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MSc. Finance and Accounting

September 2017-2018

**Project
On**

**“The financial solvency of Pharmaceutical Companies of
India on the basis of Altman Z score.”**

Project (Finance and Accounting)

7FNCE023W.Y

Submitted to: Dr. Mostafa Hussien

Submission date: 30th August, 2018

Word Count: 8308 Words (Including**: From Introduction to Conclusion, **Excluding**: Title page, Executive Summary, Table of Contents, List of tables, Time-Scale, References & Appendix)**

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EXECUTIVE SUMMARY

Expanding the horizons globally, the survival of the business in the modern world is the driving force to do better than others. Many variables are available to indicate the financial distress. Thus, the research, “**A study on financial solvency of selected pharma companies of India on the basis of Altman Z score**” was selected to have an idea about the companies which are leading in the market of pharmaceutical industry and what their position is looking to the current market scenario as well as at what zone they all are standing. The research is been done on top companies of pharma industry and they are Sun Pharma, Dr.Reddy Laboratories, Cipla, Glenmark, Torrent, Cadila, Aurobindo and Lupin. The Altman Z score model is being used to calculate the Z-score of these companies and also to interpret there financial position in the pharma industry of India. This research study gives briefing to the problem statement how one can use Altman Z-score model to predict the financial insolvency of the companies. After analysing the data to study the financial soundness & health of the companies as well as applying Z-Score to study the solvency check for investors and to analyse the degree and extent of financial distress. Thus, lastly the outcomes for co-relation and regression performed using this model on the data statistics shows that most of the companies are into Healthy Zone. The resultant findings reflect that there lies a future scope of investing in Pharma Companies on the basis of hypothesis analysis.

Key Words: Altman Z-score model, financial insolvency, pharmaceutical companies.

1: INTRODUCTION

1.1 Background of the Industry:

“The Indian pharmaceuticals market is the third largest in terms of volume and thirteenth largest in terms of value”, as per a **report by Equity Master**. Globally, India is the largest generic drugs provider. In terms of volume, it is 20% of global exports. As the industry is highly fragmented, consolidation became an essential feature of the Indian pharmaceutical market¹.

In the global pharmaceuticals sector, India enjoys a vital position. Also, “it has a large pool of scientists and engineers who have the potential to steer the industry ahead to the peak.” Currently, over 80% of the anti-retroviral drugs used globally to combat AIDS (Acquired Immuno Deficiency Syndrome) are supplied by Indian pharmaceutical firms².

Market size: “The Indian pharma industry, which is expected to grow over 15% p.a. between 2015 and 2020, will outperform the global pharma industry, which is set to grow at an annual rate of 5% between the same periods. The market is expected to grow to US\$ 55 billion by 2020, thereby emerging as the 6th largest pharmaceutical market globally by absolute size”, as **stated by Mr. Arun Singh, Indian Ambassador to the US**³.

“India has maintained its lead over China in pharmaceutical exports with a year-on-year growth of 11.44% to US\$ 12.91 billion in FY 2015-16”, **according to data from the Ministry of Commerce and Industry**. Imports of pharmaceutical products rose marginally by 0.80% YOY to US\$ 1,641.15 million⁴.

“Overall drug approvals given by the US Food and Drug Administration (USFDA) to Indian companies have nearly doubled to 201 from 109. The country accounts for around 30% (by volume) and about 10% (value) in the US\$ 70-80 billion US generics market. India's biotechnology industry comprising bio-pharmaceuticals, bio-services, bio-agriculture, bio-industry and bio-informatics is expected grow at an average growth rate of around 30% a year and reach US\$ 100 billion by 2025. Biopharma, consisting vaccines, therapeutics and

¹ Source: <http://www.ibef.org/industry/pharmaceutical-india.aspx>

² Source: <http://drop.ndtv.com/profit/gl/IPO/Dp1245.pdf>

³ Source: <http://www.ibef.org/industry/pharmaceutical-india.aspx>

⁴ Source: <http://www.ibef.org/industry/pharmaceutical-india.aspx>

diagnostics, is the largest sub-sector contributing nearly 62% of the total revenues at US\$ 1.88 billion⁵.”

1.2 Introduction of the topic:

“Solvency means ability of a company to meet its long-term financial obligations.” To have foothold in business, Solvency is essential as it asserts a company’s going concern. While a company also needs liquidity to thrive, liquidity must not be confused with solvency. A company that is insolvent can often enter bankruptcy⁶.

To be considered solvent, the value of an entity’s assets, be it in any form, must be greater than its total debt obligations. Ample of statistical calculations can be performed to help determine the solvency of a business or individual.

Solvency Ratios:

Solvency ratios can be used by the Investors ratios to analyse a company's solvency. “The interest coverage ratio= EBIT/interest expense to show a company's ability to pay the interest on its debt, with a higher result indicating a greater solvency. The debt-to-assets ratio= company's debt/value of its assets to show whether a company has taken on too much debt, with a lower result indicating a greater solvency. Equity ratios demonstrate the amount of funds that remain after the value of the assets, offset by the outstanding debt, is divided among eligible investors⁷.”

Solvency ratios differs by industry, so it is important to know what a good ratio for the company before should have so as to get conclusions out of it. A lower solvency than the industry average ratios shows probability of upcoming financial problems.

'Altman Z-Score' Model:

“The Altman Z-score is the outcome of a credit-strength test that gauges the different companies so as to get company's likelihood of bankruptcy. The Altman Z-score is based on 5 financial ratios that can be calculated from data found on a company's annual report. It uses profitability, leverage, liquidity, solvency and activity to predict whether a company has a high degree of probability of being insolvent⁸.”

⁵ Statistical Source: <http://www.ibef.org/industry/pharmaceutical-india.aspx>

⁶ Source: <https://www.investopedia.com/terms/s/solvency.asp>

⁷ Source: <https://www.investopedia.com/terms/s/solvency.asp>

⁸ Source: <https://www.investopedia.com/terms/s/solvency.asp>

BREAKING DOWN 'Altman Z-Score':

A number of studies have attempted to predict financial distress using ratios. In first such study, of **William Beaver** identified five ratios which would discriminate between failed and non-failed firms. These ratios are:-

1. Cash flow to total debt
2. Net income to total assets
3. Total debt to total assets
4. Working capital to total assets
5. Current ratio

Z score as a tool for predicting corporate bankruptcy using ratio analysis was developed by Edward I Altman. Altman studied the financial ratios of a number of bankrupt companies and non-bankrupt companies. Using multiple discriminant analysis (MDA), five financial ratios were identified that were able to discriminate between bankrupt and no-bankrupt companies.

The Altman Z-score is calculated as follows:

$$\text{Z-Score} = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + 1.0X5$$

Where:

X1 = working capital / total assets

X2 = retained earnings / total assets

X3 = earnings before interest and tax / total assets

X4 = market value of equity / total liabilities

X5 = sales / total assets

The Altman Z-score formula was developed by NYU Stern Finance Professor Edward Altman in 1967, and was published in 1968. In 2012, an updated version called the Altman Z-score Plus was released. It can be used to evaluate “public and private companies, manufacturing and non-manufacturing companies, and U.S. and non-U.S. companies. The Altman Z-score Plus can be used to evaluate corporate credit risk⁹.”

⁹ Source: <https://www.investopedia.com/terms/s/solvency.asp>

Application Altman ‘Z’-score model:**The following steps are included in the process:**

Z-Score is a combination of 5 commonly used accounting-ratios attached by different coefficients preceded to each ratio. Thus, in the process it includes:

- **STEP1:** Collect the numerical data for each ratio components from the authenticated secondary sources for all the companies.
- **STEP2:** Formulate each company’s year wise excel spreadsheet for the fetched data.
- **STEP3:** Formulate separate excel sheet for the Z-score components with the fixed coefficients attached to get $Z\text{-Score} = 1.2X1 + 1.4X2 + 3.3X3 + 0.6X4 + 1.0X5$ and fill up all the fields. **Refer: Appendix Tables.**
- **STEP4:** Enter the obtained values for each variables to complete the ratios and the results will be summed up in the last column for all the associated years.
- **STEP5:** Lastly, in the Z-score model process, calculate the average for the Z-score. Then, compare the Z-score value according to the Z-score interpretation norms and decide the zone in which it falls.

Benefits of ‘Z’-score model:

This model is highly accurate (Gordon L.V Springate, 1978: Study reveals that it gives 92.5% accurate results).

It has reliability and there are ample of researches that have tested this model.

The true and fair results are obtained.

This model helps to analyse the business soundness or failure on basis of top 5 ratios application.

Simple and easy comprehension and application with the coverage of most essential components.

The model has peculiarity where multi-variate usage is done as compared to univariate in other models.

Z-Score is a yardstick for all types of data statistics.

‘Z’-score ingredients:

The Z-score is calculated by multiplying the following accounting ratios, which is efficient in predicting bankruptcy.

Table 1

X1 (Working Capital/Total Assets)	This ratio expresses the liquidity position of the company towards the total capitalization. Liquidity and size characteristics are explicitly considered.
X2 (Retained Earnings / Total Sales)	It reflects company's leverage where extent of the reinvested amount is indicated. Other way we can say the payment of the assets made by company profits.
X3 (Earnings before Interest and Taxes / Total Assets)	"This ratio is a measure of the true productivity of the firm's assets, independent of any tax or leverage factors. Since a firm's ultimate existence is based on the earning power of its assets, this ratio appears to be particularly appropriate for studies dealing with corporate failure. Furthermore, insolvency in a bankrupt sense occurs when the total liabilities exceed a fair valuation of the firm's assets with value determined by the earning power of the assets."
X4 (Market Value of Equity / Book Value of Total liabilities)	"The measure shows how much the firm's assets can decline in value (measured by market value of equity plus debt) before the liabilities exceed the assets and the firm becomes insolvent. It appears to be a more effective predictor of bankruptcy than a similar, more commonly used ratio; net worth/total debt (book values)."
X5 (Sales / Total Assets)	This is a standard turnover measure which varies in industries unfortunately. It sales generating capacity will be revealed and management's capacity to deal with competitive conditions will be measured.

Altman Z-Score Interpretation¹⁰:

Table 2

Situation	Z Scores	Zones	Remarks
I	Below 1.8	Bankruptcy/ Distress Zone	Its failure is certain and extremely likely and would occur probably within a period of two years.
II	Between 1.8 and 2.99	Healthy/ Grey Zone	Financial viability is considered to be healthy. The failure in this situation is uncertain to predict.
III	3.0 and above	Too Healthy/ Safe Zone	Its financial health is viable and not to fall

Altman Z-scores can be used for making investor's decision. "To determine whether to buy or sell a particular stock if they're concerned about the underlying company's financial strength." Investors either purchase a stock if value is closer to 3 or sell a stock if the value is closer to 1.8¹¹.

In Indian context, **L. C. Gupta** in a study suggested five Income statement ratios and two B/S ratios to study the financial health of a firm. The profit and loss accounts ratios identified by Gupta are as follows¹²:-

1. Earnings before depreciation, interest and taxes (EBDIT) to sales
2. Operating cash flows (OCF) to sales
3. EBDIT to total assets including accumulated depreciation

¹⁰ Source: Table 1 & 2: <https://www.gurufocus.com/news/137149/a-look-at-altmans-zscore> & <https://www.gurufocus.com/term/zscore/RAD/Altman-Z-Score/Rite-Aid-Corp>

¹¹ Source: <https://www.investopedia.com/terms/s/solvency.asp>

¹² Source: <https://www.investopedia.com/terms/s/solvency.asp>

4. OCF to total assets including accumulated depreciation

5. EBDIT to (interest+0.25 debt)

Altman Z-Scores and the Financial Crisis:

There was high credit rating done in 2007 for specific asset-class. The Altman Z-score pointed that the companies' risks were increasing tremendously and they may go bankrupt soon¹³.

Altman calculated that the median Altman Z-score

The following two balance sheet ratios were identified as having power of predicting possible sickness:-

1. Net worth/debt, including both short and long-term debt
2. All outside liabilities/tangible assets

The above studies prove that ratios can be used not only to dissect the past performance of the companies but also to predict the future performance.

1.3 Research Objectives and Questions:

Primary objective – To study the financial solvency of selected Pharmaceutical companies of India on basis of Altman Z score.

Secondary objectives –

- To understand the Altman Z score model of financial solvency to predict financial health and viability of the companies.
- To understand the overall financial performance of the companies.
- To know the efficiency in financial operations.
- To check the financial solvency and derive the outcomes for investment advisory.

1.4 Rationale of the study:

“The Z-Score is a commonly used metric with wide appeal, though it is just one of many credit scoring models in use today that essentially combine quantifiable financial indicators with a small number of variables in an attempt to predict whether a firm will fail¹⁴.”

¹³ Source: <https://www.investopedia.com/terms/s/solvency.asp>

¹⁴ Source: <http://www.investinganswers.com/financial-dictionary/financial-statement-analysis/altman-z-score-5188>

All the way long, however, the Z-Score turned out to be one of the most reliable predictors of financial distress that analysts moreover compares some Z-Scores with corresponding bond ratings. So, when Altman re-performed the tests on 86 distressed companies: 1969-1975, followed by 110 bankrupt companies: 1976-1995 and lastly 120 bankrupt companies: 1996-1999, the Z-Score was between 82% -94% accurate. “The old "garbage in, garbage out" motto applies, however: if the company financials are misleading, the Z-Score will be, too. It's important to remember that changes in a company's Z-Score are as important, if not more important, than the Z-Score itself. After all, knowing a company is heading down the wrong path is better than learning about it after the fact. For example, Enron's Z-Score gave it the equivalent of a BBB bond rating at year-end 1999.” This e.g. can be guideline for the project as it shows the path where Z-Score has proven correct results over rating agencies¹⁵.

Thus, taking the above paragraph as base to the fact that Z-Scores are tested and qualified, now that it's known we can apply it. Here, we are doing this research so as to have the Z-score model proving best results as compared to other models for Indian Pharma companies and serves best to the Investors. Thus, the reason for having the selected Pharma companies is to have the precise data of that top 8 companies which are the market holders in India. Here, the moto is to have the investor's interest safeguarded and make them aware so as to have the financial decisions wisely. So, this research has been conducted to fill the gap in this sector in India.

1.5 Research Plan of the study:

The remaining portion of this report is organised in the following manner:

Chapter Two: Literature Review

This will represent the overview and gist of all the previous researches taken place on this subject and in this area. This includes the objectives, methodology, findings, recommendations and conclusion of the previous research works.

¹⁵ Source: <http://www.investinganswers.com/financial-dictionary/financial-statement-analysis/altman-z-score-5188>

Chapter Three: Research Design

This will discuss the sources of data, research approach, hypothesis, sampling plan and methodology as well as the statistical tools & techniques are to be applied for the data analysis. The justification is given for selecting specific methods, approaches and applying particular technique.

Chapter Four: Data Collection & Analysis

This section will include the result statistics for correlation and regression tests. Also, the interpretation of each tests performed to prove the hypothesis will be presented.

Chapter Five: Findings & Recommendations

This will discuss the tables for findings from the data analysis of each Pharma Company as well as Z-score tables. Also, it will have the recommendations for the investors and the management on the basis of the findings drawn.

Chapter Six: Discussion & Conclusion

This will have the conclusions drawn from the research study and a discussion in context with the results from previous researchers' study. In addition to this it will include the separate section for the scope of future research in this area, limitations & contribution.

2: LITERATURE REVIEW

2.1 Introduction:

Around the globe, there are ample researches conducted relating to the financial health and soundness by researchers and accountants. Accounting ratios have been used a lot in development of models for the prediction of default probability and financial distress of companies. Researchers have been working upon to find a ratio that would serve long lasting as the only predictor of corporate health and bankruptcy. They have also tried to construct various models that would help in predicting the corporate health.

(KANNADHASAN 2007) notes that over a period of years, ample of researches have been conducted, where the application of Multiple Discriminant Analysis to predict the corporate failure is used. Whereas, (Gupta, 1983) “Study on a sample of Indian companies financed by ICICI concludes that certain cash flow coverage ratios are better indicators of sickness”. The results showed unfavourable towards application of either multiple discriminant analysis or any other method. (Cited in VenkataRamana, Azash, and Ramakrishnaiah, 2012, p40-56). In Indian context, Gupta (1999) attempted to improvise Beaver’s method with the aim of forecasting the business failure. Beaver (1966) was the foremost one to do research by predicting the bankruptcy using the financial data (cited in KANNADHASAN, 2007, p7). On the other side, Mansur A Mulla (2002, p37-41) with the help of Z score model, conducted “A study on Textile mill so as to evaluate the financial health taking five weighted financial ratios”. Next on the list was the research done by (Selvam et al., 2004), disclosed about the financial health of cements Industry, especially India Cements Ltd. KrishnaChaitanya (2005) measured the financial distress of Industrial Development Bank of India (IDBI) using Z model and came to the conclusion that IDBI is at the verge of becoming insolvent in the upcoming years. (Cited in Satish & Janakiram, 2011, p199-206)

(Aiyabei, 2002) noted the theoretical aspect of a financially distressed firm whose discussion was based on the cyclical concept and also, reviewed the financial performance of small business firms based in Kenya applying Z-score model. Adding to this, (McClure, 2004) had remarked and made sure by his research work the ‘Z’ score model and concluded that investors should keep a regular update of the Z-score so as to keep a track for their investments. As compared to the mass ratios the diminishing Z-score can provide a way simpler results and turn up into misleading conclusions. “Given its shortcomings, the Z is probably better used as a gauge of relative financial health rather than as a predictor” (stated by McClure, 2004, p2).

Contrary, the best way is to use model to check the financial soundness but, if results are insufficient and inappropriate, a detail analysis then must be conducted. (Cited in Satish & Janakiram, 2011, p199-206) & (Cited in VenkataRamana, Azash, Ramakrishnaiah, 2012, p40-56).

2.2 Comparison between Accounting-ratios based models & Market based models:

(Altman, 1993) proved that Altman's Z-score is best for bankruptcy analysis, adding to it, (Altman, Hartzell and Peck, 1995) mentioned that no manufacturers'-score model, and the Emerging Markets Score can beat it. A review was presented by (Altman and Narayanan, 1997) on a study conducted over 22 international countries where main results showed that for predicting default companies, the effective tools are the multivariate techniques which are based upon the accounting-ratios models. Also, there are cases where, for various periods & across globe, accounting ratio-based credit scoring models have proven to perform quite well (Altman, Narayanan and Paul, 1997). MDA was found out to be the best amongst all others. (Cited in VenkataRamana, Azash, Ramakrishnaiah, 2012, p40-56). In 1978 (Gordon L.V. Springate) developed the 'Springate model' selecting 4 out of 19 ratios that best distinguished between sound business and unhealthy business. These four ratios are working capital/total assets, EBIT/total assets, EBT/current liabilities and sales /total assets.

The critics of accounting-ratio-based models led to the invention and application of market-based models that are proposed by (Black & Scholes, 1973; Merton, 1974). It is clearly reflected that the market price is the real factor affecting the future expected cash flows and so, its implementation for the bankruptcy prediction must be done. Further there are many others like (Hillegeist, Keating and Lundstedt, 2004; Reisz and Perlich, 2004; Vassalou and Xing, 2004; Campbell, Hilscher and Szilagyi, 2006) have conducted their assessment for the probable default based on Market-based models. 'The empirical evidence on the relative performance is mixed performance of market-based against accounting-ratio-based models is mixed' (Kealhofer and Kurbat, 2001; Oderda, Dacorogna and Jung; Hillegeist, Keating and Lundstedt, 2004; Reisz and Perlich, 2004; Stein, 2005; Campbell, Hilscher and Szilagyi, 2006; Blochlinger and Leippold, 2008; Agarwal and Taffler, 2008). (Cited in VenkataRamana, Azash, Ramakrishnaiah, 2012, p40-56). Thus, finally Bagchi (2004) reviewed the practical implications on risk evaluation due to accounting ratios and concluded that the dominance of the Accounting ratios still prevails in the matter of credit risk evaluation.

2.3 Research conducted in differential domains for solvency measurement:

Olhson (1980) applied logistic regression to predict company bankruptcy. The logistics model using nine ratios was used by him to get a rough idea of the probability of failure for each firm. The scrutiny of the financial distress of logistic industry in India based on Z score model was done by Tyagi (2014) .It reveals positive and healthy logistic industry, which is good sign where Indian economy was hit by global recession. (Cited in Shariq Mohammed, 2016, p4).Sanesh (2016) examined the NIFTY 50 companies using Altman Z-Score. Based on the present data, the Z-score attempted to predict the company failure due to financial distress. Gerantonis, Vergos and Christopoulos (2009) reviewed if Z-Score could judge failure for previous 3 years data. Performance of Z-Score model was optimistic and proved to be good. Likewise, Mizan and Hossain's "A study to assess the financial health of cement industry of Bangladesh" to prove financial soundness was carried out (2014, p16-22). Chowdhury and Barua (2009) measured Z score model on 53 companies of the Z-category shares traded in DSE to predict financial distress risk of each share. The results showed strong validity of Z-Score except for Bangladesh. Ramaratnam and Jayaraman (2010) applied Z score model on Indian steel industry for seeing its financial soundness. The study observed that companies were healthy. Alkhatib and Al Bzour (2011, p208-215) carried out a research using "Altman and Kida models", that showed the implications of financial ratios in Jordanian listed companies for the probability of defaulting. They recommended to apply one of these models for bankruptcy prediction. Compared to all the models, the most famous and highly applicable model is the Altman-1968 developed model (Mizan, Amin and Rahman, 2011). (Cited in Shariq Mohammed, 2016, p5)

2.4 Previous Researches on the bankruptcy prediction:

The company failure's forecast has been thoroughly researched with help of data of developed countries (Beaver, 1967; Altman, 1993; Altman., 1968; Wilcox, 1973; Deakin, 1972; Ohlson, 1980; Taffler, 1982; Boritz et al., 2007). Varied models have been developed in the academic literature using methods, such as multiple discriminant analysis (MDA), logit, probity, recursive partitioning, hazard models, and neural networks. Briefings of the literature are provided in (Zavgren, 1983; Jones, 1987; O'Leary, 1998; Boritz et al., 2007; Agarwal and Taffler, 2008). Although, there are so many models developed yet the relevance and reliability is often visible for the models developed by (Altman, 1968; Ohlson, 1980; Boritz et al., 2007). A survey of the literature represents that MDA is applied by most of the international failure predictions (Altman, 1968; Charitou et al., 2004)

The previous researchers used the diversified methods and models for different companies and countries. The study here is based upon the variables which are just Z-score & leverage and multi-variate Altman Z-Score model is used. On the other hand the models applied in the past studies were vast and also the application was done taking into account accounting ratios, market based ratios as well as the PAT as variables. Thus, in contrast to the research over the developed countries, here the research is on the developing country. The differences are clearly notified: the studies before had the industries focusing on a particular company whereas here the focus is on the top 8 companies so as to have clear and wider vision for reliable outcomes.

3: RESEARCH DESIGN

3.1 Problem identification:

- Whether the company is solvent or insolvent/ bankrupt?

This can be answered by the study of financial solvency on basis of Altman Z score.

3.2 Research Method:

- Explanatory research: The research that we have done here is Explanatory one. It is Study that establishes causal relationship between variables. It is used to study a problem/issue to explain the relationship between variables E.g.: The effect of leverage on firm performance.

3.3 Sources of data:

- Secondary source i.e. Websites, Bloomberg

3.4 Data collection method:

- Secondary method: In this method of data collection, the numerical data is obtained from the available and authenticated resources. For instance, Company's financial statements, Annual reports. The data already available or even used previously i.e. published data.

3.5 Sampling plan:

- Sampling Method: Non Probability Convenience Sampling method

Under this method, samples are collected where not every individual gets equal chance of getting selected from the whole population it is called Non-Probability sampling technique. In it there is Convenience sampling, it is selected due to its easy accessibility and convenient proximity to the researcher¹⁶.

- Sample Size: 8 Pharmaceutical companies of India based on Market Capitalization
- Time Horizon: Past 5 years data i.e. 2013-2017 for top 8 Pharma Companies
- Time Dimension: Longitudinal. It means data taken for more than one year.

¹⁶ Source: <https://www.researchgate.net/publication/304339244>

3.6 Research Approach:

- **Deductive/Quantitative Approach:** The study here, is based on deductive/quantitative approach and not the inductive/qualitative approach. Primarily, the reason being the usage of the quantitative data over the qualitative ones in this research & secondary, the hypothesis testing, cause and effect thinking, using statistical methods & performing tests for the study.

Deduction means: Theory-Hypothesis-Observation-Confirmation.

Thus, it is Positivistic Paradigm & Focuses on testing theory against empirical evidence

3.7 Hypothesis and Statistical tools:

- **Hypothesis:-**
- **H0:** There is no significant impact of Z score showing financial distress on leverage of selected pharmaceutical companies of India
- **H1:** There is significant impact of Z score showing financial distress on leverage of selected pharmaceutical companies of India.
- **Tests - Correlation and Regression**
- **Statistical tools-** Excel & SPSS.

4: DATA COLLECTION AND ANALYSIS

SUN PHARMA

Variables

1. Dependent Variable: Leverage Ratio
2. Independent Variable: Z Score

Hypothesis

H0: There is no significant impact of Z score showing financial distress on leverage of selected pharmaceutical companies of India

H1: There is significant impact of Z score showing financial distress on leverage of selected pharmaceutical companies of India.

Result Statistics:

Correlation:

Correlation

		Leverage	Z-Score
Pearson Correlation	Leverage	1.000	.171
	Z-Score	.171	1.000
Sig. (1-tailed)	Leverage	.	.392
	Z-Score	.392	.
N	Leverage	5	5
	Z-Score	5	5

Descriptive Statistics

	Mean	Std. Deviation	N
Leverage	.2140	.12054	5
Z-Score	.0963	.14985	5

Regression:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df 1	df 2	Sig. F Change
1	.171 ^a	.029	-.294	.13713	.029	.091	1	3	.783

a. Predictors: (Constant), Z-Score

CORRELATION AND REGRESSION ANALYSIS

Sr. No.	Dependent Variable	Independent Variable	Value of R	Value of R Square	Inference
<u>SUN PHARMA</u>					
1	Leverage	Z Score	0.171	0.029	Weak positive Correlation and Insignificant Impact

INTERPRETATION

Correlation Test:

The R-value: shows the direction and the strength of the correlation. The bigger the value the more significant it is. In this case, the Pearson correlation coefficient ($r = 0.171$) shows a very weak positive correlation between the variables under investigation. This means the null hypothesis is accepted. Thus there is no significant relationship between the Leverage and Z Score in case of Sun Pharma.

Regression Test:

The model summary illustrates the (R square) value which helps in explaining variance in the dependent variable (Leverage). Based on the results the (R square) value is 0.029 This means that the independent variables (Z Score) predicts the dependent variable (leverage) by 2.9%, thus, leaving out 97.1% ($100\% - 2.9\%$) unexplained. In a nutshell, this means that null hypothesis is accepted. Thus there is insignificant impact of Z Score on Leverage in case of Sun Pharma.

DR. REDDY LABORATORIES

Variables

1. Dependent Variable: Leverage Ratio
2. Independent Variable: Z Score

Hypothesis

H₀: There is no significant impact of Z score showing financial distress on leverage of selected pharmaceutical companies of India

H₁: There is significant impact of Z score showing financial distress on leverage of selected pharmaceutical companies of India.

Result Statistics:**Correlation:****Correlation**

		Leverage	Z-Score
Pearson Correlation	Leverage	1.000	.746
	Z-Score	.746	1.000
Sig. (1-tailed)	Leverage	.	.074
	Z-Score	.074	.
N	Leverage	5	5
	Z-Score	5	5

Descriptive Statistics

	Mean	Std. Deviation	N
Leverage	.2500	.04637	5
Z-Score	2.2014	.33400	5

Regression:**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.746 ^a	.557	.409	.03564	.557	3.771	1	3	.147

a. Predictors: (Constant), Z-Score

CORRELATION AND REGRESSION ANALYSIS

Sr. No.	Dependent Variable	Independent Variable	Value of R	Value of R Square	Inference
<u>DR. REDDY LABORATORIES</u>					
2	Leverage	Z Score	0.746	0.557	High positive Correlation and Insignificant Impact

INTERPRETATION

Correlation Test:

The R-value: shows the direction and the strength of the correlation. The bigger the value the more significant it is. In this case, the Pearson correlation coefficient ($r = 0.746$) shows a high strong positive correlation between the variables under investigation. This means the alternative hypothesis is accepted. Thus there is significant relationship between the Leverage and Z Score in case of Dr. Reddy Laboratories.

Regression Test:

The model summary illustrates the (R square) value which helps in explaining variance in the dependent variable (Leverage). Based on the results the (R square) value is 0.557 This means that the independent variables (Z Score) predicts the dependent variable (leverage) by 55.7%, thus, leaving out 44.3% (100% - 55.7%) unexplained. In a nutshell, this means that null hypothesis is accepted. Thus there is insignificant impact of Z Score on Leverage in case of Dr. Reddy Laboratories.

GLENMARK

Variables

1. Dependent Variable: Leverage Ratio
2. Independent Variable: Z Score

Hypothesis

H0: There is no significant impact of Z score showing financial distress on leverage of selected pharmaceutical companies of India

H1: There is significant impact of Z score showing financial distress on leverage of selected pharmaceutical companies of India.

Result Statistics:

Correlation:

Correlation

		Leverage	Z-Score
Pearson Correlation	Leverage	1.000	.373
	Z-Score	.373	1.000
Sig. (1-tailed)	Leverage	.	.268
	Z-Score	.268	.
N	Leverage	5	5
	Z-Score	5	5

Descriptive Statistics

	Mean	Std. Deviation	N
Leverage	.1420	.08526	5
Z-Score	2.2042	.34400	5

Regression:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.373 ^a	.139	-.148	.09135	.139	.485	1	3	.536

a. Predictors: (Constant), Z-Score

CORRELATION AND REGRESSION ANALYSIS

Sr. No.	Dependent Variable	Independent Variable	Value of R	Value of R Square	Inference
<u>GLENMARK</u>					
3	Leverage	Z Score	0.373	0.139	Weak positive Correlation and Insignificant Impact

INTERPRETATION

Correlation Test:

The R-value: shows the direction and the strength of the correlation. The bigger the value the more significant it is. In this case, the Pearson correlation coefficient ($r = 0.373$) shows a weak positive correlation between the variables under investigation. This means the null hypothesis is accepted. Thus there is no significant relationship between the Leverage and Z Score in case of Glenmark.

Regression Test:

The model summary illustrates the (R square) value which helps in explaining variance in the dependent variable (Leverage). Based on the results the (R square) value is 0.139 This means that the independent variables (Z Score) predicts the dependent variable (leverage) by 13.9fs%, thus, leaving out 86.1% (100% - 13.9%) unexplained. In a nutshell, this means that null hypothesis is accepted. Thus there is insignificant impact of Z Score on Leverage in case of Glenmark.

CIPLA

Variables

1. Dependent Variable: Leverage Ratio
2. Independent Variable: Z Score

Hypothesis

H0: There is no significant impact of Z score showing financial distress on leverage of selected pharmaceutical companies of India

H1: There is significant impact of Z score showing financial distress on leverage of selected pharmaceutical companies of India.

Result Statistics:**Correlation:****Correlation**

		Leverage	Z-Score
Pearson Correlation	Leverage	1.000	.210
	Z-Score	.210	1.000
Sig. (1-tailed)	Leverage	.	.367
	Z-Score	.367	.
N	Leverage	5	5
	Z-Score	5	5

Descriptive Statistics

	Mean	Std. Deviation	N
Leverage	.0880	.03493	5
Z-Score	2.5233	.22347	5

Regression:**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.210 ^a	.044	-.274	.03943	.044	.139	1	3	.734

a. Predictors: (Constant), Z-Score

CORRELATION AND REGRESSION ANALYSIS

Sr. No.	Dependent Variable	Independent Variable	Value of R	Value of R Square	Inference
<u>CIPLA</u>					
4	Leverage	Z Score	0.210	0.044	Weak positive Correlation and Insignificant Impact

INTERPRETATION

Correlation Test:

The R-value: shows the direction and the strength of the correlation. The bigger the value the more significant it is. In this case, the Pearson correlation coefficient ($r = 0.210$) shows a very weak positive correlation between the variables under investigation. This means the null hypothesis is accepted. Thus there is no significant relationship between the Leverage and Z Score in case of Cipla.

Regression Test:

The model summary illustrates the (R square) value which helps in explaining variance in the dependent variable (Leverage). Based on the results the (R square) value is 0.044 This means that the independent variables (Z Score) predicts the dependent variable (leverage) by 4.4%, thus, leaving out 95.6% (100% - 4.4%) unexplained. In a nutshell, this means that null hypothesis is accepted. Thus there is insignificant impact of Z Score on Leverage in case of Cipla.

TORRENT

Variables

1. Dependent Variable: Leverage Ratio
2. Independent Variable: Z Score

Hypothesis

H0: There is no significant impact of Z score showing financial distress on leverage of selected pharmaceutical companies of India

H1: There is significant impact of Z score showing financial distress on leverage of selected pharmaceutical companies of India.

Result Statistics:

Correlation:

Correlation

		Leverage	Z-Score
Pearson Correlation	Leverage	1.000	-.772
	Z-Score	-.772	1.000
Sig. (1-tailed)	Leverage	.	.063
	Z-Score	.063	.
N	Leverage	5	5
	Z-Score	5	5

Descriptive Statistics

	Mean	Std. Deviation	N
Leverage	.5180	.18926	5
Z-Score	2.4151	.43973	5

Regression:

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df 1	df 2	Sig. F Change
1	.772 ^a	.596	.461	.13893	.596	4.423	1	3	.126

a. Predictors: (Constant), Z-Score

CORRELATION AND REGRESSION ANALYSIS

Sr. No.	Dependent Variable	Independent Variable	Value of R	Value of R Square	Inference
<u>TORRENT</u>					
5	Leverage	Z Score	- 0.772	0.596	High Negative Correlation and Insignificant Impact

INTERPRETATION

Correlation Test:

The R-value: shows the direction and the strength of the correlation. The bigger the value the more significant it is. In this case, the Pearson correlation coefficient ($r = -0.772$) shows a very strong negative correlation between the variables under investigation. This means the alternative hypothesis is accepted. Thus there is significant relationship between the Leverage and Z Score in case of Torrent.

Regression Test:

The model summary illustrates the (R square) value which helps in explaining variance in the dependent variable (Leverage). Based on the results the (R square) value is 0.596 This means that the independent variables (Z Score) predicts the dependent variable (leverage) by 59.6%, thus, leaving out 40.4% ($100\% - 59.6\%$) unexplained. In a nutshell, this means that null hypothesis is accepted. Thus there is insignificant impact of Z Score on Leverage in case of Torrent.

CADILA

Variables

1. Dependent Variable: Leverage Ratio
2. Independent Variable: Z Score

Hypothesis

H0: There is no significant impact of Z score showing financial distress on leverage of selected pharmaceutical companies of India

H1: There is significant impact of Z score showing financial distress on leverage of selected pharmaceutical companies of India.

Result Statistics:**Correlation:****Correlations**

		Leverage	Z-Score
Pearson Correlation	Leverage	1.000	.213
	Z-Score	.213	1.000
Sig. (1-tailed)	Leverage	.	.366
	Z-Score	.366	.
N	Leverage	5	5
	Z-Score	5	5

Descriptive Statistics

	Mean	Std. Deviation	N
Leverage	.3640	.15405	5
Z-Score	2.4828	.81731	5

Regression:**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.213 ^a	.045	-.273	.17381	.045	.142	1	3	.731

a. Predictors: (Constant), Z-Score

CORRELATION AND REGRESSION ANALYSIS

Sr. No.	Dependent Variable	Independent Variable	Value of R	Value of R Square	Inference
<u>CADILA</u>					
6	Leverage	Z Score	0.213	0.045	Weak Positive Correlation and Insignificant Impact

INTERPRETATION

Correlation Test:

The R-value: shows the direction and the strength of the correlation. The bigger the value the more significant it is. In this case, the Pearson correlation coefficient ($r = 0.213$) shows a weak positive correlation between the variables under investigation. This means the null hypothesis is accepted. Thus there is no significant relationship between the Leverage and Z Score in case of Cadila.

Regression Test:

The model summary illustrates the (R square) value which helps in explaining variance in the dependent variable (Leverage). Based on the results the (R square) value is 0.045. This means that the independent variables (Z Score) predicts the dependent variable (leverage) by 4.5%, thus, leaving out 95.5% (100% - 4.5%) unexplained. In a nutshell, this means that null hypothesis is accepted. Thus there is insignificant impact of Z Score on Leverage in case of Cadila.

AUROBINDO

Variables

1. Dependent Variable: Leverage Ratio
2. Independent Variable: Z Score

Hypothesis

H0: There is no significant impact of Z score showing financial distress on leverage of selected pharmaceutical companies of India

H1: There is significant impact of Z score showing financial distress on leverage of selected pharmaceutical companies of India.

Result Statistics:

Correlation:

Correlations

		Leverage	Z-Score
Pearson Correlation	Leverage	1.000	-.886
	Z-Score	-.886	1.000
Sig. (1-tailed)	Leverage	.	.023
	Z-Score	.023	.
N	Leverage	5	5
	Z-Score	5	5

Descriptive Statistics

	Mean	Std. Deviation	N
Leverage	.6140	.22267	5
Z-Score	2.2619	.25349	5

Regression:**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.886 ^a	.784	.713	.11937	.784	10.919	1	3	.046

a. Predictors: (Constant), Z-Score

CORRELATION AND REGRESSION ANALYSIS

Sr. No.	Dependent Variable	Independent Variable	Value of R	Value of R Square	Inference
<u>AUROBINDO</u>					
7	Leverage	Z Score	- 0.886	0.784	High Negative Correlation and Significant Impact

INTERPRETATION

Correlation Test:

The R-value: shows the direction and the strength of the correlation. The bigger the value the more significant it is. In this case, the Pearson correlation coefficient ($r = -0.886$) shows a very strong negative correlation between the variables under investigation. This means the alternative hypothesis is accepted. Thus there is significant relationship between the Leverage and Z Score in case of Aurobindo.

Regression Test:

The model summary illustrates the (R square) value which helps in explaining variance in the dependent variable (Leverage). Based on the results the (R square) value is 0.784 This means that the independent variables (Z Score) predicts the dependent variable (leverage) by 78.4%, thus, leaving out 21.6% ($100\% - 78.4\%$) unexplained. In a nutshell, this means that alternative hypothesis is accepted. Thus there is significant impact of Z Score on Leverage in case of Aurobindo.

LUPIN

Variables

1. Dependent Variable: Leverage Ratio
2. Independent Variable: Z Score

Hypothesis

H0: There is no significant impact of Z score showing financial distress on leverage of selected pharmaceutical companies of India

H1: There is significant impact of Z score showing financial distress on leverage of selected pharmaceutical companies of India.

Result Statistics:**Correlation:****Correlations**

		Leverage	Z-Score
Pearson Correlation	Leverage	1.000	-.652
	Z-Score	-.652	1.000
Sig. (1-tailed)	Leverage	.	.116
	Z-Score	.116	.
N	Leverage	5	5
	Z-Score	5	5

Descriptive Statistics

	Mean	Std. Deviation	N
Leverage	.0400	.04183	5
Z-Score	3.3718	.31315	5

Regression:**Model Summary**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.652 ^a	.425	.234	.03661	.425	2.221	1	3	.233

a. Predictors: (Constant), Z-Score

CORRELATION AND REGRESSION ANALYSIS

Sr. No.	Dependent Variable	Independent Variable	Value of R	Value of R Square	Inference
<u>LUPIN</u>					
8	Leverage	Z Score	- 0.652	0.425	High Negative Correlation and Insignificant Impact

INTERPRETATION

Correlation Test:

The R-value: shows the direction and the strength of the correlation. The bigger the value the more significant it is. In this case, the Pearson correlation coefficient ($r = -0.652$) shows a high negative correlation between the variables under investigation. This means the alternative hypothesis is accepted. Thus there is significant relationship between the Leverage and Z Score in case of Lupin.

Regression Test:

The model summary illustrates the (R square) value which helps in explaining variance in the dependent variable (Leverage). Based on the results the (R square) value is 0.425 This means that the independent variables (Z Score) predicts the dependent variable (leverage) by 42.5%, thus, leaving out 57.5% (100% - 42.5%) unexplained. In a nutshell, this means that null hypothesis is accepted. Thus there is insignificant impact of Z Score on Leverage in case of Lupin.

4.1 Data collection:

The study is based on Quantitative data. The data collection is done from the secondary sources. Archival/secondary (Quantitative) – uses existing data to establish causal relationships between variables.

4.2 Data analysis:

Data analysis is based upon SPSS (Statistical Package for Social Sciences, version 20). To study on financial solvency of selected pharma companies of India on the basis of Altman Z score. A variety of statistical analysis is applied to the data. Analysis of Correlation and Regression is done on the proposed hypothesis. Usage of Correlation and regression is done for the comparison of data for the different variables like leverage & growth as well as the Z scores obtained by Altman model. The results have helped to get the outcomes showing the solvency position of the companies and so as to their market positions. Thus, the study is based on the secondary data available from Bloomberg as well as the NSE & BSE websites pertaining to these Indian companies.

5: FINDINGS & RECOMMENDATIONS

Findings on the basis of Hypothesis Testing:

Table 3

Sr. No	Name of the Company	Dependent Variable	Independent Variable	Value of R	Value of R Square	Inference
1	Sun Pharma	Leverage	Z Score	0.171	0.029	Weak positive Correlation and Insignificant Impact
2	Dr. Reddy Laboratories	Leverage	Z Score	0.746	0.557	High positive Correlation and Insignificant Impact
3	Glenmark	Leverage	Z Score	0.373	0.139	Weak positive Correlation and Insignificant Impact
4	Cipla	Leverage	Z Score	0.210	0.044	Weak positive Correlation and Insignificant Impact
5	Torrent	Leverage	Z Score	- 0.772	0.596	High Negative Correlation and Insignificant Impact

Sr. No	Name of the Company	Dependent Variable	Independent Variable	Value of R	Value of R Square	Inference
6	Cadila	Leverage	Z Score	0.213	0.045	Weak Positive Correlation and Insignificant Impact
7	Aurobindo	Leverage	Z Score	- 0.886	0.784	High Negative Correlation and Significant Impact
8	Lupin	Leverage	Z Score	- 0.652	0.425	High Negative Correlation and Insignificant Impact

Findings on the basis of Z-Score Analysis:

Table 4

COMPANY	Z-SCORE	ZONE
Sun Pharma	0.096296382	Bankruptcy Zone
Dr. Reddy Laboratories	2.201355995	Healthy Zone
Glenmark	2.204156073	Healthy Zone
Cipla	2.523252987	Healthy Zone
Torrent	2.415088955	Healthy Zone
Cadila	2.482776957	Healthy Zone
Aurobindo	2.261922864	Healthy Zone
Lupin	3.371796506	Safe Zone

General Findings:

SUN PHARMA:

The result statistics from the Average 5 years Z-Score of Sun Pharma which is **0.096296382** shows Bankruptcy Zone/Distress Zone as it falls below 1.8. On the basis of Z-Score the company's failure is certain and extremely likely and would occur probably within a period of few years. But, other factors affecting the leverage should also be analysed and considered by investors to make investment decisions as the regression results shows insignificant impact of Z-Score on Leverage of this Company. Management should take precautionary measures for the improvement of the company's position.

DR REDDY LABORATORIES:

The result statistics from the Average 5 years Z-Score of Dr Reddy Laboratories which is **2.201355995** shows Healthy Zone/Grey Zone as it falls between 1.8 and 2.99. On the basis of Z-Score the Company's financial viability is considered to be healthy. The failure in this situation is uncertain to predict. But, other factors affecting the leverage should also be analysed and considered by investors to make investment decisions as the regression results shows insignificant impact of Z-Score on Leverage of this Company. Also, management and investors both should act carefully as there is uncertainty prevailed despite it's in healthy zone.

GLENMARK:

The result statistics from the Average 5 years Z-Score of Glenmark which is **2.204156073** shows Healthy Zone/Grey Zone as it falls between 1.8 and 2.99. On the basis of Z-Score the Company's financial viability is considered to be healthy. The failure in this situation is uncertain to predict. But, other factors affecting the leverage should also be analysed and considered by investors to make investment decisions as the regression results shows insignificant impact of Z-Score on Leverage of this Company. Also, management and investors both should act carefully as there is uncertainty prevailed despite it's in healthy zone.

CIPLA:

The result statistics from the Average 5 years Z-Score of Cipla which is **2.523252987** shows Healthy Zone/Grey Zone as it falls between 1.8 and 2.99. On the basis of Z-Score the Company's financial viability is considered to be healthy. The failure in this situation is uncertain to predict. But, other factors affecting the leverage should also be analysed and considered by investors to make investment decisions as the regression results shows insignificant impact of Z-Score on Leverage of this Company. Also, management and investors both should act carefully as there is uncertainty prevailed despite it's in healthy zone.

TORRENT:

The result statistics from the Average 5 years Z-Score of Torrent which is **2.415088955** shows Healthy Zone/Grey Zone as it falls between 1.8 and 2.99. On the basis of Z-Score the Company's financial viability is considered to be healthy. The failure in this situation is uncertain to predict. But, other factors affecting the leverage should also be analysed and considered by investors to make investment decisions as the regression results shows insignificant impact of Z-Score on Leverage of this Company. Also, management and investors both should act carefully as there is uncertainty prevailed despite it's in healthy zone.

CADILA:

The result statistics from the Average 5 years Z-Score of Cadila which is **2.482776957** shows Healthy Zone/Grey Zone as it falls between 1.8 and 2.99. On the basis of Z-Score the Company's financial viability is considered to be healthy. The failure in this situation is uncertain to predict. But, other factors affecting the leverage should also be analysed and considered by investors to make investment decisions as the regression results shows insignificant impact of Z-Score on Leverage of this Company. Also, management and investors both should act carefully as there is uncertainty prevailed despite it's in healthy zone.

AUROBINDO:

The result statistics from the Average 5 years Z-Score of Aurobindo which is **2.261922864** shows Healthy Zone/Grey Zone as it falls between 1.8 and 2.99. On the basis of Z-Score the

Company's financial viability is considered to be healthy. The failure in this situation is uncertain to predict. But, other factors affecting the leverage should also be analysed and considered by investors to make investment decisions as the regression results shows insignificant impact of Z-Score on Leverage of this Company. Also, management and investors both should act carefully as there is uncertainty prevailed despite it's in healthy zone.

LUPIN:

The result statistics from the Average 5 years Z-Score of Lupin which is **3.371796506** shows Too healthy/Safe Zone as it falls into 3 and above category. On the basis of Z-Score the Company's financial viability is considered to be safest. Its financial health is viable and not to fall. Failure is last option to take place for this company. There is no uncertainty involved here. But, other factors affecting the leverage should also be analysed and considered by investors to make investment decisions as the regression results shows insignificant impact of Z-Score on Leverage of this Company. Also, management and investors both should be alert as despite it's in safe zone.

In General, apart from Z-Score, even other factors should be taken into account when deciding to invest in Pharma Companies. As, the above statistic results from the tests performed shows not much impact on leverage is predicted by Z-score. Thus, also Profit after Tax (PAT), Cash flows and other variables can be tested and considered.

6: DISCUSSION AND CONCLUSION

Based on the period of recent past scenario, past few years were tremendously showing the growth of the Indian Pharma industry. There is no cause for alarm as companies too are in the comfort zone. We have applied Z-Score here. Thus, this research on the basis of Z-score concludes that most of the companies lie in the middle phase which is Healthy/Grey Zone, whereas Sun Pharma & Lupin are in the extreme phases: the Bankruptcy Zone and Safe Zone respectively. So, Sun Pharma more precautionary measures must be taken for investment decisions and management's improvements. While for the other companies. As, compared to other researches previously where this model is applied on various companies, there were positive/ good results and the alternative hypothesis was proven to be correct. Whereas, here the null hypothesis has been true in most of the companies. This clearly implies that other variables have impact and that must be testified in case of Pharma industry for reaching to the conclusion and decision for investors. So outcome proved that most of the companies of the pharma sector are financially quite sound and healthy. Overall the project has used this model to predict the financial health of the companies so as the investors in this sector have their investments safe and the management also has no reason to worry as regards the financial health of these companies is concerned.

Future Research : There are so many models with which the results can be obtained thus, one can compare them as well to get the results and see whether they are alike or not. This, helps to determine the best suitable model and a confident response towards the industry approach. Researches have been done using each model differently but never compared. Thus, this is an area which one can experiment and explore.

Limitations:

The study is limited to the top 8 Pharma Companies in India.

The study has considered the data from past 5 years only i.e. 2013-2017.

The data used in this research is the secondary data, not the primary one and it has been primarily fetched from the financial statements of the annual reports of the company and other published data from the authenticated websites. So, there is a possibility of it being less reliable.

The study depends on single-variate than multi-variate comparisons i.e. Z-Score & Leverage instead of having more dependent variables.

Contribution: Apart from Altman Model, there are other models as well for measuring the Z-Score. They are: Springate Model and Fulmer Model. Also, the variables as compared to the narrow-study here taking only Leverage Ratio (Debt/Equity ratio), other researches have more than one variable as dependent variable to have wider-scope. The focus on horizontal scale by having 8 companies in this research is unique than previous studies only focusing on a particular company of that specific industry. The study has outlined the concept with the support of the past researches and literature reviews, highlighted key points, data methodology and project structure is briefly mentioned.

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APPENDIX

Z-Score Calculation Tables:

Sun Pharma

Financial Health Analysis based on Altman Z Score

Year	X1 = Working Capital / Total Assets	X2 = Retained Earnings/Total Assets	X3 = EBIT / Total Assets	X4 = Market Value of Equity /Book Value of Total Liabilities	X5 =Total Sales / Total Assets	Z Score
2013	-0.080958024	0.002511835	0.019646364	0.003068605	0.079078221	0.052119
2014	0.042877245	0.00338199	0.002179297	0.006057924	0.087936711	0.154951
2015	-0.14959855	0.002033085	-0.041632984	0.005531231	0.219752948	-0.09099
2016	-0.252589434	0.000450242	-0.072109561	0.017392498	0.581504661	0.051502
2017	-0.498860649	0.014595809	-0.003508358	0.025948225	0.88810673	0.313899
						0.481482
						Avg. Z-Score: 0.096296

Dr.Reddy Laboratories

Financial Health Analysis based on Altman Z Score

Year	X1 = Working Capital / Total Assets	X2 = Retained Earnings/Total Assets	X3 = EBIT / Total Assets	X4 = Market Value of Equity /Book Value of Total Liabilities	X5 =Total Sales / Total Assets	Z Score
2013	0.212876696	0.134186886	0.146232828	0.003529039	0.71529139	1.6432908
2014	0.330410808	0.637158809	0.169175627	0.005865729	0.68096912	2.5312834
2015	0.347879193	0.641030627	0.125176228	0.005177443	0.621888673	2.3529746
2016	0.30164715	0.656131818	0.110259944	0.004858295	0.59532624	2.2426602
2017	0.263619339	0.700283331	0.093906562	0.005040372	0.62691522	2.236571
						11.00678
						Avg. Z-Score: 2.201356

Cipla

Financial Health Analysis based on Altman Z Score

Year	X1 = Working Capital / Total Assets	X2 = Retained Earnings/Total Assets	X3 = EBIT / Total Assets	X4 = Market Value of Equity /Book Value of Total Liabilities	X5 =Total Sales / Total Assets	Z Score
2013	0.397764419	0.75774653	0.175047702	0.013971728	0.733611411	2.8578143
2014	0.207461312	0.768419994	0.140694831	0.012424946	0.747490715	2.5439802
2015	0.19615293	0.719437171	0.101368368	0.01057082	0.676659544	2.2601132
2016	0.230519619	0.77598013	0.114440861	0.010543964	0.813569087	2.560546
2017	0.242804933	0.809856592	0.0760507	0.010309331	0.711493142	2.3938112
						12.616265
						Avg. Z-Score: 2.523253

Glenmark

Financial Health Analysis based on Altman Z Score

Year	X1 = Working Capital / Total Assets	X2 = Retained Earnings/Total Assets	X3 = EBIT / Total Assets	X4 = Market Value of Equity /Book Value of Total Liabilities	X5 =Total Sales / Total Assets	Z Score
2013	-0.05389727	0.642404917	0.097785636	0.006972004	0.531599211	1.6931652
2014	0.088505032	0.68065699	0.118668713	0.006411969	0.559874598	2.0144544
2015	0.150766452	0.64370971	0.183023041	0.003546016	0.675813375	2.3640304
2016	0.186450918	0.725575274	0.172701303	0.002790465	0.616280415	2.4274155
2017	0.284178122	0.672002171	0.199231459	0.002015635	0.581225023	2.521715
						11.02078
						Avg. Z-Score: 2.2041561

Torrent

Financial Health Analysis based on Altman Z Score

Year	X1 = Working Capital / Total Assets	X2 = Retained Earnings/Total Assets	X3 = EBIT / Total Assets	X4 = Market Value of Equity /Book Value of Total Liabilities	X5 =Total Sales / Total Assets	Z Score
2013	0.283383652	0.479472836	0.209462017	0.012609863	0.863675786	2.5737887
2014	0.347450077	0.508966737	0.221184117	0.019530637	0.784828328	2.6559478
2015	0.215950621	0.402632117	0.122293416	0.012999283	0.580859931	1.8150535
2016	0.224328878	0.497039188	0.348652817	0.011610007	0.786525148	2.909095
2017	0.296982577	0.542682753	0.118621373	0.010510613	0.607667953	2.1215598
						12.075445
						Avg. Z-Score: 2.415089

Cadila

Financial Health Analysis based on Altman Z Score

Year	X1 = Working Capital / Total Assets	X2 = Retained Earnings/Total Assets	X3 = EBIT / Total Assets	X4 = Market Value of Equity /Book Value of Total Liabilities	X5 =Total Sales / Total Assets	Z Score
2013	0.026594595	0.506144144	0.67181982	0.01845045	0.67181982	3.6404108
2014	0.081898416	0.565023786	0.151479233	0.016402108	0.696881357	2.0959155
2015	0.094979148	0.602802082	0.19960749	0.013955897	0.745441164	2.3704173
2016	0.112213107	0.691881836	0.280594406	0.011475704	0.807658687	2.8437959
2017	0.079158897	0.589812988	0.058131325	0.009269149	0.3452215	1.4633452
						12.413885
						Avg. Z-Score: 2.482777

Aurobindo

Financial Health Analysis based on Altman Z Score

Year	X1 = Working Capital / Total Assets	X2 = Retained Earnings/Total Assets	X3 = EBIT / Total Assets	X4 = Market Value of Equity /Book Value of Total Liabilities	X5 =Total Sales / Total Assets	Z Score
2013	0.126415291	0.426397561	0.082513624	0.004266935	0.798821025	1.8223311
2014	0.202541417	0.464489075	0.17718555	0.003399207	0.837908561	2.3179948
2015	0.235079035	0.521259784	0.189748951	0.0028555	0.798202209	2.4379456
2016	0.193450192	0.541745056	0.170930703	0.004657174	0.744458663	2.3019076
2017	0.188275748	0.64329582	0.167287367	0.004498991	0.748142506	2.4294353
						11.309614
						Avg. Z-Score: 2.2619229

Lupin

Financial Health Analysis based on Altman Z Score

Year	X1 = Working Capital / Total Assets	X2 = Retained Earnings/Total Assets	X3 = EBIT / Total Assets	X4 = Market Value of Equity /Book Value of Total Liabilities	X5 =Total Sales / Total Assets	Z Score
2013	0.267501025	0.675189086	0.244660241	0.012704148	1.014205767	3.095473
2014	0.407136753	0.782974352	0.356756935	0.010192114	1.063166556	3.8313079
2015	0.435343046	0.811961798	0.291812739	0.008167003	0.902376607	3.529417
2016	0.372529351	0.830488461	0.270026145	0.006330368	0.801248794	3.3058524
2017	0.374555698	0.823045858	0.234144095	0.005060443	0.719489429	3.0969322
						16.858983
						Avg. Z-Score: 3.3717965