018 it filled for the legal bankruptcy. When Altman model is tested on the past 2-3 years data before the bankruptcy date, we get the following results showed in chart 1. Where the company was in distress zone since 2015 (approximately 3 years before bankruptcy) and continuing to be the part of it till insolvency.
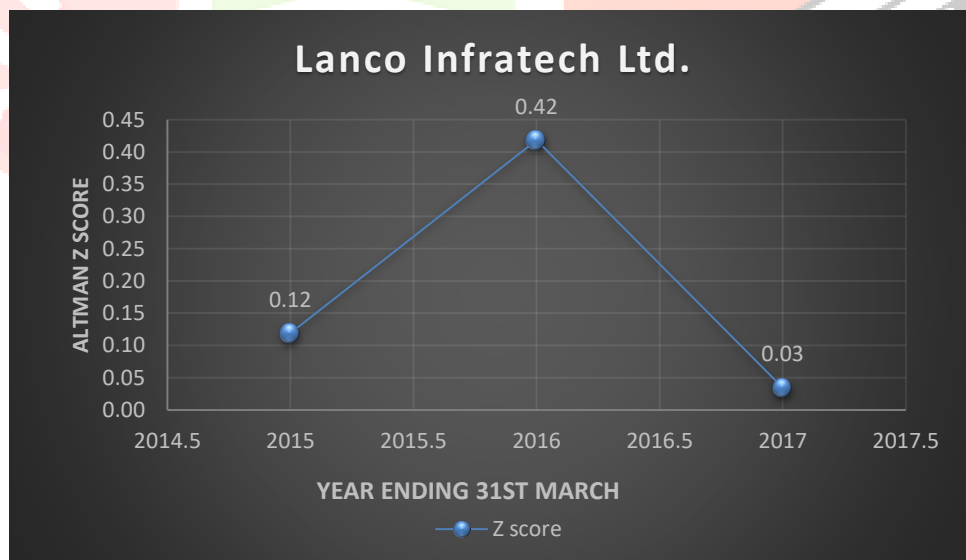
(Chart no. 1) (Source – calculated by the Author)

2. Bhushan power and steel Ltd. – The company is in manufacturing and marketing of steel. It was incorporated in 1970 and it was the largest manufacturer of auto grade steel in India till it was allegedly involved in a fraud worth of Rs 3,805.15 cr. Which was detected by Punjab national bank. The company gone bankrupt in July, 2017. When Altman Model tested on this company it indicated that it was facing financial distress since 2015 (2 years before the date of bankruptcy) as shown in chart 2. All manufacturing companies having a Z score of less than 1.8 are in distress zone and have a good probability of defaulting in future.
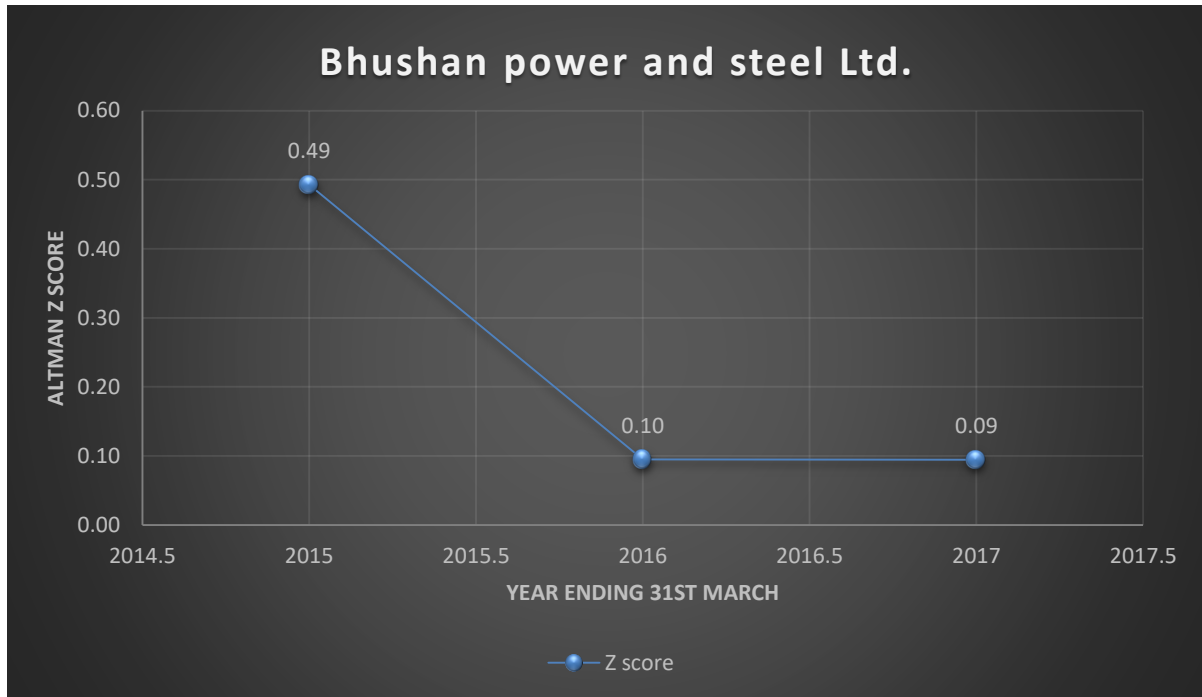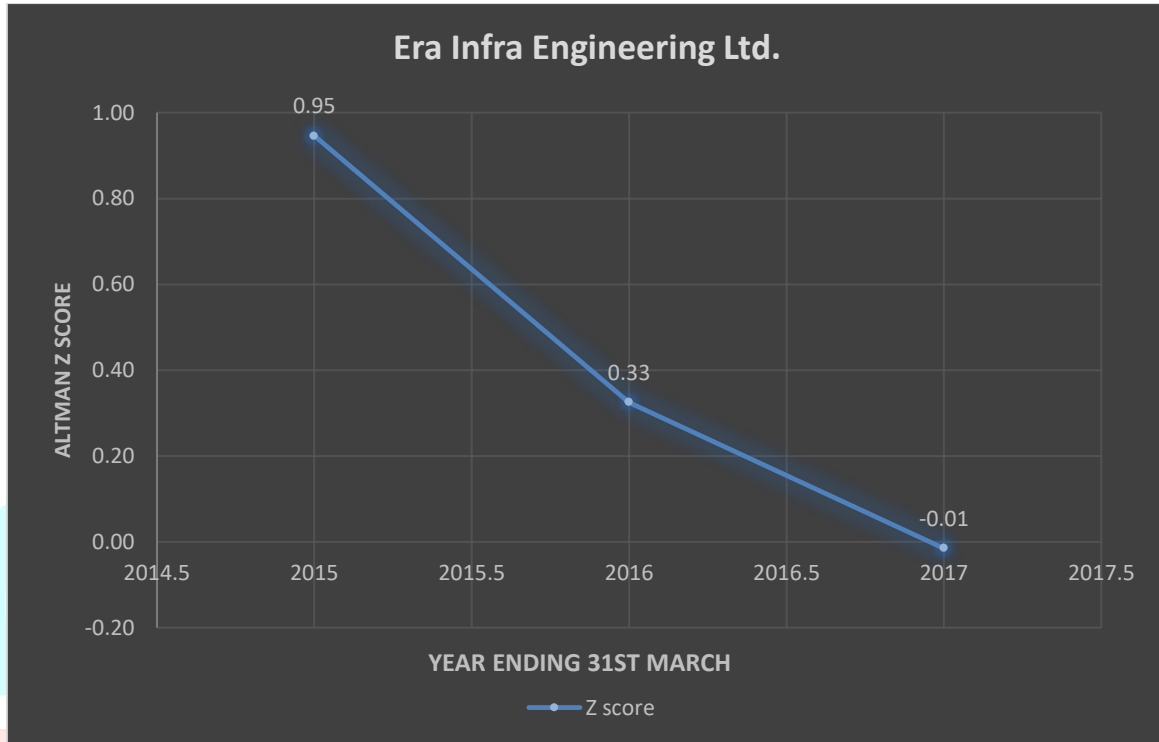
(Chart no. 2) (Source – calculated by the Author)

3. Alok Industries – It is a Mumbai based textile manufacturing company had an IPO of 4.5 cr. in 1993. The company was defaulted a loan of Rs 22,075 cr. in august 2018 and hence filed for bankruptcy. When Altman Z score model tested on this company it shows that in 2015(3 years before bankruptcy) the company was in grey zone with a Z score of 1.97 and moving forward to next year company started having problems and in 2016 it was in distress zone with a declining Z score to 0.36 in 2017 and -3.9 in 2018 which almost confirm the bankruptcy of the firm in march 2018. Then the company was acquired by Reliance industries ltd.(refer to chart no. 3 below)

(Chart no. 3) (Source – calculated by the Author)

4. Era Infra Engineering – It is a medium sized infrastructure company having a loan default of Rs 10,065 cr. The company was incorporated 1990 and was listed in just 2 years with a massive growth. The company was performing extremely well, then CRISIL, the rating agency reduced its rating to BBB- from BBB in April 2013 and further the decline started from October 2013 when again the rating was changed to D and the company finally defaulted in February 2018. When Altman model tested on this companies' past data of 2-3 years it showed that since 2015 the company is in distress zone and its financial health is decreasing year by year as well as the Z score. (refer to chart no.4 below)
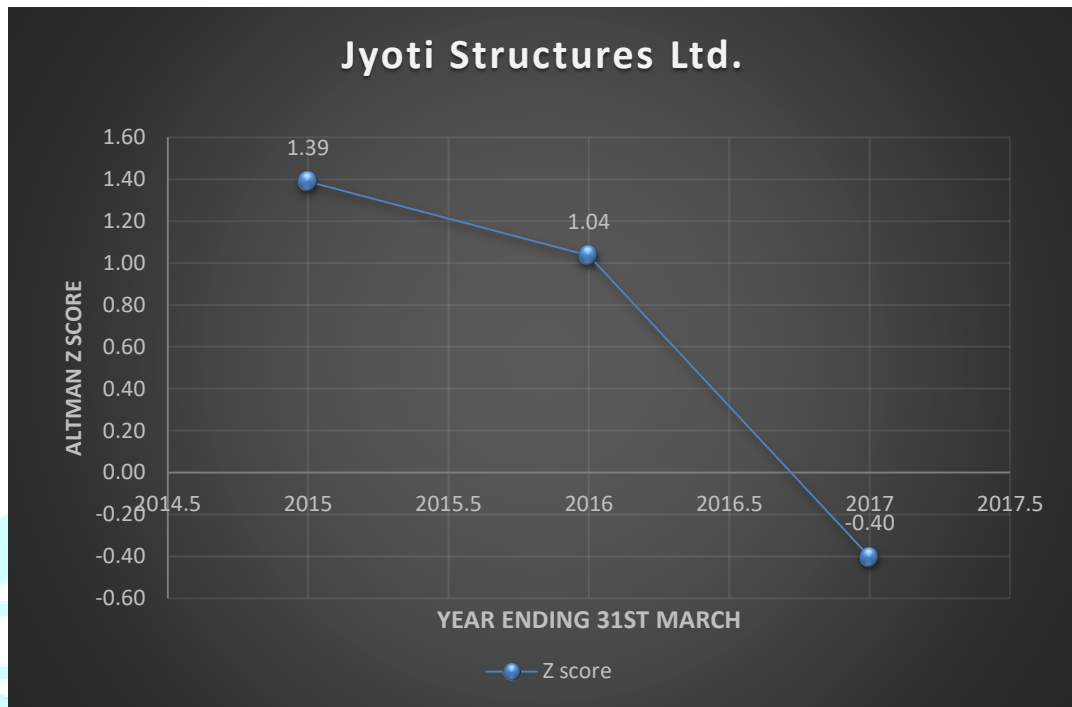

(Chart no. 4) (Source – calculated by the Author)

5. Electrosteel Steel – It is a subsidiary company of Electrosteel Casting Ltd. Which is one of the largest manufacturers of Ductile iron pipes in Indian sub-continent. About 50% of the produce were exported to various countries such as US, Middle East, Europe and many other. The decline of the company started in 2015 when CRISIL, the rating agency rated their long- and short-term debt both as D as the company started making defaults of interest which was taken for future expansion of the business but their estimated gone wrong and hence the declining phase of the company started. When Altman model tested on this company, we found that there were financial distress since 2015 which is approximately 2 years before the date of filling bankruptcy as the Z score of that time was -0.02 which is extremely less and having a high probability of a company going bankrupt in near future.(refer to chart no. 5)

(Chart no.5) (Source – calculated by the Author)

6. Jyoti Structures - The company is engaged in the business of providing turnkey solutions in the field of power transmission. They have three main lines of operation, namely Transmission Lines, Substations and Rural Electrification. In March 2010 company became the first company in India to test 1200 KV tower. The company was a loan defaulter of Rs. 5165 cr. The doubt on this company started when they missed their first ever installment then its lead lender SBI started digging and found that it was in such a huge debt. when Altman model tested on this company, we found that that company was facing problem since 2015 as its Z score has been a part of distress zone and have high probability of going bankrupt. Finally, company was taken over by Netmagic a Japanese tele communication company. (refer to chart no.6)

(Chart no. 6) (Source – calculated by the Author)

7. Facor Steel – This company is a subsidiary company of Facor group which was incorporated back in 1956. The company's primary activity is the manufacturing and sale of stainless steel and specialty steel. Facor steel ltd. was a medium sized company. When Altman model tested, we found that the company was in facing difficulties and its financial health was also weak since 2015 as the Z score is in the area of distress zone. As the Z score in 2015 was manageable by seeing the industry but problem came when it started decreasing from next year and then it got out of the hands of the management and the Z score became negative and have increased its probability near to 1 for going bankrupt in the near future.


(Chart no. 7) (Source – calculated by the Author)

SUMMARY:

Bankrupt Companies in Past	Altman Z Score				
	2014	2015	2016	2017	2018
Lanco Infratech Ltd.	-	0.12	0.42	0.03	-
Bhushan Power and steel Ltd.	-	0.49	0.10	0.09	-
Alok Industries Ltd.	-	1.97	0.64	0.36	-3.90
Era Infra Engineering Ltd.	-	0.95	0.33	-0.01	-
Electrosteel Steels Ltd.	-	-0.02	0.04	-0.34	-
Jyoti Structures Ltd.	-	1.39	1.04	-0.40	-
Facor steel Ltd.	-0.55	-1.44	-3.01	-	-

(Table no. 1) (Source – calculated by the Author)

		Z Score
Safe zone		Z>3
Grey zone		1.8<Z<2.99
Distress zone		Z<1.8
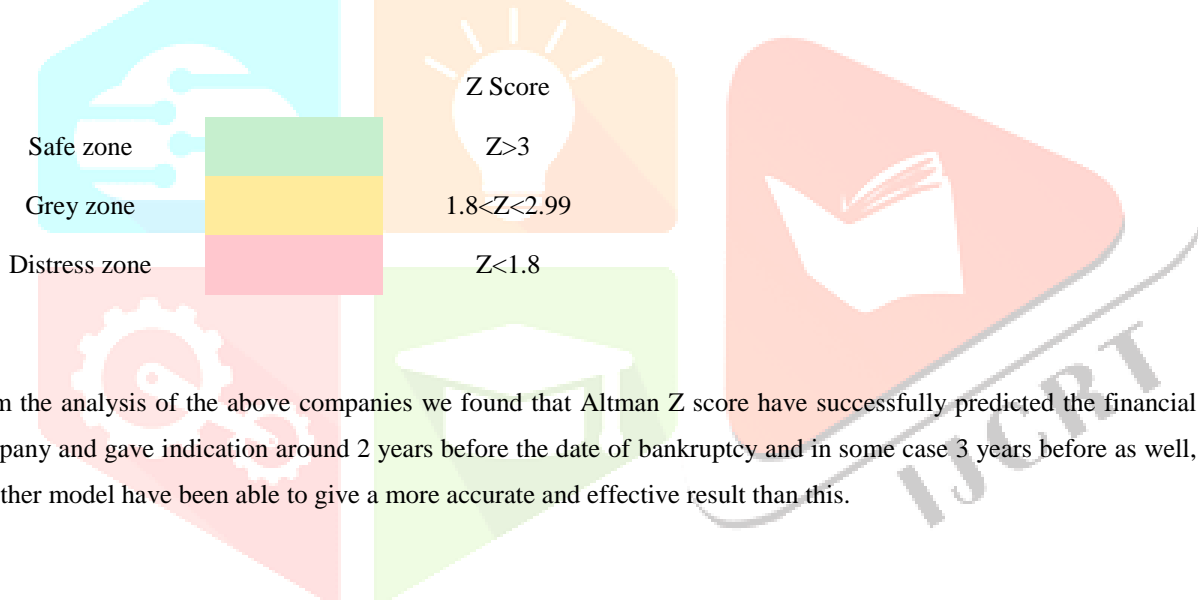
➢ From the analysis of the above companies we found that Altman Z score have successfully predicted the financial distress of the company and gave indication around 2 years before the date of bankruptcy and in some case 3 years before as well, which till date no other model have been able to give a more accurate and effective result than this.

Altman Z Score for NIFTY METAL Companies:

From various studies we know that steel, metal and power generation sectors are the biggest defaulters under insolvency and bankruptcy code. So, this study aims to find the financial health of companies' constituents of NIFTY METAL index. Altman Z score model has been taken in use to determine the following results.

NIFTY METAL	ALTMAN Z SCORE		
	2017	2018	2019
Hindalco industries	1.48	1.75	1.77
Vedanta Ltd	1.10	1.62	1.07
TATA steel Ltd.	1.37	1.67	1.90
Steel Authority of indian Ltd.	0.95	1.11	1.30
National Aluminium Company Ltd	3.94	4.12	3.57
Hindustan Zinc Ltd	5.01	13.16	9.89
Ratnamani Metals & Tubes Ltd	14.52	8.67	8.07
Hindustan Copper Ltd	4.87	4.16	3.08
JSW steel ltd	1.65	2.13	2.21
Welspun Corp Ltd	1.58	1.92	2.19
Coal India Ltd	24.83	20.14	19.54
NMDC Ltd	9.10	6.72	6.50
APL Apollo Tubes Ltd	4.58	5.68	4.78
MOIL ltd.	2.05	2.26	2.12
Jindal Steel & Power Ltd	1.08	1.32	1.46

(Table no.2) (Source – calculated by the author)

Where,

Z Score

Safe zone		$Z>3$
Grey zone		$1.8<Z<2.99$
Distress zone		$Z<1.8$
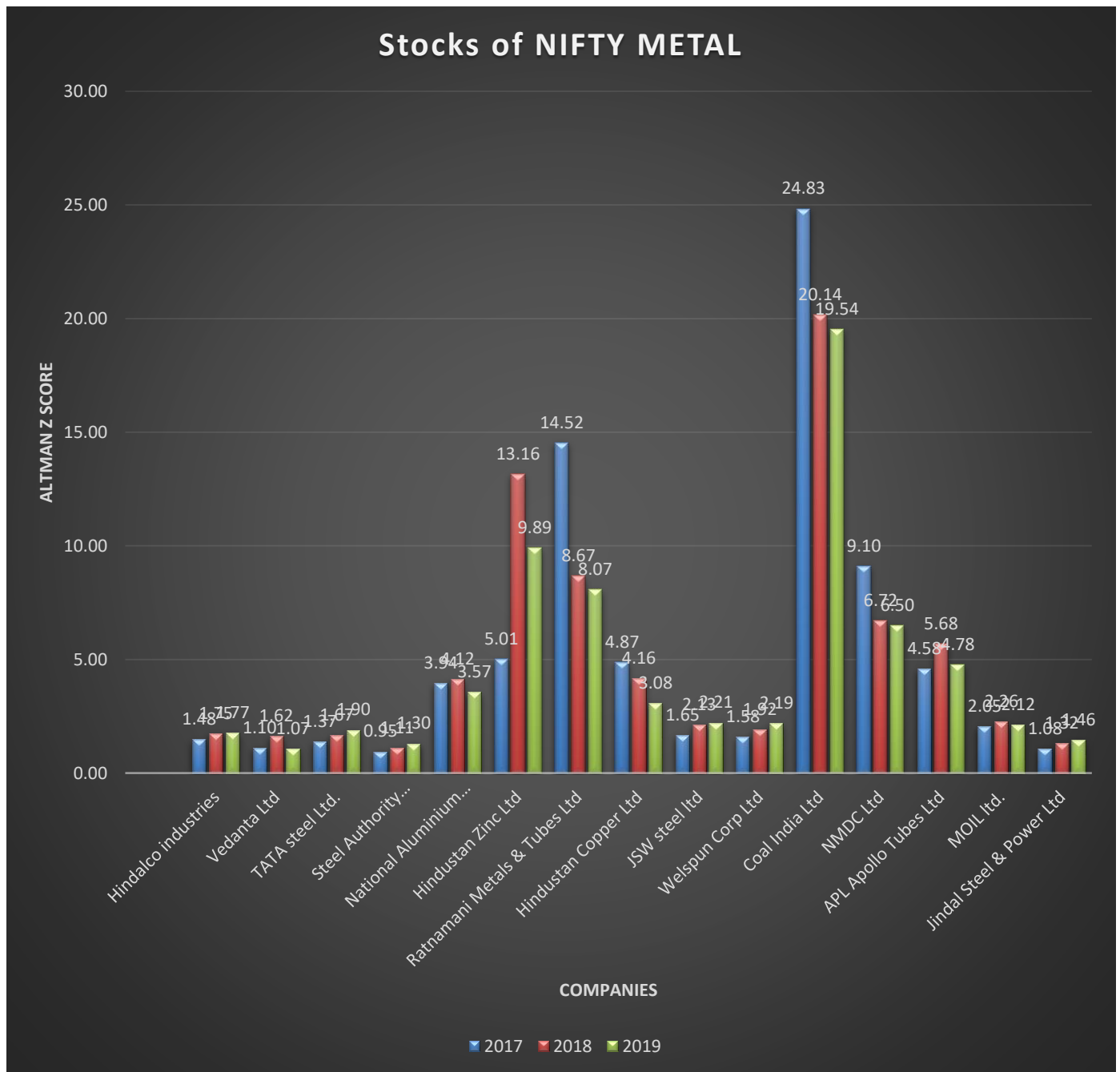
(Chart no.8) (Source – calculated by the Author)

NIFTY METAL	2017	2018	2019
No. of companies			
Safe Zone	7	8	8
Grey Zone	3	2	3
Distress Zone	5	5	4

(Table no.3) (Source – calculated by the Author)

(Table no. 4) (Source - calculated by the Author)

➢ From reference of Table no. 2, we get to know the Altman Z score for all the companies in NIFTY METAL index from year ending 31st March 2017-19. In the table different colours are used to show different zones described by the model. From Table no. 3, it indicates that how many companies from NIFTY METAL index are part of safe, grey and distress zone. From this we can conclude that the situation of the index as compared to 2017 data has been improved as number of companies in safe zone has been increased from 7 to 9 and number of distressed zoned companies have been decreased from 4 to 5, which are the indication of improvement in the industry as more number of companies are being part of safe zone.

➢ Reference from Chart no. 8, it is basically the graphical representation of Table no.2, which depicts the Altman Z score of different

NIFTY METAL	Improvement/decreased financial health on the basis of Altman Z score
Hindalco industries Ltd.	Improved
Vedanta Ltd	Decreased
TATA steel Ltd.	Improved
Steel Authority of Indian Ltd.	Improved
National Aluminium Company Ltd	Decreased (but in already in safe zone)
Hindustan Zinc Ltd	Decreased (but in already in safe zone)
Ratnamani Metals & Tubes Ltd	Decreased (but in already in safe zone)
Hindustan Copper Ltd	Decreased (but in already in safe zone)
JSW steel ltd	Improved
Welspun Corp Ltd	Improved
Coal India Ltd	Decreased (but in already in safe zone)
NMDC Ltd	Decreased (but in already in safe zone)
APL Apollo Tubes Ltd	Decreased (but in already in safe zone)
MOIL ltd.	Stable
Jindal Steel & Power Ltd	Improved

companies.

➢ With the reference from table no. 4, it analyses the movement of Altman Z Score company wise to see whether the company have an improvement or have a decrease in the financial health of the company year on year.

➢ From table no. 4, we get to know that the most number of companies Z score have been decreased but there is no pressure because they are still in green zone, the reason behind the decrease of Z score can be efficient utilization of debt after doing capital restructuring, they might have been interested in future expansion of the business thus total assets/capital expenditure many have been increased, or they might we utilizing the retained earning instead increasing their equity capital and etc.

➢ From table no. 4, Many companies have been successful in promoting their zone from distress to grey or from grey to safe, which shows a positive sign and some of those companies are TATA steel ltd, JSW steel ltd, Welspun Corp ltd and Hindalco Industries haven't yet changed the zone yet, but it is performing well as its Z score have been increasing from year to year. MOIL ltd. has been showing consistent results as compared to its financial health of the business.

➢ From table no. 4, Now there is only one company in this index whose Z score has been declining and has reached 1.07(Vedanta Ltd.) which is low as compared to industry standards. This company is showing negative results and is in distress zone, and now according to me the fate of the company depends on the hands of the management as future decisions depends on them and with good policies and right decision can change the fate of the company.

VII. CONCLUSION

The study undertaken have given greater insights about the financial position of the company. From the study we get to know that basically the Altman Bankruptcy Model is not a prediction for any company instead it determines various zones in which company resembles to other firms that have filed for bankruptcy. Thus, the poorest zone on the basis of financial health is the distress zone where the company is having a high probability of going bankrupt. It doesn't mean if a company is in distress zone that it has a probability of 1 for bankruptcy instead, with management having a greater role for deciding the fate of the company and all credit goes to them for the success. From reference to table no. 2, TATA steel has been successful is changing in its determined zone which means the company's management are taking efficient decisions which helped the company to improve.

However, the study also indicates that investors should consider Altman Z score bankruptcy model along with other factors for investing as it gives positive results after applying it on various companies and hence this can be an effective tool for investors and credit rating agencies. Therefore, at the end people need to invest their hard-earned money to earn more money.

FiguresandTables

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VIII. REFERANCE

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IX. ANNEXTURE

https://drive.google.com/file/d/1CsvdtByIKu0B1mPWYK1X2q7JxC4q2MGt/view?usp=sharing