Bankruptcy Prediction: Further Tests of Altman and Taffler Z-Score Models

Authors

Dr. Stephen Aro-Gordon[1]

&

Mr. Abilash, K. M.[2]

[1]Assistant Professor, Department of Business & Accounting Muscat College

[2]Senior Lecturer, Department of Business & Accounting, Muscat College

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Introduction

- The **ongoing Covid 19 global pandemic** and the resultant anxieties for business survival have ushered in a renewed research interest in bankruptcy science.
- Corporate business continuity, dynamic business environment & the threats of financial distress.
- The **Global Bankruptcy Report** (2017) suggests the failure rates increased by 2.6% in the advanced economies of the US and far more pronounced in the UK by 19.8% in the year to July 2017. However, the number of company failures decreasing by 4.7% in Canada in the same period **- a pointer to the possibility of having some workable resilience to business failures.**

Statement of the Problem

- Still, we have relatively limited knowledge about corporate financial distress predictability, in the Omani context, yet, globally, many companies are losing billions of dollars due to bankruptcies/financial distress.
- Prevention of corporate insolvencies through the use of prediction models comes with a range of benefits, such as reducing the loss of investment capital, minimizing the cost of business restructuring, and avoiding loss of business value, jobs, and valuable government revenue, as in taxes.
- This paper hopes to contribute to advancing knowledge of corporate bankruptcy in the Omani context, for the benefit of higher education students, researchers, investors, business executives, market regulators and policymakers.

Objectives of the Study

1. To evaluate the empirical validity of Altman and Taffler Z-score bankruptcy prediction models with emphasis on the services and manufacturing companies listed on the Muscat Securities Market (MSM).
2. To identify the most critical factors that contribute to corporate financial distress risks in the Omani context.

Research Methodology

- **The research design** - descriptive/diagnostic quantitative type (following Manalu *et al.*, 2017)
- **Data** – relevant financial data covering 2013 to June 2020 where obtainable.
- **Sources** – Published Annual Reports of Listed Companies, S&P Capitaliq.com database, & Capital Market Authority (Oman) Annual Report.
- **Sampling** - Muscat Securities Market (MSM) currently has a total of 112 companies listed on the Exchange, out of which 17 companies were randomly selected: 6 from the Services: 11 from the Manufacturing

Statistical Tools applied in the Study

- We incorporated a data inquiry schedule (DIS) into a Microsoft Excel spreadsheet tool.
- MS Excel Spreadsheet programmed to perform the accurate statistical computations as the DIS contains all the requisite samples data for the model tests.
- The spreadsheet has more than 750 data observation points for each of the 17 companies – assumed to yield some valuable insights on the two predictors' behaviors presented in Tables.

Statistical Tools applied in the Study…Altman Z-Score Model

Variables	Specification	Financial ratio categorization
Altman Z score	$= 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1X_5$	
X1	=Net working capital/Total assets	Efficiency
X2	=Retained earnings/Total assets	Profitability
X3	= Earnings before interest and tax (EBIT)/ total assets	Cash flow/liquidity
X4	=Market value of equity (MVE)/Book value of total liabilities	Investment
X5	=Sales/Total assets	Efficiency

Statistical Tools applied in the Study…Taffler Z-Score Model

Variables	Specification	Financial ratio categorization
Taffler Z score	$= 3.2 + 12.18X_1 + 2.5X_2 + 10.7X_3 + 0.03X_4$	
X1	= Profit before tax/current liabilities	Profitability
X2	=Current Assets/Total liabilities	Cash flow
X3	=Current Liabilities/Total Assets	Solvency
X4	= Number of credit interval in days $= \frac{[Current\ assets - (inventory + Prepayments)] - Current\ Liabilities}{Total\ operating\ expenses - Depreciation} \times 365\ days$	Efficiency

Limitations & Scope of the Study

- Data - The study has been limited to Oman's capital market to which it sought to apply the mathematical models at its rather basic level. The present contribution was limited to listed companies from two of Oman's economic diversification strategy priority sectors – manufacturing and services. Future contributions could fill-in gaps in some unobserved data relating to past market value of equities and improve evidence with more current (2020) Covid-19 impacted data.
- Future studies may seek to include inferential/multivariate analytics and incorporate the emerging realm of artificial intelligence and expert systems (AIES) models for more excellent data coverage and insights.

Data Results

Altman and Taffler Z Scores Model Analysis on Eleven MSM Manufacturing Companies 2015-2020

Company	Altman Z-Score [Taffler Z Score] 2015	2016	2017	2018	2019	2020
SPFI	4.83216 [34.45211]	4.36502 [28.45391]	4.36502 [28.71164]	4.60399 [20.61207]	1.53700 [-3.09048]	1.44023 [0.59712]
OCOI	1.79278 [-4.6882]	1.72556 [3.99092]	1.81492 [-11.92137]	2.02162 [-11.160]	2.21277 [-1.14319]	UNOB
OEFI	0.60138 [42.18470]	0.58038 [-80.49110]	0.54876 [-97.02123]	0.25483 [-133.09]	-0.17086 [-215.490]	0.48563 [6.65702]
NBII	3.17796 [17.14818]	2.99067 [19.51034]	2.94860 [17.83689]	2.94335 [30.05755]	2.99127 [36.53540]	UNOB
DBCI	2.97392 [-0.04419]	2.75516 [-0.90187]	2.16901 [-5.72548]	2.21800 [-7.76135]	2.29128 [-6.52566]	2.23418 [-5.62838]
OFMI	UNOB	5.18651 [105.98798]	4.65411 [101.08072]	4.11541 [98.26648]	3.22050 [95.30497]	UNOB
AACT	5.065862 [76.30310]	4.87592 [62.79104]	5.35367 [69.82701]	8.73590 [86.16477]	6.09461 [110.5858]	6.06317 [87.81273]
ATMI	3.26659 [27.30027]	3.25995 [31.12652]	3.09963 [30.43992]	14.75931 [-2.79173]	2.87014 [24.15784]	UNOB
ORCI	4.92243 [24.78008]	4.54084 [15.50248]	5.37385 [35.44313]	4.69681 [37.27899]	3.89920 [21.35121]	2.36191 [24.05782]
RCCI	1.97551 [113.16294]	1.92927 [84.73922]	1.65717 [59.85795]	1.44078 [15.87950]	0.77918 [-118.869]	UNOB
ABMI	-2.44966 [-81.44406]	-2.78486 [-1188.15]	-3.04752 [-1234.17]	-3.26507 [-86.1403]	-3.62381 [-886.40]	-3.88936 [9419.37]

Data Results

Altman and Taffler Z Scores Model Analysis on Six MSM Services-based Companies 2014-2020

Altman Z-Score [Taffler Z Score]							
Company	2014	2015	2016	2017	2018	2019	2020
HECI	UNOB	0.56973 [903.207]	-0.05489 [224.487]	-1.23802 [286.469]	-0.83072 [-84.326]	0.30192 [-589.57]	UNOB
OIMS	UNOB	22.41639 [99.90511]	22.53302 [141.127]	12.4217 [-57.802]	12.20061 [-26.791]	10.03498 [58.648]	18.20996 [625.017]
BACS	UNOB	5.05967 [54.63859]	5.77413 [63.37859]	3.99303 [53.62821]	5.16766 [66.6604]	3.81324 [66.9519]	4.38865 [77.7317]
BAHS	UNOB	3.0403 [12.09531]	3.82557 [5.89842]	2.41025 [-2.4615]	2.27741 [9.75736]	UNOB	UNOB
ABHS	1.10556 [-47.23]	1.80977 [-53.491]	1.9746 [-62.555]	2.15305 [-69.912]	2.29588 [-53.049]	2.71230 [-84.176]	UNOB
SHCS	UNOB	5.75467 [114.375]	5.75257 [121.1902]	4.73321 [103.7204]	3.59439 [56.4572]	4.40705 [57.009]	4.78646 [51.0523]

Data Results

Altman and Taffler Z Scores Model Factors that Contribute Most to the Financial Distress Prediction of Four CMA-Classified Listed Companies 2013-2020

Company	Altman Z score Variables	Taffler Z-score Variables
HECI	X1, X2, & X3	X1
OEFI	X1, X2, & X3	X1 & X4
OIMS	X2, X3, & X5	X1
ABMI	X1, X2, & X3	X1

Findings & Suggestions

- The results of Altman and Taffler Z Scores Model Analysis on eleven MSM Manufacturing companies 2015-2020 have shown a high level of (91%) predictive power as revealed in ten out of the eleven cases where there is some unanimity regarding the likely financial health condition of the companies.
- Both models have shown that companies NBII, OFMI, AACT, ATMI, and ORCI can be regarded as healthy, going by Altman Z > 2.67 and Taffler Z > 0 respectively, albeit ORCI has shown some marginal risk concern in 2020 (Altman Z = 2.36191: grey area), possibly due to the ongoing COVID 19 pandemic. **(*Slide 10*)**

Findings & Suggestions…cont'd

- In the case of the services-oriented firms, the predictive proficiency of the two models appear to be at an estimated level of 67% only, judging from the unanimity of the Z scores indicated for the financial health of BAHS, ABHS, and BACS, and SHCS. The latter two samples, notably in the education and tourism/hospitality sectors, indicated Z values in the range regarded as healthy by both models throughout the study period.
- The other two samples (ABHS and BAHS) in the same tourism sector have however indicated some level of high distress risk between 2017 and 2018 (BAHS) and for much of the recent five years since 2014 until 2019, in the case of ABHS. ***(Slide 11)***

Findings & Suggestions…cont'd

- CMA (Oman)'s (2017) classification of 'distressed companies" (HECI, ABMI, OEFI & OIMS) are largely predicted by the two predictors - Altman and Taffler models.
- The results also suggest that about half of the sample companies are probably at risk of financial distress while the remaining half may be regarded as healthy
- Business efficiency (Altman X1 & Taffler X4), profitability (Altman X2) and cash flow (Altman X3) are influential factors for financial distress model predictors **(Slide 12)**

  - Overall results are consistent with previous studies, (notably Manalu et al, 2017; Chen et al., 2013; Farshadfar & Monem, 2013).

Conclusion

- The heightened volatility of the global oil market in the wake of the ongoing COVID 19 global pandemic makes the investigation imperative, to support innovative risk management strategy.
- The underlying idea of a corporate business is continuity – that the company would continue to be of value to the society, generating streams of cash flows (benefits) that should last forever. The analysis does show mixed findings regarding how valid the Altman and Taffler Z-score bankruptcy prediction models are in the context of the manufacturing and services companies sectors of the Muscat Securities Market (MSM).
- Both models have shown varying degrees of empirical validity industry-wise, ranging from 67-91% - meaning that both models may not be perfect predictors for all industries.
- **Implications** – (1) Train/use more than one predictor model to support robust learning base for effective financial stress tests; (2) Build new business survival/continuity strategies around significant efficiency improvement and revenue base expansion.

Thank you