

Predicting corporate bankruptcy and earnings manipulation using the Altman Z-score and Beneish M score. The case of Z manufacturing firm in Zimbabwe.

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ABSTRACT

The study sought to test the validity of the Altman Z Score (bankruptcy prediction) and the Beneish M score (earnings manipulation) as investment models that can be adopted in entity financial statements analysis by stakeholders. The study utilised financial statements obtained from entity Z's website from the periods 2011 to 2014. The results reveal entity Z as in the "grey zone" using the Altman Z Score model in 2011 whilst 2012 to 2014 discovers financial distress. The Beneish M score reveals entity Z as an earnings manipulator for 2010 and 2014 with M scores of -2.11 and -0.10. Days Receivables in Sales (DSRI) for 2010 of 1.53 is superior to the manipulators mean of 1.465, with gross margin index (GMI) in 2013 of 1.51 and 4.83 in 2014 which are greater than manipulators mean of 1.193. The results thus validate the use of Altman Z score in predicting bankruptcy and Beneish M score in detecting earnings manipulation when compared with secondary data relating to the entity.

Keywords: Altman's Z-score model, Beneish M-score model, Bankruptcy, earnings manipulation, Fraud

INTRODUCTION

International standard on auditing (ISA 240) discloses fraudulent financial reporting as encompassing calculated misstatements, integrating ignoring disclosures or overlooking amounts within financial statements with the objective of deceiving financial statement users.

ISA 240 reveals the methods in which financial statement fraud can be accomplished and are as stated below:

- Forgery, manipulation of accounting records and documentation utilised to prepare financial statements.
- Financial statements are deficient of important information pertaining to transactions, events as a consequence of deliberate omission.
- There exists premeditated misemployment of accounting principles pertaining to amounts, classification and disclosure.

ISA 240 (redrafted) affirms that incentives to engage in fraudulent financial reporting exist when management is pressured from external sources to attain expected earnings targets or financial income. Zimbabwe has experienced massive closures of companies due to bankruptcy and fraudulent financial reporting with the most spectacular collapse being Royal Bank. Musarurwa (2015) states the following as factors contributing to the bank's collapse:

- The bank opened on the 21 February 2011 with capital of US\$444 529 compared with US\$12.5 million least capital requisite.
- Internal audit reports were not submitted as required by the Reserve Bank of Zimbabwe (RBZ).
- Loans and advances valued at US\$1.28 million were conveyed as notes and coins.
- The system utilised by was incapable of accommodating commercial bank transactions hence loans were computed manually with figures being integrated in the main account. Computing figures manually meant they were prone to forgery as some clients' balances reflected settlement before they were due.

The bank's management manipulated accounts to hide its illiquid position from time of opening hence surrendering its operating licence to the RBZ in July 2012.

In Zimbabwe, securities and capital markets are regulated by the Securities and Exchange Commission of Zimbabwe (SECZ). With the realisation that published financial statements lacked auditor's reports and had minimum disclosures, SECZ engaged the Public Accountants and Auditors Board (PAAB) to review released financials (SECZ, 2012). Shoko (2013) disclosed the Zimbabwe Stock Exchange (ZSE) as investigating twenty companies on suspicions of doctoring financial statements. The purpose of the research

was to test validity of Altman Z Score model in predicting bankruptcy and Beneish M Score in predicting earnings manipulation of entity Z manufacturing in Zimbabwe..

LITERATURE REVIEW

Altman Z score

Professor Edward Altman (1968) developed the Altman Z Score bankruptcy prediction model. The original formula is as stated below.

$$Z = 0.01212X_1 + 0.014X_2 + 0.33X_3 + 0.006X_4 + 0.999X_5$$

where

X_1 = Working Capital / Total Assets.

X_2 = Retained Earnings / Total Assets

X_3 = Earnings Before Interest and Tax / Total Assets

X_4 = Market Value of Equity / Book Value of Liabilities.

X_5 = Sales / Total Assets

Z = Overall index

The interpretation of the Z score is as highlighted below:

$Z > 2.67$ "safe" zone

$1.81 < Z < 2.67$ "grey" zone

$Z < 1.81$ "distress" zone

X_1 Working Capital / Total Assets. An entity's net liquid assets are compared to total capitalization. Entities incurring persistent losses have lessening current assets relative to total assets (Altman, 1968).

X_2 Retained Earnings / Total Assets. This measures the earnings capacity of entity.

X_3 Earnings Before Interest and Tax / Total Assets. An entity's worth is derived from its earnings prowess of assets thus leading to bankruptcy in the event liabilities are greater than assets (Altman, 1968).

X_4 Market Value of Equity / Book Value of Total Liabilities. The ratio reveals degree to which entity assets can weaken in value before liabilities exceed assets (Altman, 1968).

X_5 Sales / Total Assets. This measures the entity's ability to generate sales utilising its assets. (Altman, 1968)

Altman and Lafleur (1981) modified the original formula to:

$$Z = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1.0X_5$$

The Z score for non-manufacturers can be utilised by adopting the model below

$$Z = 6.56X_1 + 3.26X_2 + 6.72X_3 + 1.05X_4$$

Where

X_1 = Working Capital / Total Assets.

$X2 = \text{Retained Earnings} / \text{Total Assets}$

$X3 = \text{Profit Before Interest and Tax} / \text{Total Assets}$

$X4 = \text{Net Worth} / \text{Total Liabilities}$

The Z score was then interpreted as highlighted below:

$Z < 2.6$ “safe” zone

1.1 $Z < 2.6$ “grey” zone

$Z < 1.1$ “distress” zone

Beneish M score

Professor Messod Beneish (1999) developed the M score, a mathematical model that utilises financial ratios and is similar to Z score but differs in its objective. Whilst the Z score focuses on bankruptcy prediction, the M score seeks to uncover manipulation of earnings. Warshavsky (2012) postulates the adoption of the Beneish model as a tool in the evaluation of prospects of manipulating earnings. The model has two versions that are as stated below:

Eight variable model:

$$M = -4.84 + 0.92 * \text{DRSI} + 0.528 * \text{GMI} + 0.404 * \text{AQI} + 0.892 * \text{SGI} + 0.115 * \text{DEPI} - 0.172 * \text{TATA} - 0.327 * \text{LVGI}$$

Where

DRSI = Days’ Sales in Receivable Index. The day sales in receivable of the current and prior year are compared with the objective of revealing inflated revenue (Beneish, 1999).

GMI = Gross Margin Index. The ratio measures the gross margin of current and compares with prior year. An entity with poor growth prospect is more likely to manipulate. (Beneish, 1999).

AQI = Asset Quality Index. Non-current assets excluding property plant and equipment are compared with total assets with an AQI greater than 1 revealing the entity has either increased its intangibles or cost deferral hence creating earnings manipulation (Beneish, 1999).

SGI = Sales growth Index. The ratio measures current sales versus prior year (Beneish, 1999).

DEPI = Depreciation Index. The ratio measures the depreciation rate of the current compared to prior year. Slower rates of depreciation may indicate an entity is revising useful life upwards or is adopting an income friendly method of depreciation (Beneish, 1999).

SGAI = Sales, General and Administrative Expenses Index. The ratio compares current sales, general and administrative expenses with that of prior year (Beneish, 1999).

LVGI = Leverage Index. Total debt is compared with total assets of current to prior year (Beneish, 1999).

TATA = Total Accruals to Total Assets. The ratio measures the extent to management undertake discretionary accounting policies that translate into altering of earnings (Beneish, 1999).

Five variable model:

$$M = -6.065 + 0.823 * \text{DRSI} + 0.906 * \text{GMI} + 0.593 * \text{AQI} + 0.717 * \text{SGI} + 0.107 * \text{DEPI}$$

Empirical studies

Altman Z score

Ncube (2014) unearthed that 83.33% of Zimbabwe Stock Exchange listed financial sector entities as under distress with 16.67 % within the “grey” zone. Alareeni and Bransen (2013) in their study of Jordanian non-failed and failed entities discovered that the original Z score model worked effectively. Kumar and Kumar (2012) compared Altman’s Z score, Ohlson’s O Score and Zmijewski’s model and exposed the best existing financial distress model as Ohlson’s O score.

Beneish M score

Kuar, Sharma and Khanna (2014) in a study of Indian firms using the Beneish model discovered 32.14% companies as being engaged in earning management in the telecoms sector from a sample of 28 companies and 31.18% the retail sectors having been involved in earnings management from a sample of 93 companies. Warshavsky (2012) in his study on Enron declared the entity as a manipulator of earnings with an m score of 1.89 that is superior than -2.22. Omar et al (2014) affirm Megan Media Holdings Berhad as an earnings manipulator as the entity had an m score greater than -2.22. Gyarteng (2014) discloses AngloGold Ashanti had a high m score of -1.44 in 2010 but lower in 2011 and 2012 hence concluding the entity as not being a manipulator of earnings with AngloGold Ashanti being in financial distress as highlighted by the Altman model.

METHODOLOGY

The study applied the Altman’s Z-score and the Beneish M-Score models that are as stated below:

Altman Z score

$$Z = (1.2X1) + (1.4X2) + (3.3X3) + (0.6X4) + (1.0X5)$$

X1 = Working capital / total assets.

X2 = retained earnings / total assets

X3 = profit before interest and tax / total assets

X4 = market value of equity / book value of liabilities.

X5 = sales / total assets

Z = Overall index

Beneish M Score

The study adopted the 5 variable M-score model with manipulators of financial statements having M-scores greater than -2.22 (Kaur, Sharma & Khanna, 2014).

$$M \text{ Score} = -6.065 + 0.823\text{DRSI} + 0.906\text{GMI} + 0.593\text{AGI} + 0.717\text{SGI} + 0.107\text{DEPI}$$

DRSI - Days’ sale in receivables index.

GMI - Gross margin index.

AGI - Asset quality index.

SGI - Sales growth index

DEPI - Depreciation index.

The data sample utilised for study consisted of 2010 to 2013 financial statements obtained from the entity’s website.

RESULTS & ANALYSIS

Table 1	Altman		Z Score			
	2011	2012	2012 restated	2013	2013 restated	2014
X1	42.61/636.16 0.067	41.63/679.81 0.061	(21.57)/639.03 -0.034	(13.02)/689.83 -0.019	(99.67)/ 637.32 -0.156	(192.56)/464.37 -0.415
X2	80.68/636.16 0.127	91.28/679.81 0.134	44.35/639.03 0.069	65.66/689.83 0.095	1.31/637.32 0.002	(117.94)/464.37 -0.254
X3	73.52/636.16 0.116	43.24/679.81 0.064	43.24/679.81 0.064	1.24/689.83 0.002	24.85/637.27 0.039	(133.39)/464.37 -0.287
X4	493.04/351.41 1.403	256.83/384.45 0.668	256.83/390.60 0.658	245.02/420.10 0.585	245.62/431.94 0.569	66.56/413.15 0.159
X5	518.65/636.16 0.815	425.08/679.81 0.625	425.08/679.81 0.625	428.78/689.83 0.622	423.34/637.32 0.664	338.34/464.37 0.729

Z Score **2.2978** **1.4978** **1.2868** **1.0898** **0.9497** **-0.9763**

Table 1 reveals entity Z as being in the “grey” zone ($1.81 < Z < 2.67$) in 2011. From 2012 to 2014, entity Z is in financial distress as the Z scores are less than 1.81 (2012: 1.4978, 2013: 1.0898 and 2014: -0.9763). The restated financials disclose further financial distress (2012: 1.2868, 2013: 0.9497). The findings are in tandem with entity Z external auditors going concern assessment findings therefore ratifying the use of the Altman model in predicting bankruptcy.

Table 2	Beneish		M Score			
	2011	2012	2012 Restated	2013	2013 restated	2014
DSRI	0.29/0.19 1.53	0.35/0.29 1.20	0.33/0.29 1.15	0.32/0.34 0.93	0.29/0.33 0.88	0.09/0.32 0.31
GMI	0.32/0.31 1.06	0.31/0.29 1.06	0.31/0.29 1.06	0.29/0.24 1.19	0.29/0.19 1.51	0.19/0.04 4.83
AQI	0.5/0.505 0.99	0.47/0.505 0.923	0.50/0.505 0.98	0.48/0.47 1.02	0.52/0.50 1.04	0.55/0.47 1.18
SGI	518.65/348.57 1.48	425.08/518.65 0.82	425.08/518.65 0.82	428.78/425.08 1.01	423.34/425.08 1.00	338.34/428.78 0.79
DEPI	0.05/0.06 0.83	0.06/0.07 0.86	0.06/0.07 0.86	0.07/0.07 1	0.07/0.07 1.00	0.08/0.11 0.70
M-score	-2.11	-2.89	-2.90	-2.78	-2.53	-0.10

Table 2 reveals Days Sales in receivables (DSRI) of 1.53 that is greater than manipulators mean of 1.465 thereby alluding to revenue inflation in 2011 as receivables have risen by 128% from 2010 with sales growing by 48.79% for the same period with the entity’s business model being credit than cash. Gross margin Index (GMI) of 1.19 (2013), 1.51 (2013 restated) and 4.83 (2014) are superior to the manipulators mean score of 1.19. An analysis of the gross profit ratio from 2012 to 2014 reveals a fall in earnings (2012: 29.11%, 2013: 19.28% and 2014: 4.33%). The researcher therefore postulates manipulation of GMI (2013 and 2014) as a measure to address the fall in earnings as divulged by the gross profit ratio. According to Warshavsky (2012), m scores greater than -2.22 reveal an entity’s financial statements have been

manipulated. The overall M scores from 2012 to 2013 disclose entity Z as a non-manipulator of financial statements. The years 2011 and 2014 expose entity Z as an earnings manipulator. In 2011 the Z score revealed entity Z as being in the safe zone with the M score revealing -2.11 whilst in 2014 the M score is -0.10 with a Z score of -0.98 implying earnings manipulation in order to “window dress” financial distress.

The results therefore validate the usage of Altman Z score model for predicting bankruptcy and Beneish M Score model for detecting earnings manipulation.

CONCLUSION

The Altman Z score and the Beneish M score models can be utilised by stakeholders in bankruptcy prediction and earnings manipulation thus saving investors from incurring substantive losses from their investments, especially in developing countries like Zimbabwe where there is limited research in this field. The Securities Exchange of Zimbabwe and Zimbabwe Stock Exchange can be aided by such models in an effort to detect fraudulent financial reporting (earnings manipulation) within published financial statements.

REFERENCES

Altman, E. (1968). Financial Ratios, Discriminant Analysis and the Prediction of Corporate bankruptcy. The Journal of Finance, 23, 589-609.

Amoa-Gyarteng, K. (2014). Analyzing a Listed Firm in Ghana for early Warning Signs of Bankruptcy and Financial Statement Fraud: An Empirical Investigation of AngloGold Ashanti. European Journal of Business and Management. 6(5).10-17.

Anjum, S. (2012). Business bankruptcy prediction models: A significant study of the Altman's Z –score model. Asian Journal of management Research. 3(1), 212-219.

Branson, J. & Alareeni, B. (2013). Predicting Listed Companies' Failure in Jordan Using Altman Models: A Case Study. International Journal of Business and Management. 8(1), 113-126.

Beneish, M.D (1998). Discussion of “Are Accruals during Initial Public offerings Opportunist” Review of Accounting, 3, 209-221.

Beneish, M.D. (1999). The detection of Earnings Manipulation. Financial Analyst Journal: 24-26.

Harrington, C. (2005, March/April). Analysis ratios for detecting financial statements fraud. Fraud magazine. Retrieved 23rd September 2015, from <http://choach.com/uploaded/files/Fraud/ACFE%20Article%20Formulas%20for%20detection%20Analysis.pdf>.

International Auditing and Assurance Standards Board (2012). Handbook of International Quality control, Auditing review, other Assurance, and Related services Pronouncements, Volume 1, IFAC publishing, p168-169

Mahama, M. (2015). Detecting Corporate Fraud and Financial Distress using the Altman and Beneish Models.: the case of Enron Corp. International Journal of Economics, Commerce and Management, 3(1), 1-18

Musaruwa, D. (2015, August 12). Shocking rot at Royal Bank. The Sunday Mail.

Ncube, T. (2014). Predicting Corporate Failure: Insights from the financial sector in Zimbabwe. International Journal of Economics, Commerce and Management. 2(11), 1-19.

Omar, N. et al (2014). Financial Statement Fraud: A Case Examination Using Beneish Model and Ratio Analysis. International Journal of Trade, Economics and Finance, 5(2), 184-186

Securities and Exchange Commission of Zimbabwe 2012 annual report. Retrieved from : <http://www.seczim.co.zw/investor-information/annual-reports>.

Sharma, K., Khanna, A. & Kaur, R. (2014). Detecting Earnings Management in India: A sector –wise study. *European Journal of Business and Management*, 11(6), 11-19.

Warshavsky, M. (2012). Enron: A Case of Deception and unethical Behaviour. *Feature Edition*, 2012 (1), 88-97.