COMPARATIVE STUDY AND ANALYSIS OF FINANCIAL HEALTH OF PHARMACEUTICAL COMPANIES USING BANKRUPTCY PREDICTION MODELS

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ABSTRACT

This research was carried out to study the bankruptcy prediction models on pharmaceutical companies. Companies from different sectors like Aurobindo, Cadila, Cipla, Divi's and Dr. Reddy from large-cap; Abbott, Ajanta, Alkem, Biocon and Torrent from mid-cap and Alembic, IPCA, Laurus, Wockhardt and Granules from small-cap. The existing literature primarily consists of companies financial data like it's' current assets and liabilities, total assets and liabilities, Earnings before interest and depreciation, sales, net income etc. The data taken is for 5 financial years, viz. 2015-2016, 2016-2017, 2017-18, 2018-19 and 2019-20. This study seeks to study the financial health of companies using prediction models. Models used in this study are Altman Z Score, Ohlson O Score and Zmijewski X Score.

Keywords: Pharmaceutical, Altman Z Score, Ohlson O Score, Zmijewski X Score, Bankruptcy Prediction Models.

1.0 Introduction:

Bankruptcy prediction is the art of predicting bankruptcy and various measures of financial distress of a firms. It is a vast area of finance and accounting research. The importance of the area is due in part to the relevance for creditors and investors in evaluating the likelihood that a firm may go bankrupt.Bankruptcy can be predicted using different prediction models.Financial data of company for previous year(s) is used.

1.1 Bankruptcy Prediction Models:

Altman Z Score: $Z = 1.2(\frac{WC}{TA}) + 1.4(\frac{RE}{TA}) + 3.3(\frac{EBIT}{TA}) + 0.6(\frac{MVE}{TL}) + 1.0(\frac{Sales}{TA})$

Bankruptcy Prediction Based on Z Score

Z Score< 1.8, Unhealthy Zone (Red Zone)

1.8 < Z Score< 2.99, Grey Zone

Z Score> 2.99, Healthy Zone (Green Zone)

Ohlson O Score: $\mathbf{T = -1.32 - 0.407 \log(\frac{TA_t}{GNP}) + 6.03(\frac{TL_t}{TA_t}) - 1.43(\frac{WC_t}{TA_t}) + 0.0757(\frac{CL_t}{CA_t}) - 1.72X - 2.37(\frac{NI_t}{TA_t}) - 1.83(\frac{FFO_t}{TL_t}) + 0.285Y - 0.521(\frac{NIt - NIt-1}{|NIt|+|NIt-1|})}$

Bankruptcy Prediction Based on O Score

O Score > 0.38, Unhealthy Zone (Red Zone)

O Score = 0.38, Grey Zone

O Score < 0.38, Healthy Zone(Green Zone)

Zmijewski X Score: $\mathbf{Z = -4.336 - 4.513\ (\frac{NI}{TA}) + 5.679\ (\frac{TL}{TA}) + 0.004\ (\frac{CA}{CL})}$

Bankruptcy Prediction Based on X Score

X Score > 0, Unhealthy Zone (Red Zone)

X Score < 0, Healthy Zone (Green Zone)

2.0 Literatures Review:

According to (Prof.Vandana Samba, 2020), in the paper "A study on bankruptcy using Altman Z-Score prediction model", the main aim of the study was to study the financial distress and bankruptcy of VAMA Infrastructures Pvt. Ltd. company using Z-Score. For the study the data taken was for five years (2013-14 to 2018-19). From the study it was found that it indicated grey zone stating that they have chances of getting bankrupt in near future.

According to (PANIGRAHI, 2019), in the paper "Validity of Altman's "Z" Score Model in Predicting Financial Distress of Pharmaceutical Companies", the main aim was to examine the financial distress status of pharmaceutical industry using Altman's Z-Score model. The author has studied the financial health for a sample of four pharmaceutical companies for a period of five years (2012-13 to 2016-17) using secondary data such as annual reports of the company. From the analysis the author had found that the financial health of industry was healthy and there is no scope of bankruptcy for the selected companies as the average score of the companies was 5.90 which is above than the cut-off of 1.8.

According to (Bracegirdle, 2019), in the paper "Using the Altman z-score model to test bankruptcy in the Oil Industry", the main aim was to assess whether large independent oil and gas companies have better z-scores than the smaller oil and gas companies, and consequently, less likely to file for bankruptcy. The authors had conducted the research for a time period of 2008 to 2012, a sample of nineteen public limited companies listed on London Stock Exchange were taken into consideration. The author concluded that larger companies did experience greater Z-Score compared to smaller companies.

According to (Arpita Agarwal, 2019), in the paper "Bankruptcy prediction models: an empirical comparison", the main aim of the study was to study and evaluate the efficiency and accuracy of five bankruptcy prediction model and also to compare the results of each model results. For the study five bankrupt companies were taken into consideration for a time period of 10 years data to understand when they would have got the alarm for bankruptcy. From the study it was found that all the models are accurate enough but not properly comparative to each other

According to (Jayakumari P Dakhwani, 2018), in the paper "Predicting financial distress of S Kumar Nationwide ltd – a comparison of Altman's Z score Model and Ohlson's O score model", the main aim of the study was to the effectiveness of predicting financial distress using Z-Score and O-Score and also to compare which model is more accurate. From the study it was found that O Score is more reliable compared to Z Score.

According to (Elsa Imelda, 2017), in the paper "The Analysis of Altman Model and Ohlson Model in Predicting Financial Distress of Manufacturing Companies in the Indonesia Stock Exchange", the main aim of this study was to study the accuracy of both Atlman and Ohlson models for bankruptcy prediction. In this study the authors have taken 40 manufacturing companies listed on Indonesian Stock Exchange, and the study period selected was 2010 to 2014. The result of the study was that according to Ohlson model and logit analysis were more accurate than Altman model and multiple discriminant analysis for predicting bankruptcy.

According to (Miss Jayakumari P Dakhwani, 2017), in the paper "Financial distress analysis of selected Indian pharmaceutical companies", the main aim of the study was to analyse financial conditions of selected companies, also to study financial result of Altman Z-Score model and also to identify the most prominent financial parameters which affect corporate bankruptcy in the selected companies. For the study five companies were selected with a time period of ten years (2007-08 to 2016-17). From the study it can be concluded that the financial health of the companies was healthy. The Z-Score of Cipla, Sun Pharma and Dr. Reddy was in very safe zone whereas for Orchid Pharma and Surya Pharma was below 1.8 resulting in distress zone.

According to (Mohan Kumar M.S., 2016), in the paper "A study on financial health of steel authority of India Ltd.", the main aim of study was to analyse short term financial position and long term financial performance of SAIL and also to study the profitability position and financial health of SAIL company. The study was done using time frame of ten years (2005-06 to 2014-15). From the study it was found that company was in healthy zone but slowly it was moving towards grey zone looking towards the decrease in Z score over the years.

2.1Research Gap:

It is observed from literature review that most of the researches done are based on Altman Z Score, whereas here we have used Ohlson O Score and Zmijewski X Score also.

It is also observed that very few researches are done on pharmaceutical companies and the selected companies are of large cap section only, whereas here in the study the companies selected are from large cap, small cap and mid cap sections.

3.0 Objectives:

Primary Objective:

1. To evaluate the financial health of the companies using Bankruptcy Prediction Models.

Secondary objective:

1. To evaluate financial health using Z score, O score and X score models.

2. To analyse the financial condition of pharmaceutical industry in India.

3. To suggest recommendations for future growth and development of the select pharmaceutical companies in India.

4.0 Research Methodology:

4.1: Research Design

Descriptive research study

4.2: Population

All the pharmaceutical companies in India

4.3: Sampling Frame

Registered companies in pharmaceutical sector in stock indices

4.4: Sampling Method

Non probability convenience sampling method

4.5: Sample Size

From last five years; 2015-2016, 2016-2017, 2017-2018, 2018-19 and 2019-20, fifteen companies i.e. AurobindoPharma Ltd., Cadila Healthcare Ltd., Cipla Ltd., Divi's Laboratories Ltd., Dr. Reddy's Laboratories Ltd., Abbott India, Ajanta Pharma, Alkem Laboratories, Biocon, Torrent Pharma, Alembic Pharmaceuticals Ltd., IPCA Laboratories, Laurus Labs, Wockhardt and Granules from pharmaceutical industries of India.

4.6: Statistical Tool and Techniques

Microsoft Excel as statistic tool and Altman Z Score, Ohlson O Score and Zmijewski X Score model used as statistical techniques.

5.0 Analysis:

Altman Z Score:

Table 1: Altman Z Score Calculation: (Source: Author's calculation)

Company name	2015-16	2016-17	2017-18	2018-19	2019-20
Abbott	15.83	12.29	13.37	13.54	21.12
Ajanta	26.96	39.48	20.87	14.34	12.36
Alembic	11.22	11.45	5.40	4.76	4.32
Alkem	7.42	10.05	7.30	6.82	6.27
Aurobindo	5.24	5.86	4.24	4.23	3.38
Biocon	2.79	4.74	6.39	5.53	4.16
Cadila	6.58	4.83	4.30	3.25	2.79
Cipla	7.20	5.28	4.97	4.94	4.73
Divi	26.23	15.42	23.03	28.01	28.64
Dr. Reddy	5.88	4.27	3.70	5.27	6.38
Granules	3.76	3.32	2.39	2.70	3.29
IPCA	4.27	4.76	5.20	7.35	8.75
Laurus	3.69	3.89	3.40	2.67	2.54
Torrent	4.02	3.84	1.92	2.77	2.95
Wockhardt	3.23	1.99	1.72	1.35	0.69

Ohlson O Score:

Table 2: Ohlson O Score Calculation: (Source: Author's calculation)

Company name	2015-16	2016-17	2017-18	2018-19	2019-20
Abbott	-3.27	-2.06	-2.62	-1.98	-1.85
Ajanta	-4.27	-6.28	-3.44	-2.48	-1.73
Alembic	-2.31	-1.55	1.75	0.90	1.02
Alkem	-0.30	-0.47	0.22	-0.29	0.23
Aurobindo	1.37	0.27	0.90	1.40	0.62
Biocon	2.00	1.63	1.81	1.86	2.37
Cadila	0.40	2.40	1.74	2.26	2.37
Cipla	2.11	0.35	0.21	0.02	-0.26
Divi	-4.84	-4.09	-3.36	-3.92	-3.45
Dr. Reddy	0.38	1.67	1.44	0.40	-0.38
Granules	1.48	2.31	2.32	1.69	1.06
IPCA	1.11	0.67	0.39	-0.40	-0.71
Laurus	2.88	2.22	2.56	2.73	2.32
Torrent	1.86	2.30	4.02	3.66	3.65
Wockhardt	1.72	2.98	3.64	3.88	5.08

Zmijewski X Score:

Table 3: Zmijewski X Score Calculation: (Source: Author's calculation)

Company name	2015-16	2016-17	2017-18	2018-19	2019-20
Abbott	-5.51	-4.68	-4.68	-4.01	-3.55
Ajanta	-4.12	-4.21	-3.01	-2.51	-2.40
Alembic	-3.80	-3.60	0.04	-1.27	-0.82
Alkem	-2.35	-2.37	-1.85	-2.26	-1.75
Aurobindo	-0.93	-1.81	-1.01	-0.66	-1.25
Biocon	0.87	0.58	0.52	0.47	0.74
Cadila	-1.90	0.14	-0.13	0.29	0.14
Cipla	-1.63	-1.02	-1.01	-1.12	-1.50
Divi	-2.71	-2.30	-1.93	-2.08	-2.12
Dr. Reddy	-1.26	-0.48	-0.37	-1.03	-1.65
Granules	-1.38	-0.53	-0.02	-0.72	-1.09
IPCA	-1.13	-1.52	-1.67	-2.03	-2.29
Laurus	0.07	-0.50	-0.25	-0.10	-0.41
Torrent	0.10	0.54	1.84	1.31	1.14
Wockhardt	0.00	1.26	1.22	1.10	1.97

5.1 Z-Score:

The details used for Z Score are total asset and total liabilities, difference of current asset with current liability, companies' retained earnings, companies' earnings before interest and tax, companies market value of equity and its' sales for the year.

Companies having their Z Score above 2.99 is said to be in healthy zone which means that the company is nowhere near facing financial distress, if the Z Score is between 1.8 to 2.99 means the company is in grey zone and to avoid financial distress they need to manage their finances so that they can jump back to healthy zone and not fall down to distress zone and if Z Score is below 1.8 that means the company is facing financial distress, they are likely to face bankruptcy in upcoming two or three years.

Based on analysis it is found that Abbott, Ajanta, Alembic, Alkem, Aurobindo, Cipla, Divi's, Dr. Reddy and IPCA are such companies who have been in completely healthy zone throughout the study period.

Biocon is one of the companies who was in grey zone in first year (2015-16), but after that they have always been in healthy zone (2016-17 to 2019-20).

Cadila is one of the companies who was in healthy zone for first four years (2015-16 to 2018-19), but in last year (2019-20) it shifted to grey zone.

Granules is one of the companies who was in healthy zone for first two years (2015-16 and 2016-17), then it shifted down to grey zone for two years (2017-18 and 2018-19) but then they jumped back to healthy zone in last year (2019-20).

Laurus is one of the companies who was in healthy zone for first three years (2015-16 to 2017-18), but in last two years (2018-19 and 2019-20) it slipped down to grey zone.

Torrent is one of the companies who was in healthy zone for first two years (2015-16 and 2016-17), but in last three years (2017-19 to 2019-20) it slipped down to grey zone.

Wockhardt is one of the companies who was in healthy zone in first years (2015-16), in second year (2017-18) it was in grey zone, but in last three years (2017-18 to 2019-20) it slipped down to distress zone.

5.2 O-Score:

The details used for O Score are total asset and total liabilities, difference of current asset with current liability, current assets and current liability, gross national product index, companies' net income, companies' earnings before interest, tax, depreciation and amortization for the year.

Companies having their O Score below 0.38 is said to be in healthy zone which means that the company is nowhere near facing financial distress, if the O Score is equal 0.38 means the company is in grey zone and to avoid financial distress they need to manage their finances so that they can jump back to healthy zone and not fall down to distress zone and if O Score is above 0.38 that means the company is facing financial distress, they are likely to face bankruptcy in upcoming two or three years.

Based on analysis it is found that, Abbott, Ajanta, Alkem and Divi's are such companies who have been in completely healthy zone throughout the study period.

Based on analysis it is found that Biocon, Cadila, Granules, Laurus, Torrent and Wockhardt are such companies who have been in completely unhealthy zone throughout the study period.

Alembic is one of the companies who was in healthy zone for first two years (2015-16 and 2016-17), but for last three years (2017-18 to 2019-20) it was in unhealthy zone.

Aurobindo is one of the companies who was in unhealthy zone in first year (2015-16) then in next year (2016-17) it shifted to healthy zone but in last three years (2017-18 to 2019-20) it shifted back to unhealthy zone.

Cipla is one of the companies who was in unhealthy zone in first year (2015-16) but after that all four years (2016-17 to 2019-20) the company was in healthy zone.

Dr. Reddy is one of the companies who was in grey zone in first year (2015-16), then it went down to unhealthy zone for next three years (2016-17 to 2018-19) and then in last year (2019-20), it was in healthy zone.

IPCA is one of the companies who was in unhealthy zone for first three years (2015-16 to 2017-18), but in last two years (2018-19 and 2019-20) it shifted to healthy zone.

5.3 X-Score:

The details used for X Score are total asset and total liabilities, current assets and current liability and companies' net income

Companies having their X Score below 0. is said to be in healthy zone which means that the company is nowhere near facing financial distress, if the X Score is equal 0 means the company is in grey zone and to avoid financial distress they need to manage their finances so that they can jump back to healthy zone and not fall down to distress zone and if X Score is above 0 that means the company is facing financial distress, they are likely to face bankruptcy in upcoming two or three years.

Based on analysis it is found that, Abbott, Ajanta, Alkem, Aurobindo, Cipla, Divi's, Dr. Reddy, Granules and IPCA are such companies who have been in completely healthy zone throughout the study period.

Based on analysis it is found that Biocon and Torrent are such companies who have been in completely unhealthy zone throughout the study period.

Alembic is one of the companies who was in healthy zone for first two years (2015-16 and 2016-17), in third year (2017-18) it slipped to unhealthy zone, but for last two years (2018-19 and 2019-20) it was again in healthy zone.

Cadila is one of the company who was in healthy zone in first year (2015-16) then in next year (2016-17) it slipped to unhealthy zone, again in third year (2017-18) it was in healthy zone, but in last two years (2018-19 and 2019-20) it shifted back to unhealthy zone.

Laurus is one of the companies who was in unhealthy zone in first year (2015-16) but after that all four years (2016-17 to 2019-20) the company was in healthy zone.

Wockhardt is one of the companies who was in grey zone in first years (2015-16), but then it went on slipping to unhealthy zone for all four years (2016-17 to 2019-20).

6.0 Conclusions:

The year 2015-2016 may be considered a successful year for the pharmaceutical industry because it reported the highest average ratio of Z-score i.e. 8.95. The year 2017-2018 may be considered a successful year for the pharmaceutical industry because it reported the highest average ratio of O-score i.e. 0.77 and X-score i.e. -0.82. Hence, it can be concluded that the companies in the pharmaceutical sector are financially quite healthy and there is no scope of bankruptcy or any cause of concern as regards the financial health of companies in this sector in the coming years. Investors' investments in this sector are safe. The management also has no reason to worry as regards the financial health of these companies. Moreover, low or negative working capital in some cases indicates aggressive working capital management policy of the firms which implies minimal investment in current assets by the

companies so as to derive a higher rate of return. But it has to be remembered that risk of default and bankruptcy increases when a firm adopts more aggressive working capital policies. In some cases, it is a sign that a company may be facing bankruptcy or serious financial trouble.

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