



## A STUDY ON THE ANALYSIS OF ALTMAN Z - SCORE MODEL ON LISTED INDIAN AIRLINE COMPANIES TO MEASURE FINANCIAL DISTRESS

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### **Abstract:**

In this article, it is mentioned that Altman Z – Score model is a tool which may be used to predict the probability of a firm that will go into bankruptcy within two years. This model is used to predict corporate defaults and easy to calculate control measure for the financial distress status of companies in academic studies. Z -Score model is used to calculate multiple corporate income statement and balance sheet to measure the financial health of a company. The Novel Corona Virus disease has severely affected the Airline industry with decline of 70% to 75% in their business. Under this study, the main focus is given to assess the current financial health of major listed Indian Airline companies by employing the methodology 'Altman Z – Score' model. The study has resulted that a very high percentage of companies classified in the distress zone i.e., Vulnerable to bankruptcy stage and most of the firms are running on negative working capital. In addition, a few numbers of Airline companies are of the opinion that they had a huge barrier to entry and frequently increasing in cases of bankruptcy in India. At present, the Airline sector is financially weak and there is a possibility of insolvency in the coming years. Lastly, in order to sustain the Airline industry, it requires support from the government and financial authorities to operate in difficult times by extending or reforming and relaxation on borrowings to support or boost the industry.

**Key Words:** Altman Z"- Score Model, Financial Distress, Airline Companies, Balance Sheet, Corporate Income Statement, Bankruptcy, Etc.

### **Introduction:**

A corporation's financial health plays a significant role in its successful functioning and survival without which it may lead to business failures. The COVID-19 pandemic has severely financially hurt the travel and hospitality sector. According to McKinsey, a management consulting firm, the 'Airlines and hotels' industry in India project to suffer by seventy to seventy-five percent decline in their respective businesses due to COVID — the highest among all sectors. It can be attributed to a steep fall in the consumption of non-essential goods, social distancing measures, lower footfalls, a decline in business volume, and subdued operating efficiencies, all of which will impact companies in these sectors. However, the financial health of Airline companies was already experiencing distress from previous years. This distress and the ongoing pandemic pose an immediate threat to the survival of the industry. It calls upon an assessment of the financial health of the Airline companies operating in India, mainly listed firms where the general public is invested and is prone to market-linked volatility.

The Z-score formula for predicting bankruptcy was published in 1968 by Edward I. Altman. The formula is one of the most popular and widely cited bankruptcy prediction models used by finance professionals and institutions to predict that a firm will face bankruptcy within successive two years. The Altman Z-score uses multivariate analysis using various P&L account and balance sheet values to measure a company's financial health. The Z-score is a linear combination of four or five ratios, weighted by coefficients. The estimation was initially applicable to publicly held manufacturers but has since been developed to apply on private, non-manufacturing, and service companies, including in developing countries.

### **Objective of the Study:**

#### **The Following are the Objectives of this Study:**

- The paper aims to assess the current financial health of major Indian airline companies and analyze their financial distress over the past ten years.
- The methodology employed will be the Z" Score bankruptcy (non-manufacturing) model, a variant of the original Altman Z-Score Model.
- To study the financial position of Indian airline companies, which was run in India through Z"- Score Models.

### Literature Review:

- E. I. Altman in "Financial Ratios, Discriminant Analysis, and the Prediction of Corporate Bankruptcy" (1968) used the Multiple Discriminant Analysis (MDA) technique and financial ratios to predict corporate bankruptcy. The variables were classified into five standard ratio categories: liquidity, profitability, leverage, solvency, and activity ratio. The discriminant function yielded a score called Z-score, and based on this, a cut-off was found for classifying firms as failed, non-failed, or under the zone of ignorance. Based on the empirical results, it was suggested that the bankruptcy prediction model is an accurate forecaster of failure up to two years before bankruptcy and that the accuracy diminishes substantially as the lead time increases. The Z-score model has retained its reported high efficiency and is still robust despite its development over the years.
- E. I. Altman, Hartzell, and Peck in "Emerging market corporate bonds — a scoring system" (1995) introduced a scoring system known as the Emerging Market Score Model (EM Score Model) for emerging markets corporate bonds, an enhanced version of Z-score model. Unlike the original Z-score model, this was built for application to non-manufacturing companies and manufacturers, privately held and publicly owned firms, including in developing countries. This model combined fundamental credit analysis and rigorous benchmarks with analyst-enhanced assessments to have a modified rating, which can be compared to agency ratings and market levels.
- "The Effects of a Comprehensive, Integrated Obesity Prevention Intervention Approach (Super FIT) on Children's Physical Activity, Sedentary Behavior, and BMI Z-Score" Super FIT is a comprehensive, integrated intervention approach aimed at promoting healthy energy balance-related behaviors in 2- to 4-year-old children in the preschool and home settings. A quasi-experimental research design was adopted to evaluate the effects of Super FIT on physical activity (PA), sedentary behavior (SB) and Body Mass Index (BMI) z-score. Children could participate in the preschool-based and family-based component (full intervention) or only in the preschool-based component (partial intervention). Children's PA levels and SB were assessed with accelerometers and observations, and height and weight were measured for the BMI z-score. Measurements were performed at baseline and two follow-up time points. Effectiveness was evaluated using linear mixed-model analyses, correcting for relevant covariates. Healthy changes in PA levels occurred within all study groups over time. No significant differences were found in overall PA levels between the intervention groups and control group at both follow-ups. Nevertheless, sedentary behavior decreased more in the full intervention group (effect size (ES): -0.62), and moderate-to-vigorous PA (ES: 0.85) and counts per minute (ES: 0.45) increased more compared to the control group on preschool days at the first follow-up. No effects were found for BMI z-score. The integrated approach of Super FIT may induce changes in PA of young children, although the effects were small.

### Research Methodology:

This study predicts financial distress companies and the causal relationship of the variables observed and studied.

### Research Method:

The model weights vital financial ratios to gauge the liquidity, leverage (debt burdens), sales (or efficiency), and profitability of the companies. All versions of the Z-Score models take the form:

Altman Z-score (Z) Version	Formulas	Zones of Discrimination
Z-score (1968)	$Z = (1.2 \times X_1) + (1.4 \times X_2) + (3.3 \times X_3) + (0.6 \times X_4) + (1 \times X_5)$	$Z > 3$ – Safe zone <sup>[1]</sup> $1.8 < Z < 3$ – Grey zone <sup>[2]</sup> $Z < 1.8$ – Distress zone <sup>[3]</sup>
Z"-score (emerging markets) (1995)	$Z = 3.25 + (6.56 \times X_1) + (3.26 \times X_2) + (6.72 \times X_3) + (1.05 \times X_4)$	$Z > 2.6$ – Safe zone $1.1 < Z < 2.6$ – Grey zone
Z"-score (non-manufacturing) (1995) – e.g. banks, airlines etc.	$Z = (6.56 \times X_1) + (3.26 \times X_2) + (6.72 \times X_3) + (1.05 \times X_4)$	$Z < 1.1$ – Distress zone

Where,

$$X_1 = \frac{\text{Working Capital}}{\text{Total Assets}}$$

It is the measure of the net liquid assets of concern to total capitalization.

$$X_2 = \frac{\text{Retained Earnings}}{\text{Total Assets}}$$

It indicates the efficiency of management in manufacturing, sales, administration, and other activities.

$$X_3 = \frac{\text{Earnings Before Interest and Taxes (EBIT)}}{\text{Total Assets}}$$

It is a measure of the productivity of assets employed in an enterprise. The ultimate survival of an enterprise is based on earning power (profitability).

$$X_4 = \frac{\text{Market Value (Cap.) Of Equity}}{\text{Total Liabilities}}$$

It is reciprocal of the debt-equity ratio. Equity is calculated from the merged market value of all shares, while debt includes both current and long-term liabilities. This equation measures the extent to which an enterprise's assets can decline in value before the liabilities exceed the assets, and the concern becomes insolvent.

$$X_5 = \frac{\text{Net Sales}}{\text{Total Assets}}$$

Known as the capital turnover ratio, this is a measure of the sales-generating ability of assets.

[<sup>1</sup>] Safe zone refers to a negligible chance of bankruptcy and healthy financials.

[<sup>2</sup>] Grey zone refers to a moderate chance of bankruptcy and struggling financials.

[<sup>3</sup>] Distress zone refers to a high probability of bankruptcy and poor financial health.

**Secondary Data:** This study is based on secondary data, which have been obtained from published sources, i.e., Annual Reports of the companies for ten financial years (2009-10 to 2018-19). The Annual Report presented the Balance Sheet, Income Statement, and Cash Flow Statement. The BSE data has been collected from aggregated sources as [www.moneycontrol.com](http://www.moneycontrol.com) and [financials.morningstar.com](http://financials.morningstar.com).

#### **Sampling Techniques:**

The method used is purposive sampling method; it means the research that has the purpose or specific targets in selecting a random sample based on criteria. The sampling criteria used are as follows.

Companies listed under the Airline sector on the BSE and the NSE.

Companies with published audited standalone financial statements from 2009 to 2019.

#### **Research Design:**

Analyzing the financial statements to assess the financial distress or chances of the bankruptcy of the listed Airline companies using the Altman Z"-score (non-manufacturing) bankruptcy model.

Sample size

There are four Airline companies listed on the Bombay Stock Exchange (BSE) and National Stock Exchange (NSE) combined, considered for this study.

Company Name	Market Capitalisation as of July 2020 (Cr.)
Inter Globe Aviation Ltd.	39,283.85
Spice Jet Ltd.	3,039.39
Jet Airways (India) Ltd.	325.46
Global Vectra Helicorp Ltd.	76.72

#### **Limitations:**

**Full Disclosure:** The Altman Z"-Score model relies on the authenticity of the figures mentioned in the financial statements to predict the outcome. If the values are manipulated at the source, the score might portray a different picture.

**Cash Flow:** The model ignores the cash flow statement despite its being an essential part of an organization's financials.

**Historical Comparison:** The ten-year financial statements do not consider any change in accounting practices specific to the sector, business processes, or regulatory amendments.

**Turnaround management:** The prediction concluded of bankruptcy or insolvency is rational if the company mentioned consistently reports down-trend Z"-scores in the successive years. However, if a company successfully manages a turnaround in its operations, it can avoid a daunting fate.

Population of the study

In this study, the community is four companies listed in the BSE or NSE under the Airline sector.

#### **Tools and Techniques:**

For this study, Microsoft Excel software, and charting techniques as tables, bar diagrams, and line graphs were used for data analysis and visualization.

#### **Data Interpretation & Analysis:**

Inter Globe Aviation (Indigo)

(INR in Millions except per share data)

Year	Total Assets	Working Capital	Retained Earnings	EBIT	Market Cap.	Total Liabilities
2010	-	-	-	-	-	-
2011	-	-	-	-	-	-
2012	-	-	-	-	-	-
2013	-	-	-	-	-	-
2014	-	-	-	-	-	-
2015	107682	2190	13042	16681	-	103475
2016	130191	16149	19897	26430	363264	111848
2017	152097	46618	16591	17670	340398	114306
2018	211293	85085	22423	26499	443975	140519
2019	250117	101049	1572	-4323	428900	180669

### Calculation of Altman Z-score

Formula,

$$Z''\text{-score} = (6.56 \times X_1) + (3.26 \times X_2) + (6.72 \times X_3) + (1.05 \times X_4)$$

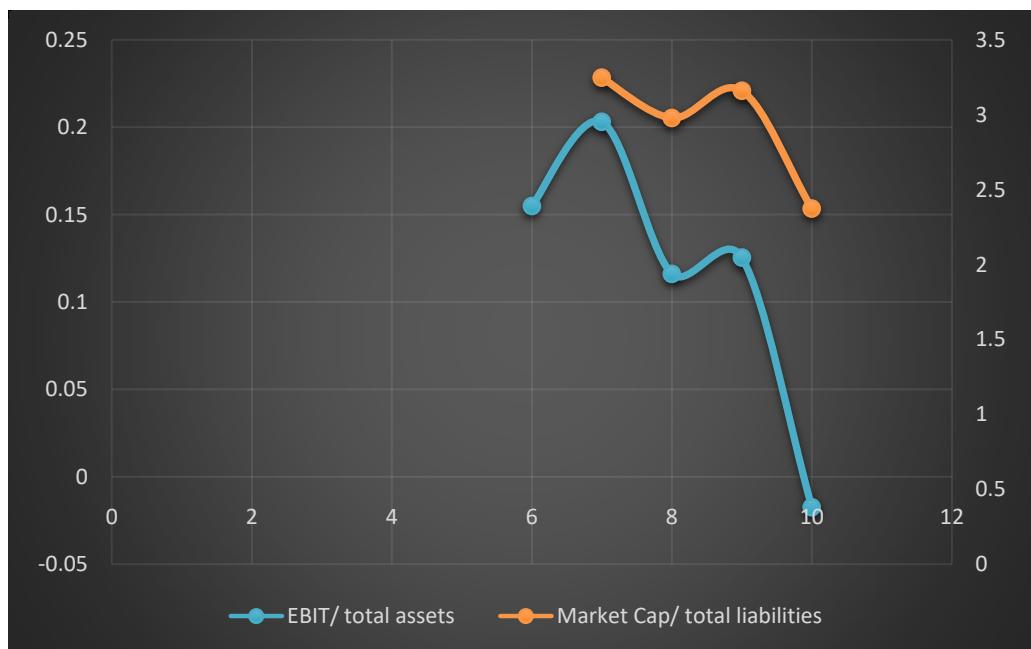
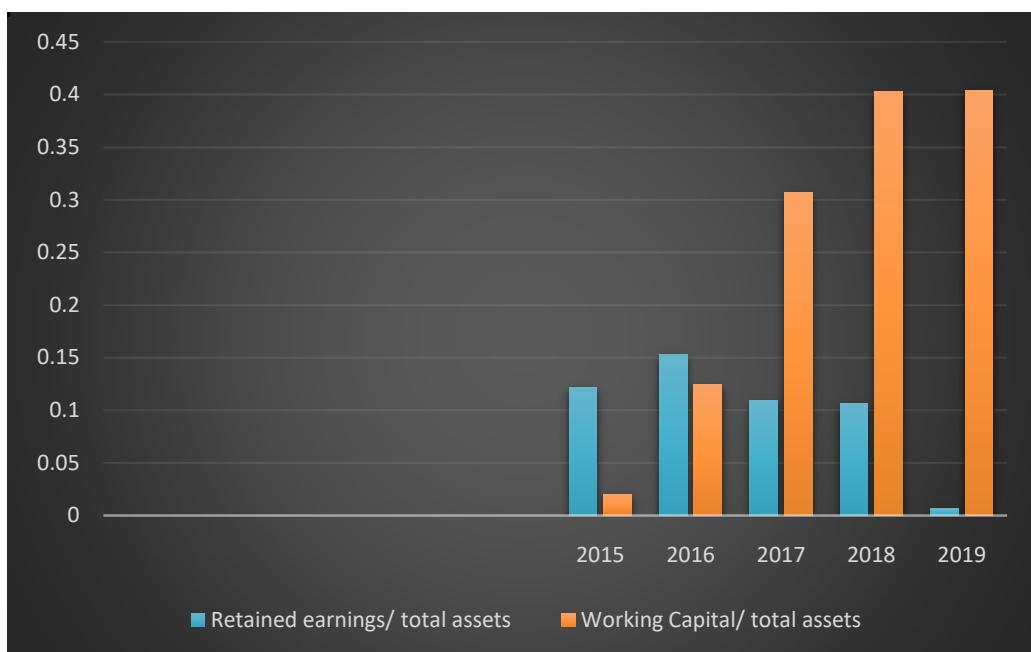
$X_1$ : Working Capital / Total Assets

$X_2$ : Retained Earnings / Total Assets

$X_3$ : EBIT / Total Assets

$X_4$ : Market Value (Cap.) of Equity / Total Liabilities

Perimeter	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
$X_1$	-	-	-	-	-	0.02	0.12	0.31	0.40	0.40
$X_2$	-	-	-	-	-	0.12	0.15	0.11	0.11	0.01
$X_3$	-	-	-	-	-	0.15	0.20	0.12	0.13	-0.02
$X_4$	-	-	-	-	-	-	3.25	2.98	3.16	2.37
Z''-score	-	-	-	-	-	-	6.09	6.27	7.15	5.05



### Interpretation:

Applying the Altman Z-score model to the data, we obtained the resultant scores as 5.05 for 2019-18, 7.15 for 2017-18, 6.27 for 2016-17 et al. We observe that the company has been in the safe zone since FY 2014-

15 when the company went public via initial public offering (IPO). The safe zone implies that the company's financials are strong, and the company faces no plight of insolvency.

However, we notice a worrying downward trend in the EBIT/ total asset metric, implying a sharp dip in profitability. The firm's management has to take radical steps to change this trend and improve the productivity of the assets and capital employed.

Spice Jet

(INR in Millions except per share data)

Year	Total Assets	Working Capital	Retained Earnings	EBIT	Market Cap.	Total Liabilities
2010	18114	-2958	670	433	14915	13312
2011	18308	-2913	1012	659	26217	7885
2012	19703	-9393	-6058	-5511	13124	21234
2013	30710	-9453	-1911	-1350	18118	32955
2014	29345	-20945	-10032	-8953	14203	39539
2015	26066	-15802	-6871	-6096	13068	38711
2016	27038	-10649	4072	5117	42310	33354
2017	29880	-16253	4272	4457	47591	36007
2018	41096	-21348	5572	6306	73800	41655
2019	47928	-22500	-3024	-830	60930	51428

#### Calculation of Altman Z-score

Formula,

$$Z''\text{-score} = (6.56 \times X_1) + (3.26 \times X_2) + (6.72 \times X_3) + (1.05 \times X_4)$$

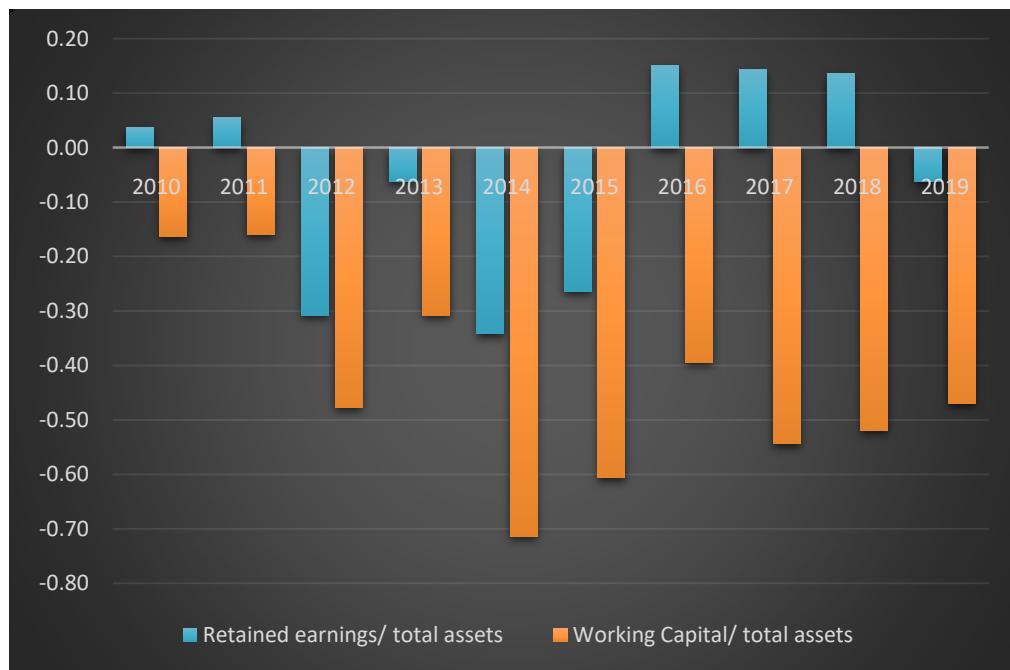
X<sub>1</sub>: Working Capital / Total Assets

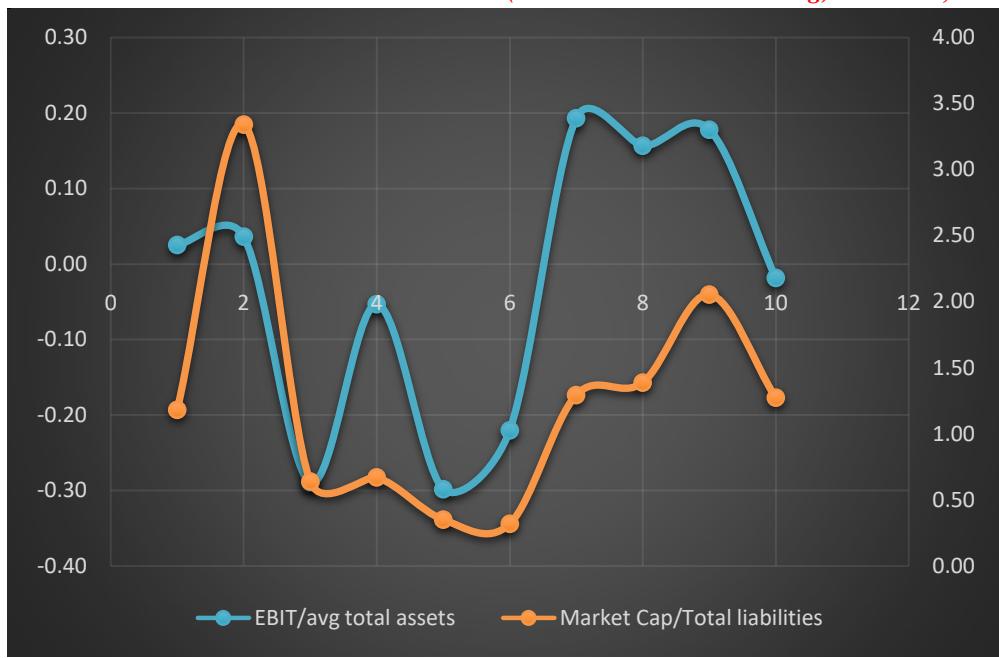
X<sub>2</sub>: Retained Earnings / Total Assets

X<sub>3</sub>: EBIT / Total Assets

X<sub>4</sub>: Market Value (Cap.) of Equity / Total Liabilities

Perimeter	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
X <sub>1</sub>	-0.16	-0.16	-0.48	-0.31	-0.71	-0.61	-0.39	-0.54	-0.52	-0.47
X <sub>2</sub>	0.04	0.06	-0.31	-0.06	-0.34	-0.26	0.15	0.14	0.14	-0.06
X <sub>3</sub>	0.02	0.04	-0.28	-0.04	-0.31	-0.23	0.19	0.15	0.15	-0.02
X <sub>4</sub>	1.12	3.32	0.62	0.55	0.36	0.34	1.27	1.32	1.77	1.18
Z''-score	0.39	2.87	-5.36	-1.94	-7.47	-6.05	0.51	-0.71	-0.07	-2.16





#### Interpretation:

Applying the Altman Z-score model to the data, we obtained the resultant scores as -2.16 for 2019-18, -0.07 for 2017-18, -0.71 for 2016-17 et al. We observe that the company has been in the distress zone since FY 2011-12. The distress zone implies that the company's financials are weak, and the company can be declared bankrupt soon.

However, we notice that the company had an incredible turnaround in Going concern since FY 2013-14 when it beat a critical bankruptcy situation with a -7.47 Altman Z"-score. This timeline was in parallel with real events in 2014 when Spice Jet had to cease operations for hours due to a near bankruptcy crisis. The company would require a similar workaround from FY 2019-20 to overcome the complications from COVID-19 inflicted worldwide travel restrictions and lockdowns.

#### Jet Airways:

(INR in Millions except per share data)

Year	Total Assets	Working Capital	Retained Earnings	EBIT	Market Cap.	Total Liabilities
2010	223089	-6136	-4202	4550	32962	189378
2011	221221	-6621	-858	8551	55943	187983
2012	206901	-73846	-14201	-5290	29341	205592
2013	183548	-81706	-7798	80	39210	201825
2014	171101	-97222	-41297	-23933	40634	212849
2015	170972	-96272	-20974	-8552	41898	234220
2016	172979	-86358	12117	14706	58656	225083
2017	146035	-64200	4385	5981	57137	185034
2018	129551	-72055	-6365	-4182	75819	200942
2019	-	-	-	-	-	-

#### Calculation of Altman Z-Scores:

Formula,

$$Z''\text{-score} = (6.56 \times X_1) + (3.26 \times X_2) + (6.72 \times X_3) + (1.05 \times X_4)$$

X<sub>1</sub>: Working Capital / Total Assets

X<sub>2</sub>: Retained Earnings / Total Assets

X<sub>3</sub>: EBIT / Total Assets

X<sub>4</sub>: Market Value (Cap.) of Equity / Total Liabilities

Perimeter	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
X <sub>1</sub>	-0.03	-0.03	-0.36	-0.45	-0.57	-0.56	-0.50	-0.44	-0.56	-
X <sub>2</sub>	-0.02	0.00	-0.07	-0.04	-0.24	-0.12	0.07	0.03	-0.05	-
X <sub>3</sub>	0.02	0.04	-0.03	0.00	-0.14	-0.05	0.09	0.04	-0.03	-
X <sub>4</sub>	0.17	0.30	0.14	0.19	0.19	0.18	0.26	0.31	0.38	-
Z''-score	0.08	0.36	-2.59	-2.85	-5.25	-4.24	-2.20	-2.19	-3.63	-



#### Interpretation:

Applying the Altman Z-score model to the data, we obtained the resultant scores as -3.16 for 2017-18, -2.19 for 2016-17, -2.20 for 2015-16 et al. The airline was grounded in April 2019 and suffered NCLT insolvency proceedings thereon, as such FY 2018-19 Annual Report was not released. We observe that the company has been in the distress zone since FY 2009-10. The distress zone implies that the company's financials were weak, and the company foreseeably suffers from insolvency.

The company had substantial assets compared to peers but equally burdened liabilities. It also had the license to fly international routes. From 2010 onward, it was the second-largest airline in India, both in terms of market share and passengers carried.

#### Global Vectra Helicorp:

(INR in Millions except per share data)

Year	Total Assets	Working Capital	Retained Earnings	EBIT	Market Cap.	Total Liabilities
2010	6483	-102	75	193	617	5628
2011	6052	-344	-444	-147	558	4325
2012	5446	-1838	-242	-242	304	4926
2013	5018	-2050	69	61	236	4465

2014	4913	-2288	55	290	203	4338
2015	4676	-1930	231	608	746	3871
2016	6242	-2312	129	1291	1297	5365
2017	5866	-1731	222	425	1365	4766
2018	6276	-1743	-17	290	2089	5103
2019	6382	-2365	70	186	1246	5719

**Calculation of Altman Z-Scores:**

Formula,

$$Z''\text{-score} = (6.56 \times X_1) + (3.26 \times X_2) + (6.72 \times X_3) + (1.05 \times X_4)$$

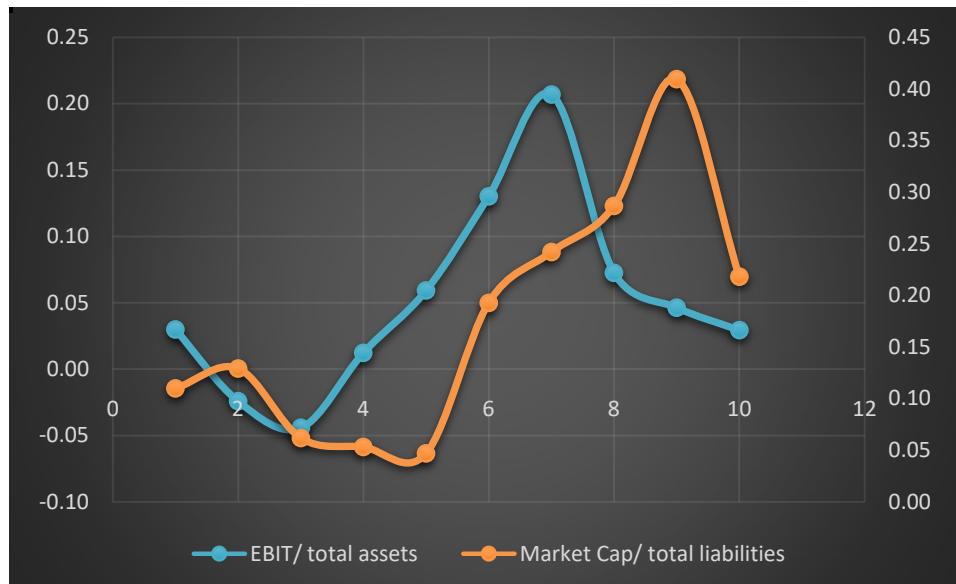
$X_1$ : Working Capital / Total Assets

$X_2$ : Retained Earnings / Total Assets

$X_3$ : EBIT / Total Assets

$X_4$ : Market Value (Cap.) of Equity / Total Liabilities

Perimeter	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
$X_1$	-0.02	-0.06	-0.34	-0.41	-0.47	-0.41	-0.37	-0.30	-0.28	-0.37
$X_2$	0.01	-0.07	-0.04	0.01	0.01	0.05	0.02	0.04	0.00	0.01
$X_3$	0.03	-0.02	-0.04	0.01	0.06	0.13	0.21	0.07	0.05	0.03
$X_4$	0.11	0.13	0.06	0.05	0.05	0.19	0.24	0.29	0.41	0.22
Z''-score	0.25	-0.64	-2.59	-2.50	-2.57	-1.47	-0.72	-1.02	-1.09	-1.97



**Interpretation:**

Applying the Altman Z-score model to the data, we obtained the resultant scores as -1.97 for 2018-19, -1.09 for 2017-18, -1.02 for 2016-17 et al. We observe that the company has been in the distress zone since FY 2009-10. The distress zone implies that the company's financials were weak, and the company has a high risk of bankruptcy.

The company falls under the Small-Cap sub-section (market capitalization < 500Cr.) due to its relatively small operation. It mainly operates charter flights for private clients. Due to its small capitalization and weak financials, it is vulnerably to market dictated volatility in the Civil Aviation sector, which may drag it to bankruptcy. Also, with COVID-19 impact, its business will be severely hit. The management has a steep road to recovery going forward.

**Findings & Suggestions & Conclusion:**

**Findings:**

From the analysis, it seems evident that Altman Z"-Score model applies to the Indian Airlines context, with a few cautions. Applying the indicators to the sample highlighted the high percentage of companies classified in the distress zone, i.e., vulnerable to bankruptcy. It indicates the poor overall state of Indian Airlines as a market segment based on its financials.

From the study, it is conspicuous that most of the firms are running on negative working capital. While the working capital can be temporarily negative, a sustained negative trend over time indicates trouble, reflected in the companies' distressed financials.

Most carriers experienced a decline in their financial health as measured by the Altman Z" Score Model. A critical factor in this trend has been the decreasing equity values and increasing use of debt. This trend can be explained by the low Retained Earnings / Total Assets ratio, which indicates that companies are financing capital expenditure through borrowings. The segments' reliance on debt has had a significant negative impact on the carriers.

The study suggests that the companies in the Airline segment are barely profitable ventures. It is indicated by the EBIT / Total Assets metric, which for all the firms are closer to zero than otherwise.

A few numbers of Airline companies suggest the industry has a huge barrier to entry and frequent cases of bankruptcy, for example, the now-defunct Kingfisher Airlines, Air India, and Jet Airways, which are undergoing insolvency proceeding. The industry, for all its importance, is relatively difficult to operate and grow a profitable venture.

**Suggestions:**

The following are a few suggestions I would like to put forward –

**Structural Reforms:**

The Civil Aviation sector requires substantial support from the authorities or government to operate in difficult times, especially with impending COVID-19 impact. After consultations with established industry leaders, the government needs to extend reforms and relaxation on borrowings to support the industry.

**Z" Scores for Evaluation:**

The Altman Z" score has globally proven to be effective in detecting possible cases of bankruptcy or financial distress in corporations. This metric should be used effectively by public financing institutions like banks and non-banking financial institutions (NBFC) for loan servicing and refinancing activities. It might help to control the non-performing asset (NPA) problem in Indian banks.

**Conclusion:**

The financial health of the Indian Airlines industry has worsened throughout the past decade. Except for Inter Globe (Indigo), airlines experienced a decline in their financial health as measured by the Altman Z" Score Model. Spice Jet, Jet Airways, and Global Vectra are financially worsening and have an immediate cause of concern concerning financial soundness. The Z-scores of these companies is well below the distress zone. Only Inter Globe (Indigo) falls in the healthy zone having Z-scores between 5.0 and 7.15. Hence, it can be concluded that the companies in the Airline sector are financially weak, and there is a possibility of insolvency regarding the financial health of companies in this sector in the coming years. Investors' investments in this sector are volatile, with the COVID-19 impact taking a massive toll on the industry. The management of these firms has a considerable role to play going forward and might have to pull off monumental measures to survive the crisis.

The research also proves Altman Z"-score to be a very competitive tool to measure a company's distress and future bankruptcy. For these reasons, the application of the Z"-Scores in the Indian Civil Aviation context is exceptionally informative, but not without its complications. We are convinced that such models can be beneficial to investors, regulators, and financial institutions like banks.

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