

Box 6: Altman Z-score – Measure of distress

The Altman Z-score is a statistically driven empirical model that is, generally used to assess the health of firms. Particularly, it measures the liquidity conditions as well as predicts the probability of insolvency and financial distress.

The Altman Z-score is derived from several key ratios that measure different key aspects of a corporate entity's financial health and performance. The score consists of five variables:

X1 = Working Capital / Total Assets

X2 = Retained Earnings / Total Assets

X3 = EBIT / Total Assets

X4 = Market Value of Equity / Total Liabilities

X5 = Net Sales / Total Assets

The Z-score is calculated by the following formula^{228,229}:

$$Z = 1.2 * X1 + 1.4 * X2 + 3.3 * X3 + 0.6 * X4 + 0.999 * X5$$

²²⁸ Eidleman, G. J. (1995). Z scores-A Guide to failure prediction. The CPA Journal, 65(2), 52.

²²⁹ The parameters of the model as identified in the original paper have been used to signal distress status of the firms and

Table 1.1: Altman Z score of different sectors of corporate sector

	Textile			Oil & Gas			Automobiles		
	2016	2017	2018	2016	2017	2018	2016	2017	2018
Working Capital/ Total Assets	-0.02	0.00	0.01	0.14	0.21	0.15	0.32	0.30	0.23
Retained Earnings/ Total Assets	0.02	0.03	0.03	0.06	0.08	0.07	0.10	0.15	0.13
EBIT/Total Assets	0.05	0.06	0.05	0.10	0.11	0.11	0.18	0.22	0.19
Mkt. Value of Equity/ Total Liabilities	0.92	0.64	0.60	1.83	1.50	1.04	5.89	3.28	1.77
Sales/Total Assets	0.77	0.76	0.78	1.03	1.10	1.17	1.76	1.64	1.69
Altman Z score	1.48	1.37	1.36	2.70	2.73	2.44	6.43	4.91	3.85

	Power			Chemicals			Cement		
	2016	2017	2018	2016	2017	2018	2016	2017	2018
Working Capital/ Total Assets	0.14	0.14	0.13	0.11	0.13	0.08	0.16	0.13	0.06
Retained Earnings/ Total Assets	0.09	0.08	0.06	0.07	0.08	0.10	0.13	0.11	0.07
EBIT/Total Assets	0.13	0.12	0.10	0.12	0.13	0.15	0.19	0.16	0.08
Mkt. Value of Equity/ Total Liabilities	1.22	0.81	0.61	3.76	3.51	3.09	4.84	2.37	0.94
Sales/Total Assets	0.65	0.68	0.52	1.16	1.17	1.20	0.58	0.53	0.33
Altman Z score	2.10	1.84	1.46	4.06	3.99	3.77	4.48	2.79	1.32

	Food			Pharmaceuticals		
	2016	2017	2018	2016	2017	2018
Working Capital/Total Assets	0.05	-0.02	0.02	0.36	0.36	0.33
Retained Earnings/Total Assets	0.14	0.13	0.12	0.18	0.16	0.12
EBIT/Total Assets	0.22	0.21	0.22	0.25	0.23	0.18
Mkt. Values of Equity/Total Liabilities	9.10	6.85	5.32	15.65	9.18	6.19
Sales/Total Assets	1.62	1.51	1.44	1.29	1.26	1.27
Altman Z score	8.07	6.47	5.53	12.18	8.16	6.16

Source: SBP, PSX

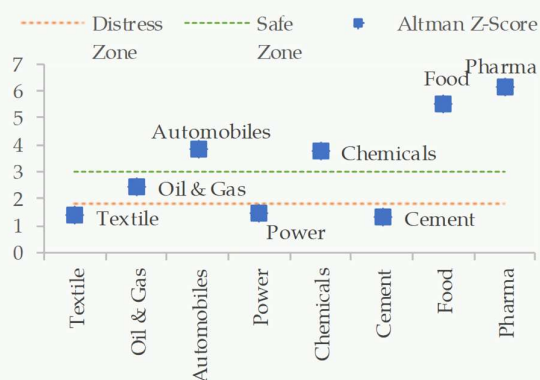
To apply the model on the corporate sector of Pakistan, 303 listed companies are selected as a sample. These corporations are categorized into eight sectors, namely, textile, oil & gas, chemicals, power, cement, automobiles, foods, and pharmaceuticals. Based on the individual scores of these selected firms, the aggregate weighted-average scores of all sectors have been calculated for the last three years (Table 1.1).

In line with slowdown in economic activity and contracting market value of corporate entities that prevailed during the year under review, the weighted average Z-score of all the sectors declined in CY18 as compared with the previous year's assessment. Noteworthy sectors highlighted by the Z-score are textile, power and cement. The scores of these sectors fall in the lower ranges, which as per

have not been calibrated to the local conditions. As such, the model may under/overestimate the distress factor. However, the current model provides a useful benchmark.

the original Z-score model are considered distress zone. This urges rigorous measures for improving the financial position of firms. All the remaining sectors are placed in the safe zone except for the oil & gas sector, who fell in the grey zone and skewed towards the safe zone (**Chart 1.1**).

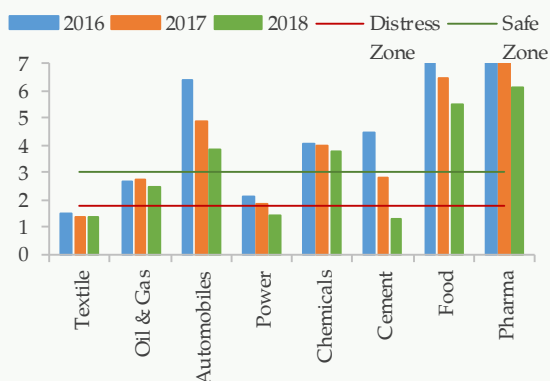
Chart 1.1: Altman's Z-score, December 2018



Source: SBP, PSX

Taking into account the Z-score of the preceding years, the textile sector continually stays in the distress zone and oil & gas sector stays in the grey zone. Whereas, the power sector that is on the borderline of distress zone for the last two years, demoted into the distress zone in CY18. Following similar footsteps, the cement sector started to decline from the safe zone in CY16 into the distress zone in CY18 (**Chart 1.2**).

Chart 1.2: Altman's Z-score

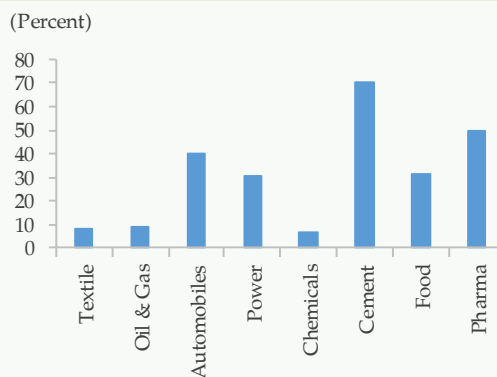


Source: SBP, PSX

According to the applied model, textile sector constantly falls under distress zone due to the poor working capital management as compared with the other sectors that has lead them to earn lowest ROE. Moreover, the market value of equity as the ratio of book value of debt also remains quite low constantly.

Cement sector faces the most drastic decrease (70.5percent from CY16 to CY18) in the Altman Z-score. Primarily, the higher rate of growth of debt levels as compared with the growth of asset base lead to decline in the score. Simultaneously, the weakening of working capital affected the liquidity position of the sector. Over the years, the market value of equity of the cement sector also deteriorated as a reflection of poor performance. Thus, in CY18, the Z-score stands at 1.32.

Chart 1.3: Percentage decrease in Altman's Z-score from 2016-2018



Source: SBP, PSX

The Altman Z-score of the remaining sectors also decreased during the CY18, given the slowdown of economic activity (**Chart 1.3**). Besides cement sector, the pharmaceutical and automobile sector faced severe decrease in the Z-score. Nevertheless, their score remains quite above the safe zone.