

# Can Altman Z-score Model Predict Business failures in Pakistan? “Evidence from Textile companies of Pakistan”

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## Abstract

Prediction of bankruptcy is one of the challenging tasks for every sort of organizations in different industries in the world. Asian countries like china India and Sri Lanka this model has been used several times. Pakistan Textile industry takes large part in economic development of Pakistan. But on the other hand Pakistan Textile industry is facing many problems like problem of Supply, financial constrains, electricity and gas shortage etc. This paper investigates whether Altman Z-score model can predict correctly company Failures in Pakistan? The empirical analysis examines 21 textile companies (12 stable companies and 9 bankrupted companies) listed in the Karachi stock exchange, during the period 2000 to 2010. In this study bankruptcy predications of Z score model is investigated for four years prior to bankruptcy. In this paper overall results of Z score model was also quite accurate. These results for bankrupted, non bankrupted shows that Altman model can give good predictions for textile sector of Pakistan. This is in line with other findings. The empirical results are interesting since they can be used by company management for financing decisions, by regulatory authorities and by portfolio managers in stock selection.

**Keywords:** Z-score model, company, business failure, bankruptcy

## 1. INTRODUCTION

Prediction of bankruptcy is one of the challenging tasks for every sort of organizations in different industries in the world. Many users of financial statements like banks, credit rating agencies, underwriters, auditors and regulators analyze company's financial position for their interest. For this purpose different approaches are used. During monetary and economic crisis selection of model for bankruptcy prediction is very important, For example when bank financially assists an organization bank predict risk of bankruptcy of that organization prior to financial help. Edward Altman in 1968 developed a well-known model for bankruptcy prediction called Altman Z score model. This model also called multiple discriminant analysis model (MDA). Altman study in 1968 presented that mostly bankruptcy occurs due to poor management, not due to economic recession, severe competition. Altman used 66 firms in his first study, half of which were bankrupted. He compared bankrupted organizations with non bankrupted organizations. He selected five best ratios among a large number of ratios for bankruptcy forecasting. His study results showed 95% accuracy one year prior and 72% two year prior to failure. In 1983 Altman used model for private organizations showed 93% accuracy rate one year prior and 73% accuracy two years prior to failure. One can rely on both versions of Altman models of bankruptcy. After Altman many people used this model in various countries of the world (Altman, 1968). In most of the countries in the world like china India and Sri Lanka this model has been used several times as shown in literature review.

In Pakistan this model has not been extensively used. This research is an attempt to investigate financial failure of companies in Pakistan. In this study companies have been selected from Textile sector listed in KSE. Study is based on available data. The main objective of this study is to find that up to what extent Altman Model predicts company's failure in Textile sector of Pakistan. Model is applied on two types of organizations. 1: Financially stable companies. 2: Bankrupted companies.

Results of the study shows for bankrupted, stable companies individually as well as combined. Conclusions and recommendations will be provided on the bases of results of the study.

### 1.1. Hypothesis

This study is commenced on prediction of business failures in Pakistan. For this purpose two hypotheses have been generated.

**H<sub>0</sub>:** Altman Z score model cannot predict business bankruptcy in Pakistan.

**H<sub>1</sub>:** Altman Z score model can predict business bankruptcy in Pakistan.

Pakistan Textile industry is used as an evidence for this study. In 1947 there were only 3 cotton mills in Pakistan. But today Pakistan textile industry is in position that we are exporting cloth to other countries. Textile takes large part in economic development of Pakistan. It gives 38% jobs opportunities of total industry. It contributes 8.5% to total GDP. There is 31% of total investment in textile industry. 7% of total market capitalization is from textile. It provides Rs. 40 billion annual market capitalization. Financial institutions earn 4 billion interests per annum fro textile industry. Presently in Pakistan 345 spinning units, 53 composite units, 44

weaving units are registered with APTMA. Textile industry is facing many problems like Supply of raw cotton is not fulfilling the requirement level. Textile industry is facing financial constrains. Like other industries textile industry is also facing problem of electricity and gas shortage. Due to these and many other problems the industry performance for previous 10 years is not like it should have. In this era textile industry is struggling for survival only.

### **MATERIAL AND METHOD**

The present study is an attempt to explore “can Altman Z-score model predict business failures in Pakistan? Evidence from textile companies of Pakistan” Applications of Altman Model in prediction of company’s failure in Textile sector of Pakistan. This chapter illustrated the methodological ways that will be used in concluding the study. It is mostly comprised of the following sub steps within the domain of major steps known as research design.

#### **Data sources and Description**

This study is based on secondary data that have been collected from different published resources. The financial data have been taken from KSE, Security Exchange commission of Pakistan (SECP) and sample listed company’s websites. The financial data used is annual that covers the period of (2000 to 2010). The data was analyzed quantitatively. Microsoft excel was used as a tool for analysis.

#### **Scope of study**

Scope of the study is limited only to predict bankruptcy of sampled textile companies listed in Karachi Stoke Exchange Pakistan. There are various ways to predict bankruptcy of companies but in this research Altman Z score model (1968) is selected for predictions.

#### **Sample Size**

Many companies in different sectors are listed in KSE but this study is based on available data only. For analysis 21 companies from textile sector have been purposively selected as sample. From which 12 companies are none bankrupted and 9 are bankrupted organizations. Lists of sampled companies are given in the annexure at the end of study.

#### **Model explanation**

To find the financial failure of listed companies a prominent model developed by Altman in (Z score model) is used. Model contains 5 ratios given below.

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 0.999X_5$$

Where:

$X_1$  = Working capital/Total assets,

$X_2$  = Retained earnings/Total assets,

$X_3$  = EBIT/Total assets,

$X_4$  = Market value of equity/Book value of total debt,

$X_5$  = Sales/Total assets, and

Z = cumulative Values.

According to this model:

If value of Z scores exceeds 2.99 the firms are to be considered in the safe zone, and there is low risk to default. And firms having Z scores between 1.81 and 2.99 are deemed to be in the intermediate or gray zone and having high risk of default. While Firms with Z scores value below 1.81 signifies as filled firms or firms in distressed zone.

In this model variables  $X_1$ ,  $X_2$ ,  $X_3$ ,  $X_4$  and  $X_5$  can be described as:

$X_1$  =  $X_1$  can be calculated by subtracting current liabilities from current assets. It is the relationship between liquid assets and total assets of balance sheet.

$X_2$  = for calculation of  $X_2$  we divide retained earnings or losses on total assets. Retain earnings are the company earnings or losses throughout its existence time period.

$X_3$  =  $X_3$  indicates operating profit before interests and taxes (EBIT) to total assets. EBIT is the real profit of the organization.

$X_4$  = It the result of Market value of equity to book values of liabilities. Market value of equity comes from multiplication of outstanding shares by market price of share.

$X_5$  = It shows the degree of total assets used for documented sales i.e. sales divide by total assets.

#### **Analysis and Results**

For analysis related data is extracted from financial statements and ratios of model like  $X_1$ ,  $X_2$  .....  $X_5$  and Z scores are calculated through MS Excel. For selected companies ratios are calculated for four years. Calculations and results will be examined for bankrupted companies, stable companies and at last combine results for both. The model validity is based on the percentage results of the cases. The percentage results for bankrupted companies must come below 1.81 while for stable companies it should above 1.81. Results come opposite to the given range will be considered as Type 2 error.

**Table 4.1 Calculations for bankrupted Organization**

Company Symbols	Years	X1	X2	X3	X4	X5	Z- Scores
STL	-1	-1.45646	-1.113	-0.03424	0.395271	8.622262	5.35425798
	-2	-1.12727	-0.36244	0.010663	0.199033	5.167226	4.7492182
	-3	-0.12609	-0.05882	0.007727	0.223263	3.687348	3.72607034
	-4	-0.17871	0.065567	-0.09579	0.217571	1.344941	1.23557647
KCML	-1	0.02599	0.01436	-0.12624	0.151864	0.387848	0.0789118
	-2	0.09318	0	0.024457	0.103946	0.466198	0.60572992
	-3	0.10309	0.324254	0.00693	0.202376	0.387839	0.98344783
	-4	0.17822	0	0.003404	0.239892	0.513755	0.6659244
STIL	-1	0.22539	0.270317	0.090214	1.399902	2.988212	4.4771258
	-2	0.46407	0.339019	0.074426	1.441847	4.309463	5.8572778
	-3	0.76303	0.266156	0.105853	1.19403	5.49361	6.8861816
	-4	0.08180	0.19562	0.081918	0.467637	3.481327	4.27227497
STML	-1	0.02719	0.004844	0.066724	0.275065	1.090254	1.47168749
	-2	-0.04189	0.018979	0.087073	0.303667	1.066663	1.55160539
	-3	-0.02528	0.003238	0.104671	0.706372	1.585701	2.34331133
	-4	0.03775	0.003395	0.10387	1.427407	1.501183	2.69059237
ATML	-1	-0.0534	0.009751	-0.05748	0.580594	0.205952	0.37557548
	-2	0.16174	0	-0.03558	1.245261	2.274179	2.88312073
	-3	0.18036	0.010239	0.013313	1.136077	0.951611	1.68417285
	-4	0.19777	0	0.01709	1.586741	1.006504	2.00725379
RTML	-1	0.19529	0.01098	-0.10752	0.822792	0.403741	0.55627829
	-2	0.08624	0	0.017938	0.605117	0.475287	1.02443955
	-3	0.10371	0.013751	0.00595	1.178587	0.373005	0.773094142
	-4	0.15522	0	0.003842	1.131512	0.426216	1.14178464
ITTIT	-1	-0.30969	-2.657315	-2.017835	7.2638774	0	-1.50547965
	-2	-0.03473	-0.927939	-0.014379	1.3525711	0	-0.57668491
	-3	-0.01430	-0.676564	-0.009934	1.3106252	0	-0.21074985
	-4	-0.00824	-0.592099	-0.006164	1.9739641	0	0.32525656
ATML	-1	-0.80660	-1.285984	-0.254543	0.2446024	0	-3.4615124
	-2	-0.65505	-0.805439	-0.046682	0.2389529	0	-1.92434190
	-3	-0.50246	-0.616102	-0.018965	0.3121218	0	-1.3408021
	-4	-0.30347	-0.035448	0.0577137	0.4196780	0	0.0284811
DATAT	-1	-0.05273	-0.111706	-0.197511	0.634025	1.403039	0.91060993
	-2	-0.66371	-1.391820	-0.069550	0.4422967	2.0249489	-0.6862021
	-3	-0.47392	-0.753129	-0.060978	0.375393	1.6511245	0.05040621
	-4	0.07171	-0.582186	0.337924	0.6676509	1.993157	2.77788692

**Table 4.2 Z. Score results for Bankrupted companies**

Year	All	Correct Classification	Type 2 Error	% age Results
-1	9	7	2	78%
-2	9	6	3	67%
-3	9	6	3	67%
-4	9	5	4	56%
Mean				67%

The model is being applied on given bankrupted companies for four years prior to bankruptcy. Table-2 shows that model give 78% correct results 1 year prior to bankruptcy 67% consecutively for 2 and 3 years prior to failure. 4 years prior accuracy rate is 56%. So Z score can provide good indication of problems due to which insolvency occurs. By using this model companies can reveal financial problems. Above 50% accuracy rate for all and 67% average rate of accuracy illustrate that company can exhibit at least half of financial problems through Z score model which the company will face in near future.

**Table 4.3 Calculations for Stable Organizations**

Company Symbols	Years	X1	X2	X3	X4	X5	Z- Scores
CRTM	-1	-0.1272912	0.172272	0.3371342	0.693774	0.597142453	2.8584097
	-2	-0.1590259	0.163623	0.1416211	0.711773	0.402479531	2.1700321
	-3	-0.16451313	0.198417	0.0955559	0.073713	0.682851167	1.9613946
	-4	-0.1640368	0.160171	0.1296562	0.058146	0.897876282	1.6739215
NML	-1	-0.12729119	0.059231	0.0462485	1.08202	0.793548573	2.31884104
	-2	-0.1590259	0.055129	0.0822082	2.002233	0.993951331	3.18191097
	-3	-0.16451312	0.015359	0.0828362	0.237471	0.988596283	2.06408082
	-4	-0.16403678	0.589362	0.0522101	0.188072	0.169844998	1.91642144
BWM	-1	0.21205496	0.192572	0.0684724	0.859856	0.465156924	2.12452333
	-2	0.16949677	0.17134	0.0564885	0.459617	0.487932013	1.83714490
	-3	0.210577304	0.150236	0.0557677	0.468915	0.45423711	1.7779345
	-4	0.20326962	0.214971	0.0699578	0.465713	0.403576204	1.86322762
KOHTM	-1	0.397928652	0.591743	0.5341987	0.434349	0.749169878	4.24835863
	-2	0.371345945	0.660426	0.5439872	0.417906	0.742679033	4.36020615
	-3	0.403738579	0.742764	0.320955	0.359852	0.55736985	3.52157331
	-4	0.337865862	0.760672	0.3896258	0.402246	0.630401657	3.87020557
KTML	-1	-0.52158299	0.167718	0.0749623	0.054769	0.559240986	1.71243177
	-2	-0.9753025	0.012694	0.0612065	0.044362	0.715550695	1.59306181
	-3	-0.47432469	-0.06875	-0.041818	0.14182	0.714954386	1.2029582
	-4	-0.6857145	-0.30517	-0.102403	0.172509	0.900306225	0.8714121
AATM	-1	2.12296491	2.4846142	0.067414158	2.3539967	2.584724252	10.8697594
	-2	1.197520244	1.68497408	0.054000323	2.0293163	1.994704916	7.81653671
	-3	1.264874124	1.6756632	0.07059528	1.8601076	2.52464404	8.36220394
	-4	1.393633641	1.9053667	0.063662013	1.8082284	3.005393215	9.26023456
J.A	-1	0.02087089	-0.7833131	0.046530926	0.45024226	2.08770803	2.06893513
	-2	-0.00715488	-0.7355026	0.04132608	0.41797848	1.541264365	1.52472538
	-3	-0.03705808	-0.7891372	-0.08245047	0.4539147	1.359737888	0.84714105
	-4	-0.4332292	-0.5766626	-0.03514957	0.40109567	1.341190872	0.77524020
SAFA	-1	-0.06490947	0.03976543	0.08403294	0.21351895	1.95373663	2.96739952
	-2	0.00696646	0.0409642	0.077872711	0.2807747	2.39780065	3.51497704
	-3	0.005970436	0.0435757	0.054469622	0.31998976	2.236910313	3.30445538
	-4	-0.08269779	0.04168606	0.068287716	0.39953255	2.477575709	3.52699207
FTML	-1	-0.49617551	0.05149788	0.193694421	0.08434059	1.785584946	2.58421147
	-2	-0.09292935	0.07886868	0.116263167	0.11033415	1.581847467	2.66479886
	-3	-0.08606406	0.02953803	0.07398754	0.02879619	1.233878063	2.07105225
	-4	0.04538276	0.19769486	0.028964491	0.02371796	0.73515643	1.69885057
GATM	-1	-0.01534821	0.00552957	0.11320993	0.07495107	1.348576076	2.39297728
	-2	-0.02873629	0.00590486	0.088992541	0.06065499	1.023758637	1.96737269
	-3	-0.05569385	0.00833932	0.075875739	0.05768086	0.950870448	1.82120262
	-4	-0.02779335	0.09044632	0.074471808	0.07509429	0.983796621	1.00804502
ZTL	-1	-0.26433205	-0.0601402	0.103876762	0.23467274	1.118563145	1.83957867
	-2	-0.23869042	-0.0911565	0.066470116	0.21724588	0.802358063	1.37998579
	-3	-0.19275906	-0.0792137	0.059371081	0.22169470	0.781738761	1.41065268
	-4	-0.18016365	-0.0743361	0.045422761	0.21625832	0.739054072	1.34104679
FTHM	-1	0.116445946	0.15176484	0.059108276	0.00203386	0.242384196	1.43844389
	-2	0.145096883	0.15849449	0.005226467	0.00222347	0.317164133	1.74216308
	-3	0.179250621	0.16793517	0.050287243	0.00267978	0.53027734	1.37858246
	-4	0.212750498	0.18899094	0.065043689	0.00363018	0.79403130	1.7927403

**Table 4.4 Z. Score results for Non Bankrupted companies**

Year	All	Correct Classification	Type Error	% age Results
-1	12	10	2	83%
-2	12	8	4	67%
-3	12	7	5	58%
-4	12	5	7	42%
Mean				63%

Table 4 shows that model predictions for stable companies is quite satisfactory. It classifies 83%, 67%, 58%, 42% companies correctly for 1, 2, 3, 4 years time period respectively. Average accuracy rate for 4 years is 63%. So the study showed that Z score model performs better for stability prediction of stable companies.

**Table 4.5 Z. Score Predictions for all companies (Bankrupted and Non Bankrupted)**

Year	All	Correct Classification	Type Error	% age Results
-1	21	17	4	81%
-2	21	14	7	67%
-3	21	13	8	62%
-4	21	10	11	48%
Mean				65%

In the above Table it is elaborated that Altman Z score can identify failed and stable companies by 81% to 48% from 1-4 years. As the time horizon increases accuracy rate of the Z score model decreases. The mean of accuracy shows that model is quite successful for both bankrupted and non bankrupted companies. It is also to be noted that for short time period the model give good indications while with the increase in time span accuracy rate reduces year by year.

In the light of above results, the accuracy rate of the model was high. So  $H_0$  is rejected and  $H_1$  is accepted Which means that Altman Z score model can predict business bankruptcy in Pakistan.

#### **Conclusion and Recommendations**

The prediction of business failure is very useful for financial managers, investors and other users of financial statements. In this study it is tried to know whether Z score model is able to predict business failure in Pakistan. Analysis of this paper shows that the model can predict business bankruptcy one, two, three, even four years prior to failure with a higher rate of accuracy. Model is also useful to know the financial soundness of organizations. In this paper overall results of Z score model was also quite accurate. These results for bankrupted, non bankrupted shows that Altman model can give good predictions for textile sector of Pakistan. Hence it can be concluded that user of financial statements like financial managers, analysts, investors etc can predict business failure or financial soundness of companies through Altman Z Score model in Pakistan.

#### **Recommendations for Future research:**

In this paper model is used for Textile companies in Pakistan only, one can use this model for bankruptcy prediction in other sectors as well.

Portfolio managers and company management while using this model can predict upcoming future problems for organization.

Investors can evaluate bankruptcy risk of organizations through this model in Pakistan.

This is in their best interest that Z score model performs better for stability prediction of stable companies, so a firm should evaluate its Z score on regular basis.

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### Annexure

#### List 1: Bankrupted Companies List:

S. No	Company Name	Symbol
1	Schon Textiles Limited	STL
2	Karim Cotton Mills Limited	KCML
3	Sadoon Textile Industries Limited	STIL
4	Saif Textile Mills Limited	STML
5	Ayaz Textile Mills Limited	ATML
6	Riaz Textile Mills Limited	RTML
7	ITTI Textiles	ITTIT
8	Amazai Textiles Mills Limited	ATML
9	DATA Textiles Limited	DATAT

#### List 2: Stable Companies List:

S. No	Company Name	Symbol
1	Crescent Textile Mills LTD	CRTM
2	Nishat Mills Limited	NML
3	Bannu woolen Mills LTD	BWM
4	Kohat Textile Mills Limited	KOHTM
5	Kohinoor Textile Mills LTD	KTML
6	Ali Asghar Textile Mills Limited	GLAXO
7	J.A Textile Mills Limited	JATML
8	Safa Textile Limited	SAFA
9	Fazal Textile Mills	FZTM
10	Gul Ahmad Textile Mills	GATM
11	Zephyr Textile Limited	ZTL
12	Fateh Textile	FTHM

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