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RESEARCH ARTICLE

Financial Distress and its Determinants on the Non- Financial Sector of KSE-100 Index Evidence from Chemical & Pharmaceutical Sector of Pakistan

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ABSTRACT

Prediction of Financial distress and its determinants is one of the core areas of finance; no one can deny its significance. This paper evaluates the determinants of financial distress of twenty companies of chemical and pharmaceutical sector of Karachi Stock Exchange from 2005 to 2014. Determinants like liquidity, profitability, efficiency and solvency were identified. Altman Emerging Market Z score model is used to predict the performance of chemical firms of Pakistan. The result shows that all firms are in the healthy area of the scale except GLAXOSMITHKLINE, ITTEHAD CHEMICAL Ltd and SITTARA CHEMICAL. These firms shows continuously downward trend which provides a warning signal to companies' management. An empirical result also shows that liquidity, profitability, leverage and solvency are positively correlated.

Key words: *Financial Distress, EM Z-score, Liquidity, Profitability, Leverage, Solvency, Jel Classification: G, G01, G3, G33*

INTRODUCTION

Corporate financial distress is very important and relevant topic when we talk about global financial crises. Financial distress refers to the inability to pay obligations (e.g. debt) when due (Beavor, 2011).In the economic development of any country, chemical sector plays a vital role. Potential of chemical sector has not yet utilized by Pakistan. It is difficult to agree on a common definition of the chemical industry across countries because of the wide variety of the products. In specific, fibers, rubbers and plastic handling can be either included or excluded.The major contributor to the national economy is the chemical industry, playing both direct and indirect role all over the world. In Pakistan many segments of chemical industry remains neglected while some segments of chemical industry have received due attention. The investment in this field is estimated to be Rs. 550-600 billion (jatoi, 2015). Pakistan has already suffers because of lack of investment in basic petrochemical and chemical industry. The market of Pakistan is expanding gradually for industrial chemicals though it has a less developed chemical industry than India.

In Pakistan, chemical industry is extensive, in organized and unorganized sector. Pakistan has an efficient system for export and import of chemical products which are then converted into 70,000 products, for industry as well as the goods of consumer that people depend on their daily life. But unluckily, in Pakistan, imports are much higher than the export. Pakistan needs to boost its chemical exports which would really help in the economy of Pakistan (jatoi, 2015). Basic chemicals, life sciences, consumer products and speciality chemical are the four types of modern chemical industry. Constant scientific and technological advances and breakthroughs are the basic reason for chemical industry outstanding success, which have led to the expansion of new products and procedures.

Exports from Pakistan are mainly the goods produced with low technology, feed stocks including resources like cotton, textile, readymade garments and leather. 60% of total export includes these

types of products. The contribution of average and high products based on technology containing chemicals, petrochemicals and other manufactured products in exports are very small. These types of products contribute between 8-10% of total exports from Pakistan. Pakistan retains a very high compulsion of imports of goods which are high value added, and are expensive. About 40% of total import with the value of Rs. 412688 million in 2015 is chemicals, medicines, drugs, dyes, capital plant, equipment and machinery (Jatoi, 2015).

The rank of Pakistan is 16 in BMI's Asia Pacific Business Environment (BERs), According to a recent Healthcare report. The rank of Pakistan is 75 out of 83 surveyed markets, when observed on International basis. Due to instability and other happenings, Pakistan is facing issues but due to its strategic importance foreign allies of Pakistan are expected to do everything they can to ensure its stability. However, foreign drug makers are also anticipated to continue to take a cautious stance regarding direct investment in the country.

OBJECTIVE OF THE STUDY

The main objective of the study is:

1. To investigate the determinants of financial distress in the chemicals and pharmaceutical sector of Pakistan.
2. Present the tentative relationship between leverage and financial distress in chemical sector of Pakistan economy.

SIGNIFICANCE OF THE STUDY

This research is of importance to the chemical sector in Pakistan, as it extends the bankruptcy measurement techniques that currently exist in the field. Furthermore, it provides direct empirical evidence on a subject which have not been studied comprehensively before, which should be considered as knowledge oriented contribution of this study, as it fills an important gap. As a practical involvement, the anticipated bankruptcy prediction model in this study will act as an early warning tool to predict the financial distress faced by the chemical sector in Pakistan.

LITERATURE REVIEW

Hussain et al. (2014) investigated whether Altman z-score model predicted correctly business failures of textile companies in Pakistan? The author examined 21 textile companies (12 non-failed and 9 failed) of Pakistan. Data range was from 2000 to 2010. Financial distress was used as dependent variable and working capital to total assets, retained earnings to total assets, EBIT to total assets, market value of equity to book value of total debt & sales to total assets as independent variables. Altman's z-score model was used to predict the business failure of textile companies of Pakistan. Empirical result showed that Altman z-score could identify stable and failed companies by 81% to 48% from 1-4 years and the accuracy rate of the model was very high.

Khaliq et al. (2014) studied to identify financial distress of government linked companies of Malaysia. They took the sample of 30 government linked listed companies of Bursa Malaysia. Data range of the sample was from 2008-2012. The author used financial distress Z-score as dependent variable and current ratio and debt ratio as independent variable to test the relationship of financial distress with current ratio and debt ratio. They used Altman Z-score statistical technique to predict financial distress. Findings showed that there is significant relationship between both variables and Z-scores that determine financial distressed of GLCs.

Mizan&Hossain (2014) studied about financial soundness of cement industry of Bangladesh by using Z-score. All listed cement firms of Bangladesh were taken by the author. Data range was from 2006 to 2010. They used financial distress as dependent variable and net working capital to total assets, accumulated retained earnings to total assets, EBIT to total assets, market value of equity to book value of debt and sales to total assets as independent variables. One-way Anova was used to analyze the performance of company fundamentals. Altman's Z-score model was used by the author to predict the financial soundness of cement industry. Result showed that two cement firms (HCL & MCL) had higher z-score than benchmark (2.99) and were financially sound.

Rizwan (2013) studied the determinants of financial distress evidence from KSE 100 index. They took the sample from Pakistan. Time period for observation ranges from 2003-2010. They used

financial distress as dependent variable and liquidity, profitability, efficiency, leverage and solvency as independent variable. The author used panel data to identify different determinants of financial distress. First of all the author used correlation matrix to check the correlation between the financial distress and these variables then he used regression model to check the dependency of one variable over others. The author used Z-score model to identify the financial distress in companies. Result showed that current ratio, profitability, solvency and leverage are negatively correlated while efficiency is positively correlated.

Shahzad et al. (2013) studied about the assessing the financial failure of sugar sector listed companies of Karachi stock exchange by using Z-score and current ratio. The author used the data of 35 sugar sector listed companies of Pakistan. Data range of the author selected was from 2009 to 2010. The author used financial distress as dependent variable and working capital to total asset, retained earnings to total assets, EBIT to total assets, market value equity to book value of total debt, sales to total assets and current assets to current liabilities as independent variables. The author followed ex-post-facto design or inductive reasoning method. The author used Altman z-score model and current ratio for the prediction of the financial health of the sugar sector companies listed at Karachi stock exchange. Paired sample t-test was used to assess the significance difference in z-score and current ratio. Total population sampling technique was used by the author. The findings showed that current ratio and z-score was significantly different between financially failed and non-failed companies in 2010 and was not significant in 2009. They also concluded that there were a positive correlation between Altman's z-score model and current ratio and there were also some financially distressed companies among sugar sector listed companies.

SOURCE OF DATA

Secondary data was employed for the purpose of this study and data was collected from 'State bank of Pakistan's Balance Sheet Analysis' a publication of State Bank of Pakistan, website of Karachi Stock Exchange, Islamabad Stock Exchange, Lahore Stock Exchange and also from the website of individual firms of chemical and pharmaceutical sector.

DATA RANGE

Data range that I used in my study was from 2005 – 2014.

TARGET POPULATION

The population for this study was twenty major chemicals and pharmaceutical companies of Pakistan listed by KSE i.e. Abbott Laboratories (Pakistan) Ltd, Colgate-Polmolive (Pakistan) Ltd, Dawood Hercules Chemicals Ltd, Descon Chemicals Ltd, Engro Corporation Ltd, Fauji Fertilizer Bin Qasim Ltd, Fauji Fertilizer Company Ltd, Ferozsons Laboratories Ltd, Glaxosmithkline (Pakistan) Ltd, Highnoon Laboratories Ltd, ICI Pakistan Ltd, Ittehad Chemicals Ltd, Leiner Pak Gelatine Ltd, Linde Pakistan Ltd, Nimir Industrial Chemicals Ltd, Pakistan Gum and Chemicals Ltd, Pakistan PVC Ltd, Shaffi Chemicals, Sittara Chemicals, Wah Nobel Chemicals for the prediction of determinants financial distress.

ECONOMETRIC MODEL

Altman was the first person who challenged the worth of univariate analysis and had investigated a new statistical tool of MDA to draw a linear combination of most significant ratios that can able to best discriminate between the two group of financially healthy and non-healthy companies. By using this technique, following function was developed and with the Z as overall score.

$Z'' = 3.25 + 6.56(X1) + 3.26(X2) + 6.72(X3) + 1.05(X4) + 1.00(X5) + e$

Where cut off scores reflect

Bankrupt firms < 1.10

Non-bankrupt firms > 2.60

Grey area = 1.10 – 2.60

Where

Z = Financial Distress

X1 = W.C/T.A
X2 = R.E/T.A
X3 = EBIT/T.A
X4 = M.V.E/T.L
X5 = S / T.A
e = error term

First of all financial distress, X1, X2, X3 and X4 are calculated separately one by one. Altman's Z-score model was used to calculate the financial distress. Altman is considered as the pioneer of who started work on financial distress (Rizwan, 2013). Z-score model is based on five financial ratios. These ratios are used for the measurement of financial distress. Ratios were calculated from total assets, total liabilities, market value of companies for publicly hold or book value for privately hold, retained earnings and EBIT (earnings before interest and tax). First ratio is working capital to total assets which is used to measure liquidity and this ratio is used to meet day to day business needs. Second ratio is retained earnings to total assets which are used to measure the profitability of the financial institutions. Third ratio is EBIT to total assets which show the earning capacity of the financial institutions with respect to its assets. This ratio tells us how much part of total assets belongs to EBIT. Fourth ratio is market value of equity to total liabilities for publicly hold companies or book value to total liabilities for privately a hold company which is very important ratio for evaluation net worth of companies in the market. Fifth ratio is sales to total assets which tells the growth of the company but we exclude fifth ratio because this ratio is used in the original Altman's Z-score model (1968) but we use revised Altman's Z-score model (2002) in which Altman exclude the fifth ratio from his model for the prediction of financial distress.

HYPOTHESIS

To check the impact of distress empirically, we construct following hypothesis:
H1: there is a positive relationship between liquidity and financial distress.
H2: there is a positive relationship between profitability and financial distress.
H3: there is a positive relationship between efficiency and financial distress

VARIABLE

I was able to identify my dependent and independent variable after discussing and reading the different researcher in literature. My dependent variable is financial distress and independent variables are liquidity, profitability, efficiency, leverage and solvency.

Dependent Variable:
Financial distress:
The situations where the companies are unable to pay their obligations are known as financial distress. In this situation liabilities of the companies exceeds its assets and as a result companies default.
Independent variables:
W.C/T.A:
Working capital is calculated by current assets of company less its current liabilities and measures the efficiency of the company and its short-term financial health. The company is able to meet its short-term obligations if company's working capital is positive and negative working means that it could have problems paying back creditors in the short-term, ultimately forcing it into bankruptcy.
R.E/T.A:
The amount of reinvested earnings or losses is measured by this ratio, which reflects the magnitude of the company's leverage. If RA/T.A is low it means that the company is funding assets by borrowings instead of through retained earnings which again increases the risk of bankruptcy.
EBIT/T.A:
It is measured by earnings before interest and tax (EBIT) to total assets. This ratio evaluates the firm's ability to generate profit from its assets before deducting interest and taxes.

MVE/BVD:

This ratio explains that how much a company's market value could decline before liabilities exceeded assets on the financial statements. Dissimilar, the other ratio components used by the Z-score, market value is not based purely on fundamentals-the firm's market capitalization is an indication of the market's confidence in a company's financial position. The chances of surviving the firm are higher if the market capitalization of a firm is higher.

S / T.A

This ratio is measured by sales to total assets. This ratio explains the profitability of the firm or company. This ratio evaluates the ability of the firm to generate profit from its assets.

RESULTS AND DISCUSSIONS

According to the study conducted by Oathman (2013) we used modified version of emerging market Z-Score model (Altman, 2002) to assess the financial health of companies in the analysis. The model is as follows:

Z" = 6.56(X1) + 3.26(X2) + 6.72(X3) + 1.05(X4) + 3.25

A constant term of +3.25 was added by Altman (2002) so as to regulate the scores with a score of zero equated to a default rated bond (Altman, 2002). In other words, +3.25 is a scale factor that associates 0 to a benchmark typical of other organizations that have defaulted on their corporate bonds. The banks are considered as having a low probability of bankruptcy whose score are greater than or equal to 2.6, the banks whose score below 1.1 is considered as having a high probability of bankruptcy and the banks having score between 1.1 and 2.6 is in the grey area. Banks are considered an uncertain credit risk with Z-score within this range and should be carefully observed before it is too late for any remedial or recovery action by the relevant authority.

Emerging Market Z- Score for all banks:

SECTOR	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
ABBOT LABO-RATAR-IES	3.63	3.62	3.66	3.79	3.60	3.63	3.64	3.79	3.81	3.76
COLGA-TE – POLMO-LIVE	4.35	4.60	4.09	4.35	4.16	4.15	4.08	3.85	-195	-187
DHCL	4.76	5.95	5.53	4.85	5.22	4.85	5.21	5.32	5.24	4.91
DCL	4.67	4.68	4.59	4.29	2.89	2.71	3.19	3.23	3.33	3.53
ECL	4.43	4.31	4.10	4.06	4.23	3.92	3.86	3.73	3.47	3.41
FFBQL	4.05	4.05	4.22	4.24	3.99	4.47	3.86	3.93	3.99	3.67
FFCL	4.78	5.32	4.06	4.07	4.00	3.89	3.86	3.81	3.80	3.78
FLL	4.36	4.60	4.64	4.58	3.91	3.93	3.68	3.39	3.17	2.88
GPL	4.18	4.83	5.22	5.35	3.97	2.96	1.92	1.04	0.25	-0.93
HLL	8.03	7.27	4.43	4.36	4.18	4.22	3.82	3.38	2.95	2.50
ICI Pak Ltd	3.63	3.62	3.66	3.79	3.60	3.63	3.64	3.79	3.81	3.76
ICL	4.35	4.60	4.09	4.35	4.16	4.15	4.08	3.85	-194.5	-186.6
LPGL	4.76	5.95	5.53	4.85	5.22	4.85	5.21	5.32	5.24	4.91
LPL	4.67	4.68	4.59	4.29	2.89	2.71	3.19	3.23	3.33	3.53
NICL	4.44	4.31	4.11	4.07	4.24	3.92	3.86	3.74	3.47	3.42
PGCL	4.06	4.05	4.22	4.24	3.99	4.48	3.87	3.93	3.99	3.67
PPL	4.79	5.32	4.07	4.08	4.00	3.89	3.86	3.82	3.80	3.79
SHAFI CHEMICAL	4.36	4.60	4.64	4.58	3.91	3.93	3.69	3.39	3.18	2.88
SITARA CHEMICAL	4.18	4.83	5.23	5.35	3.97	2.97	1.92	1.05	0.26	-0.93
WNC	8.03	7.28	4.44	4.36	4.19	4.22	3.82	3.38	2.95	2.50

The data from 2005 to 2014 was reconstructed in order to calculate the Z-score for each companyand the EM Z-score for each company as shown in above Figure. It can be concluded that all companies of chemical sector falls into the healthy area of the scale because EM z-score of these companies exceeded the cut-off value of 2.6 but shows continuously downward trend in each

company. In 2013 and 2014 Colgate-Polmolive and ICL is in distressed area. In 2011 to 2014 Glaxosmith and Sitara Chemical is continuously is in distressed area. This empirical evidence provides the warning signal to the management of the companies of chemical sector and the parties which are related in the planning, controlling and decision making processes. Therefore, this concludes that the recent global financial crises somewhat influenced the performance of the chemical industry of Pakistan. On the basis of these results relevant authorities could take early remedial actions to reduce the likelihood of bankruptcy.

DESCRIPTIVE STATISTICS

A technique used to check the characteristics of data is known as descriptive statistics. It is based on measure of measure of dispersion and measure of central tendency. Central tendency is measured by mean, median and mode.

	Minimum	**Maximum**
Predicted value	-197.737823	4.850932

The minimum and maximum value of data is -197.737823 and 4.8509 respectively.

Descriptive Statistics:

	Mean	Std. Deviation	N
Y = FINANCIAL DISTRESS	-10.867	46.3506067	200
X1 = working capital / total assets	.132785	.0875703	200
X2 = retained earning / total assets	-3.678145	14.2287666	200
X3 = EBIT / total assets	.009607	.0222777	200
X4 = market value of equity / total liabilities	.138751	.3660716	200
X5 = sales / total asset	.1388	.3661	200

This table provides the mean and standard deviation for each group's combination of the independent variables and number of observations.

Mean value of financial distress, Liquidity, profitability, leverage and solvency is -10.867, .132785, -3.678145, .009607, .138751 and .1388 and 200 observations for all variables were used in the regression analysis. Standard deviation of financial distress, liquidity, profitability, leverage and solvency is 46.3506067, .0875703, 14.2287666, .0222777, -3660716 and .3661.

The deviation indicates as to how much of these values deviate from its mean. Higher deviation indicates inconsistency in values.

Descriptive Statistics:

	N	Skewness		Kurtosis	
	Statistic	Statistic	Std. Error	Statistic	Std. Error
Y = FINANCIAL DISTRESS	200	-3.734	.172	12.077	.342
X1 = working capital / total assets	200	.440	.172	-.392	.342
X2 = retained earning / total assets	200	-3.735	.172	12.081	.342
X3 = EBIT / total assets	200	-2.549	.172	10.248	.342
X4 = market value of equity / book value of debt	200	7.748	.172	68.165	.342
X5 = sales / total assets	200				
Valid N (listwise)	200	7.75		68.17	.342

Skewness indicates the shapes of the data. If the skewness is 0, the data is normally skewed. Based on these results, financial distress, liquidity, profitability and leverage is negatively skewed or skewed left but liquidity because the value of financial distress, profitability and leverage is -3.734, -3.735, and -2.549 respectively which is less than 0 and solvency and the last ratio which also indicates profitability is positively skewed or skewed right because the value of solvency is 7.748 and 7.75 greater than 0.

Kurtosis indicates the peak of the curve. Normal distribution of kurtosis is 3. Result shows that financial distress, profitability, leverage and solvency is leptokurtic because the values are 12.077, 12.081, 10.248, 68.165 and 68.17 respectively which is more than 3 while liquidity is platykurtic because the value is -.392 which is less than 3.

CORRELATION ANALYSIS

Correlation indicates the association amongst the variables. Higher correlation values indicate the higher degree of association while lower correlation shows the lower degree of correlation. The value of correlation falls between -1 to 1. -1 and 1 indicates perfect negative correlation and perfect positive correlation respectively while 0 shows no correlation at all.

Table: Correlations

		Y = FINANCIAL DISTRESS	X1 = working capital / total assets	X2 = retained earning / total assets	X3 = EBIT / total assets	X4 = market value of equity /total asset	X5=sale/total asset
Pearson Correlation	Y = FINANCIAL DISTRESS	1.000	-.096	1.000	-.015	.105	.105
	X1 = working capital / total assets	-.096	1.000	-.109	.196	.009	.009
	X2 = retained earning / total assets	1.000	-.109	1.000	-.021	.096	.096
	X3 = EBIT / total assets	-.015	.196	-.021	1.000	.095	.095
	X4 = market value of equity /total asset	.105	.009	.096	.095	1.000	1.000
	X5=sale/total asset	.105	.009	.096	.095	1.000	1.000
Sig. (1-tailed)	Y = FINANCIAL DISTRESS	.	.089	.000	.416	.070	.070
	X1 = working capital / total assets	.089	.	.063	.003	.450	.450
	X2 = retained earning / total assets	.000	.063	.	.382	.088	.088
	X3 = EBIT / total assets	.416	.003	.382	.	.091	.091
	X4 = market value of equity /total asset	.070	.450	.088	.091	.	.000
	X5=sale/total asset	.070	.450	.088	.091	.000	.
N	Y = FINANCIAL DISTRESS	200	200	200	200	200	200
	X1 = working capital / total assets	200	200	200	200	200	200
	X2 = retained earning / total assets	200	200	200	200	200	200
	X3 = EBIT / total assets	200	200	200	200	200	200
	X4 = market value of equity /total asset	200	200	200	200	200	200
	X5=sale/total asset	200	200	200	200	200	200

Regression analysis is used to infer the causal relationship between the independent and dependent variable. "R" column represents the value of *multiple correlation coefficients.* R value is the measure of the quality of the prediction of the dependent variable. R2 indicates the fitness of the model. The value of R2 also called the coefficient of determination. It indicates the proportion of variance in the dependent variable that can be explained by the independent variables. Adjusted R square explains the accurately report your data. Durbin Watson is used to interpret whether auto correlation exist or not.

Table: Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Sig. F Change	Durbin Watson
1	0.860[a]	0.739	0.725	.24988	.000	1.228

a. Predictors: (Constant), X5salestototalasset, X1 = working capital / total assets, X2 = retained earning / total assets, X3 = EBIT / total assets
b. Dependent Variable: Y = Financial Distress

Multiple regressions were run to predict financial distress from liquidity, profitability, solvency and leverage. The result shows that the value of R is 86% which indicates a good value of prediction. R2 is 0.73 which means that 73% of the variance of financial distress is accounted for by the variables in the model. Adjusted R square interpret that 72% of the variability of financial distress is accounted for by the model, even after taking into account the number of predictor variables in the model. Durbin Watson test is applied to detect the autocorrelation. The value of Durbin Watson is 1.228 which means autocorrelation exist in model or there is positive serial correlation of the residual.

CONCLUSION

The core objective of this study is to find the determinants of financial distress of non-financial companies or chemical sector of Karachi Stock Exchange and to introduce the EM Z-score developed by Altman (2002) as a valuable analytical tool in finding the possible reasons that may lead to deterioration of the performance of companies to the Pakistani chemical sector. Data from 20 companies were collected and the result significantly shows that all companies fall in financially healthy and sound criteria except Glaxosmithkline (Pakistan) Ltd, Ittehad Chemicals Ltd and Sitara Chemicals. The EM Z-score of those companies which falls in healthy criteria are well above the cut- off point of 2.6 and the EM Z-score of those firms which falls in non-healthy criteria are below the 1.1. Although mostly companies fall in healthy criteria but empirical result shows continuously declining trend. Based on empirical results, it also indicates that liquidity is negative correlated while profitability, leverage and solvency are positively correlated. This empirical result is important for the chemical sector since it provides the warning signal of the management of this sector as well as the parties associated in the planning, controlling and decision making processes. If the descending trend continuous, the management as well as the relevant parties could take early remedial actions to reduce the likelihood of bankruptcy. However based on presented results, it can be concluded that companies should concentrate on their past performance in order to predict their future position to sustain themselves in the chemical sector.

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