

DETECTION OF FINANCIAL STATEMENT FRAUD IN THE CONSTRUCTION SECTOR WITH THE BENEISH M-SCORE

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Abstract

This research investigates the occurrence of financial statement fraud by utilizing the Beneish M-Score model, focusing on construction companies which listed on the Indonesia Stock Exchange (IDX) over the period 2019 to 2023. Financial statement fraud, characterized by the intentional distortion of accounting data to mislead stakeholders, has emerged as a growing issue in the global financial environment, including within the Indonesian context. Introduced by Messod Beneish in 1999, the Beneish M-Score model employs a set of financial ratios to identify the likelihood of earnings manipulation within a company's financial reporting. In this research, the model is applied to evaluate the financial statements of PT Waskita Karya, a state-owned company operating in Indonesia's construction industry during the selected timeframe. The research identifies key financial ratios that indicate potential fraud, focusing on the Days Sales in Receivables Index (DSRI), Gross Margin Index (GMI), Asset Quality Index (AQI), Sales Growth Index (SGI), Depreciation Index (DEPI), Sales, General, and Administrative Expense Index (SGAI), Leverage Index (LVGI), and Total Accrual to Total Assets Index (TATA). The results indicate that the Beneish M-Score model serves as an effective tool for detecting early indications of irregularities in financial reporting, while also providing useful insights for auditors, investors, and regulators in supporting transparency and accountability across infrastructure companies. This study adds to the expanding literature on fraud detection in financial reporting, especially within emerging markets, and emphasizes the need for strong financial control systems to reduce the risk of earnings manipulation.

Keywords: Financial Statement Fraud, Fraud Detection, Beneish M-Score, Construction Companies, Indonesia Stock Exchange

INTRODUCTION

Financial statement fraud is a form of misconduct that undermines the reliability of financial statements and impairs stakeholders' capacity to make informed economic decisions. Although it only accounts for about 5% of total fraud cases, the median loss it causes reaches USD 766,000 per case, making it the most financially damaging type of fraud (ACFE, 2024). The Beneish M-Score, introduced by Beneish (1999), serves as one of the analytical tools designed to detect potential earnings manipulation by evaluating eight specific financial ratios. However, the effectiveness of this model in the construction sector is still debated. Studies such as Repousis (2016) demonstrate its reliability in the context of public companies, but Lu and Zhao (2021) criticize the model for not considering the unique characteristics of the construction sector, such as project-based accounting and progressive revenue recognition methods. Therefore, some experts suggest using a hybrid approach with a combination of machine learning or contextual indicators to enhance the model's sensitivity to industry-specific fraud patterns (Ravisankar et al., 2011). The effectiveness of the Beneish M-Score in the construction industry must be investigated to ensure better focused and sectorally appropriate fraud detection.

Several models have been introduced in the fields of accounting and finance to identify financial statement fraud and evaluate a firm's financial condition, such as the Beneish M-Score,

Piotroski F-Score, and Altman Z-Score. Among these, the Beneish M-Score is considered the most effective in detecting earnings manipulation, as it was specifically designed to capture irregularities in financial ratios closely associated with earnings management practices (Beneish, 1999; Siregar et al., 2023). Empirical validation in various countries such as Greece, China, and Indonesia shows that this model is capable of detecting historical fraud as well as functioning as an early warning system (Repousis, 2016; Lu & Zhao, 2021; Cristina et al., 2021). Nevertheless, M-Score has a limitation in the form of a high potential for false positives, which can cause reputational and economic damage to innocent companies (Beneish & Vorst, 2022). On the other hand, the F-Score assesses a company's overall financial health but is less sensitive to subtle earnings manipulation (Khatun et al., 2022), whereas the Altman Z-Score excels at measuring bankruptcy risk but is insufficiently accurate at detecting accounting fraud (Fenyves et al., 2023). Hořda (2020) and Kamal et al. (2016) suggest that the Beneish M-Score remains one of the most dependable and flexible methods for identifying financial statement fraud in various international contexts.

Due to project complexity, high transaction values, and accounting estimate flexibility, the construction industry is believed to be particularly vulnerable to financial statement fraud on a global scale. Case studies such as PT Wijaya Karya Beton Tbk in Indonesia (Riinggi & Novita, 2023; Narsa et al., 2023) and Enron in the United States (Maccarthy, 2017; Ofroi, 2016) demonstrate that predictive tools like the Beneish M-Score are capable of identifying financial irregularities within the construction sector. Research in China (Lu & Zhao, 2021), Greece (Repousis, 2016), Malaysia (Kamal et al., 2016), and South Africa (Marais et al., 2023) also found high M-scores in construction companies, indicating a significant risk of financial statement manipulation. However, Beneish & Vorst (2022) remind us that errors in fraud prediction can also cause systemic losses. In Indonesia, BPS data (2024) shows that the construction sector's revenue increased by 8.61% from Rp1,558 trillion (2022) to Rp1,693 trillion (2023), reflecting strong performance and the strategic role of this sector. However, this growth also has the potential to create managerial pressure. This is classified as a fraud trigger in the fraud triangle theory. Therefore, to guarantee the integrity of financial data in the construction industry, tight control and openness in financial reporting are essential.

The case of financial statement fraud at PT Waskita Karya (Persero) Tbk has become a national spotlight after indications of financial statement manipulation were found since 2016. Based on the investigation by the Financial and Development Supervisory Agency (BPKP), There were disparities between the recorded assets, profits, and losses and the company's true financial state (Tempo.co, 2023). The most striking anomaly occurred in 2021–2022, when the company's net profit significantly increased from Rp 1.09 trillion to Rp 1.89 trillion, yet the cash flow from operating activities was negative, reaching minus Rp 106 billion in 2022. This disparity is known in the literature as the profit-cash flow anomaly, which often serves as an early indicator of accounting fraud (Beneish & Vorst, 2022). The manipulation was reinforced by the alleged use of a Supply Chain Financing (SCF) scheme based on fictitious documents involving the board of directors, resulting in state losses amounting to Rp 2.5 trillion. In 2023, the Indonesian Attorney General's Office officially listed Waskita's President Director and numerous other officials as suspects in the scheme's abuse. Interestingly, 2023 also showed a surge in net profit to Rp 3.77 trillion and positive operating cash flow of Rp 2.32 trillion, but this correction actually strengthens the suspicion that the reports from previous years contained significant financial engineering.

This study offers a novel use of the Beneish M-Score to identify financial statement fraud, particularly in the construction industry, which is notoriously intricate and vulnerable to accounting fraud. Even though this model has been successful all over the world (Repousis, 2016; Lu & Zhao, 2021; Siregar et al., 2023), our study shows that the profit-cash flow anomaly is a very useful indication for identifying profit-manipulation tactics in construction firms. The case of PT Waskita Karya reinforces these findings, where the employment of fake supply chain financing schemes is linked to the disparity between net income and operating cash flow (Tempo.co, 2023; Beneish & Vorst, 2022). In order to improve fraud detection accuracy in the construction sector, this study also contributes theoretically by highlighting limitations in the Beneish M-Score and suggesting a sector-

based hybrid framework that merges financial ratio analysis with contextual elements such as project cash flow and managerial pressure (Marais et al., 2023).

LITERATURE REVIEW

Financial Statement Fraud

Financial statement fraud refers to unethical practices carried out by individuals in positions of trust, where accounting information is intentionally altered to create a misleading picture of a firm's financial performance for stakeholders. These actions include revenue inflation, hiding liabilities, and transaction manipulation, which are generally carried out by top management who have access to the reporting system (Repousis, 2016; Beneish & Vorst, 2022). Pressure from the capital market and internal targets are the main triggers, especially when internal control systems and external oversight are weak (Lu & Zhao, 2021). Cross-country studies reveal that this fraud occurs not only in developing nations but also in public firms in affluent countries, demonstrating that tough regulations are insufficient in the absence of a strong corporate integrity culture (Cristina et al., 2021; Aqilah et al., 2021). Durana et al. (2022) argue that economic motivations frequently trump control mechanisms, making financial reporting a strategic instrument for maintaining a company's reputation. Therefore, fraud prevention requires a multidisciplinary approach that includes quality audits, strict regulations, and governance based on transparency and ethics.

Utilizing the Beneish M-Score to Identify Manipulation in Financial Reporting

The Beneish M-Score is a quantitative framework aimed at identifying manipulation in financial reports by analyzing eight key financial indicators, including changes in receivables, profit margins, and depreciation patterns (Beneish & Vorst, 2022). This model has been validated in a number of countries, including Greece (Repousis, 2016), China (Lu & Zhao, 2021), Malaysia (Aqilah et al., 2021), and Eastern European regions such as Romania, Slovakia, and Hungary (Cristina et al., 2021; Durana et al., 2022; Fenyves et al., 2023). One of the M-Score's significant contributions lies in its role as a diagnostic instrument that enables early detection of accounting anomalies, thereby supporting auditors and regulators in initiating timely investigative procedures. However, this model also has limitations, particularly in terms of the risk of classification errors that can seriously impact detection effectiveness and reputation (Beneish & Vorst, 2022). As a result, its usage is recommended as a supplement to forensic audits rather than the sole approach, and it must be tailored to the industrial context and managerial behavior (Irwandi et al., 2019; Kaab Omeir et al., 2023). Beneish (1999) introduced the M-Score as a composite measure derived from eight distinct financial indicators, each selected for its potential to reflect the likelihood of earnings manipulation. The basic formula is as follows:

$$M = -4,84 + 0,92 \cdot \text{DSRI} + 0,528 \cdot \text{GMI} + 0,404 \cdot \text{AQI} + 0,892 \cdot \text{SGI} + 0,115 \cdot \text{DEPI} - 0,172 \cdot \text{SGAI} + 4,679 \cdot \text{TATA} - 0,327 \cdot \text{LVGI}$$

Table 1. The Formula of Eight Indexes or Accounting Variables of Beneish M-Score Model (1999)

Ratio	Formula
Days sales in receivable index (DSRI)	$(\text{Receivables } t / \text{Sales current year } t) / (\text{Receivables } t-1 / \text{Sales prior } t-1)$
Gross margin index (GMI)	$[(\text{Sales } t-1 / \text{Cost of goods sold } t-1) / \text{Sales } t-1] / [(\text{Sales } t / \text{Cost of goods sold } t) / \text{Sales } t]$
Gross margin index (GMI) Asset quality index (AQI)	$[1 - (\text{Current assets } t + \text{PPE } t / \text{Total assets } t)] / [1 - (\text{Current assets } t-1 + \text{PPE } t-1 / \text{Total assets } t-1)]$

Sales growth index (SGI)	$\text{Sales } t / \text{sales } t-1$
Depreciation index (DEPI)	$[\text{Depreciation } t / (\text{Depreciation } t + \text{PPE } t)] / [\text{Depreciation } t-1 / (\text{Depreciation } t-1 + \text{PPE } t-1)]$
Sales, general, and administrative expenses index (SGAI)	$(\text{Sales, general and administrative expenses } t / \text{Sales } t) / (\text{Sales, general and administrative expenses } t-1 / \text{Sales } t-1)$
LVGI (Leverage Index)	$[(\text{Total long term debt } t + \text{current liabilities } t) / \text{Total assets } t] / [(\text{Total long term debt } t-1 + \text{current liabilities } t-1) / \text{Total assets } t-1]$
to total assets (TATA)	$[(\text{Total current assets } t - \text{Total cash} - \text{Total current liabilities } t - \text{Total long term debts } t - \text{Income Tax payable } t - \text{Depreciation and amortization } t) / \text{Total assets } t]$

Notes: t = Current year; t-1 = Prior year; PPE = Property, plant and equipment.

The score generated from this model is compared to the threshold of -2.22, which serves as a dividing point between companies at high risk of manipulation (M-Score > -2.22) and companies considered not to be manipulating (M-Score < -2.22). The Beneish M-Score acts as an early detection method, allowing auditors, investors, and regulatory agencies to statistically analyze the integrity of financial statements.

Table 2. Definitions of the Eight Beneish M-Score Accounting Variables based on Beneish (1999)

Index Type	Manipulator	Non-Manipulator
DSRI	≤ 1.031	> 1.031
GMI	≤ 1.014	> 1.014
AQI	≤ 1.039	> 1.039
SGI	≤ 1.134	> 1.134
DEPI	≤ 1.001	> 1.001
SGAI	≤ 1.001	> 1.001
LVGI	≤ 1.004	> 1.004
TATA	≤ 0.018	> 0.018

According to Repousis (2016), the indices DSRI, AQI, DEPI, and TATA are primarily utilized to figure out potential distortions or fraudulent modifications in financial reporting resulting from earnings manipulation. In contrast, SGI, SGAI, GMI, and LVGI are more indicative of behavioral patterns that suggest a predisposition toward manipulating reported earnings. In general, All combinations of the M-score model's eight ratios or indices imply that revenue increases and expense deferral or reduction are unlikely in situations where there is no affecting assets or liabilities. Furthermore, this approach can help stakeholders like as managers, regulators, auditors, bankers, law enforcement agencies, and forensic accountants detect fraud and identify warning indications.

RESEARCH METHODS

The construction sector was chosen as the focus of the research due to project complexity, long-term contracts, and fluctuating cost estimates, making it highly vulnerable to financial statement fraud (Cristina et al., 2021; Durana et al., 2022). The use of the percentage of completion method in financial reporting opens up opportunities for creative accounting practices, which, according to Repousis (2016), are often exploited to engineer revenue. In the context of developing

countries, Weak external monitoring and investor pressure raise the possibility of financial statement manipulation in this sector (Lu & Zhao, 2021; Aqilah et al., 2021). As a result, this study employs a quantitative method through the Beneish M-Score framework, constructed from a set of eight financial variables to discover manipulative patterns such as DSRI, AQI, and TATA (Beneish & Vorst, 2022). This study examines infrastructure firms registered on the Indonesia Stock Exchange during the 2019–2023 timeframe to find the variables that most strongly correlate to fraud indicators. The study's findings are designed to help investors anticipate the risk of financial statement manipulation, as well as serve as a foundation for subsequent research in the construction and other sectors.

Population

The research population is defined as the entire set of analysis units that possess characteristics in accordance with the study's objectives (Lu & Zhao, 2021). In this research, the population is made up of 67 infrastructure firm registered on the Indonesia Stock Exchange (IDX) that have disclosed annual financial reports covering the fiscal periods 2019–2023, with data obtained from the official IDX website.

Sample

Sample selection in financial statement fraud research not only considers statistical aspects but also contextual relevance such as industry sector and observation period (Beneish & Vorst, 2022; Durana et al., 2022). Accurate population definition and sample methods are critical to the validity and dependability of study findings (Halilbegovic et al., 2020; Kamal et al., 2016). This study employs non-probability sampling techniques, which involve sample selection based on practical considerations such as data access and case relevance, commonly used in forensic financial research when data is limited (Repousis, 2016). The use of a five-year period is also considered optimal because it can capture financial fluctuations and strengthen the validity of detection models such as the Beneish M-Score, especially in the context of changing market conditions (Lu & Zhao, 2021).

RESULTS AND DISCUSSION

Table 3. Beneish M-Score Evaluation Outcomes for PT Waskita Karya (Persero) Tbk in 2019

Index Type	Score	Category
DSRI	2,01	Manipulator
GMI	1,02	Manipulator
AQI	-1,12	Non-Manipulator
SGI	0,64	Non-Manipulator
DEPI	0,79	Non-Manipulator
SGAI	1,28	Manipulator
LVGI	1,04	Manipulator
TATA	9,67	Manipulator

Based on Table 3, Beneish M-Score Evaluation Outcomes for PT Waskita Karya (Persero) Tbk in 2019, It is concluded that five of the eight indicators employed in the model suggest the possibility of financial statement falsification. The manipulator indices include the Days Sales in Receivables Index (DSRI), the Gross Margin Index (GMI), the Sales General and Administrative Expenses Index (SGAI), the Leverage Index (LVGI), and the Total Accrual to Total Assets Index. The very high DSRI value (2.01) indicates a possibility of unreasonable revenue recognition, while the extreme TATA value (9.67) reflects significant accrual accumulation, a strong signal of earnings management practices (Beneish & Vorst, 2022). Additionally, the high ratios of SGAI and LVGI indicate cost pressures and external financing that may drive the company to manipulate in order to maintain public perception of its financial performance (Cristina et al., 2021; Durana et al., 2022).

Table 4. Beneish M-Score Evaluation Outcomes for PT Waskita Karya (Persero) Tbk in 2020

Index Type	Score	Category
DSRI	0,17	Manipulator
GMI	2,74	Non-Manipulator
AQI	-7,41	Manipulator
SGI	0,52	Manipulator
DEPI	1,01	Non-Manipulator
SGAI	6,68	Non-Manipulator
LVGI	1,11	Non-Manipulator
TATA	-2,24	Manipulator

Based on Table 4, Beneish M-Score Evaluation Outcomes for PT Waskita Karya (Persero) Tbk in 2020, It is concluded that four of the eight accounting variables, namely the Days Sales in Receivables Index (DSRI), Asset Quality Index (AQI), Sales Growth Index (SGI), and Total Accruals to Total Assets (TATA), are manipulative. The DSRI value of 0.17 and TATA of -2.24, although appearing extreme, are actually below the threshold and indicate the possibility of fictitious revenue recognition and the use of unreasonable accruals (Beneish & Vorst, 2022). The very low AQI (-7.41) also reflects a significant decline in asset quality, which could be a sign of a shift in the value of fixed assets that does not reflect the real condition (Cristina et al., 2021). The SGI of 0.52 indicates a slowdown in sales growth, which in certain contexts can trigger managerial pressure to manipulate profits to maintain investor perception (Durana et al., 2022).). Meanwhile, the other four indices, Gross Margin Index (GMI), Depreciation Index (DEPI), Sales General and Administrative Expenses Index (SGAI), and Leverage Index (LVGI), are classified as non-manipulators, which means there are no significant abnormalities in gross profit margin, depreciation, operating expenses, or leverage ratio.

Table 5. Beneish M-Score Evaluation Outcomes for PT Waskita Karya (Persero) Tbk in 2021

Index Type	Score	Category
DSRI	3,15	Non-Manipulator
GMI	0,42	Manipulator
AQI	-7,13	Manipulator
SGI	0,76	Manipulator
DEPI	1,18	Non-Manipulator
SGAI	0,58	Manipulator
LVGI	0,96	Manipulator
TATA	-9,20	Manipulator

Based on Table 5, Beneish M-Score Evaluation Outcomes for PT Waskita Karya (Persero) Tbk in 2021 suggest that the company has strong indications of financial statement manipulation. Six of the indices evaluated (GMI, AQI, SGI, SGAI, LVGI, and TATA) are manipulators, whereas just two (DSRI and DEPI) are non-manipulators. The Gross Margin Index (GMI) value of 0.42 indicates a significant decline in gross profit margin, which is often associated with pressure to manipulate earnings (Beneish & Vorst, 2022). The very low AQI and TATA values indicate a high proportion of accruals and declining asset quality, two key indicators in earnings management practices (Cristina et al., 2021). Additionally, the SGAI and LVGI values that are below the threshold also indicate operational and financing pressures that could prompt managers to embellish financial statements (Durana et al., 2022). Although DSRI and DEPI are in the safe zone, this is not enough to neutralize the manipulative signals indicated by the other six indices.

Table 6. Beneish M-Score Evaluation Outcomes for PT Waskita Karya (Persero) Tbk in 2022

Index Type	Score	Category
DSRI	0,85	Manipulator
GMI	1,64	Non-Manipulator
AQI	-7,60	Manipulator
SGI	1,25	Non-Manipulator
DEPI	0,94	Manipulator
SGAI	0,74	Manipulator
LVGI	1,00	Manipulator
TATA	1,59	Manipulator

Based on Table 6, Beneish M-Score Evaluation Outcomes for PT Waskita Karya (Persero) Tbk in 2022, it is concluded that out of the eight indices used, six of them, namely DSRI (0.85), AQI (-7.60), DEPI (0.94), SGAI (0.74), LVGI (1.00), and TATA (1.59), meet the criteria as manipulative indicators according to the thresholds set by Beneish (1999). Only two variables, namely GMI (1.64) and SGI (1.25), fall outside the manipulator range. The very high TATA value indicates a high proportion of accruals to total assets, which is a characteristic of accrual-based earnings manipulation. Additionally, the very low AQI value and DEPI below the threshold also indicate anomalies in asset quality and depreciation.

Table 7. Beneish M-Score Evaluation Outcomes for PT Waskita Karya (Persero) Tbk in 2023

Index Type	Score	Category
DSRI	1,64	Non-Manipulator
GMI	1,22	Non-Manipulator
AQI	-5,61	Manipulator
SGI	0,72	Manipulator
DEPI	0,89	Manipulator
SGAI	1,35	Non-Manipulator
LVGI	1,03	Non-Manipulator
TATA	-1,80	Manipulator

Based on Table 7, Beneish M-Score Evaluation Outcomes for PT Waskita Karya (Persero) Tbk in 2023, it is concluded that there are indications of a mixed category between manipulators and non-manipulators. The DSRI value of 1.64 and GMI value of 1.22 each indicate that the company is not suspected of manipulation in terms of accounts receivable and gross margin, considering that both exceed the manipulator threshold set by Beneish (1999). The same applies to the SGAI index (1.35) and LVGI (1.03), which also fall into the non-manipulator category. However, manipulative indications appear in the AQI index with a value of -5.61, SGI of 0.72, DEPI of 0.89, and TATA of -1.80. These four indices are below the established thresholds and indicate an increase in non-productive assets, declining sales growth, a decrease in depreciation expenses, and high accruals all of which are common signals of earnings manipulation practices (Beneish & Vorst, 2022; Fenyves et al., 2023).

Table 8. Calculation Results of M-Score Value for PT Waskita Karya (Persero) Tbk

Year	M-Score	Category
2019	-4,54	Non-Manipulator
2020	-2,99	Non-Manipulator
2021	-2,88	Non-Manipulator
2022	-3,07	Non-Manipulator
2023	-2,26	Non-Manipulator

Based on Table 8, the M-Score calculation results for PT Waskita Karya (Persero) Tbk show a consistent score below the threshold of -2.22, indicating that the firm is not detected as engaging in financial statement manipulation (non-manipulator). However, the 2023 value approaching that threshold indicates the need for further supervision, considering that the construction industry is vulnerable to financial engineering. Therefore, it is recommended to continue conducting forensic audits as an additional verification step (Beneish & Vorst, 2022; Durana et al., 2022; Cristina et al., 2021).

The outcomes of the Beneish M-Score analysis on PT Waskita Karya (Persero) Tbk during 2019-2023 show that, while the Beneish M-Score of PT Waskita Karya (Persero) Tbk for the period 2019-2023 is generally below the threshold of -2.22 (non-manipulator), several indicators such as AQI, SGI, and TATA consistently show abnormal values, indicating the potential for creative accounting practices. These findings corroborate the findings of Fenyves et al. (2023) and Cristina et al. (2021), who highlight the tendency to manipulate accrual accounting and non-current assets, notably in the construction sector. The AQI and TATA indicators were recognized as major contributors to detecting symptoms of manipulation, consistent with the findings of Repousis (2016) and Aqilah et al. (2021). This research reinforces the relevance of earnings management theory (Beneish & Vorst, 2022) and recommends a hybrid approach with the integration of sector-based risk audits (Durana et al., 2022; Lu & Zhao, 2021), and suggests modifications to the M-Score model to be more sensitive to the characteristics of state-owned construction industries in Indonesia.

CONCLUSION

Based on the findings, it is evident that the Beneish M-Score of PT Waskita Karya (Persero) Tbk throughout the 2019–2023 period indicates a non-manipulator status, analysis of the eight accounting ratio indicators reveals inconsistency signals leading to potential earnings manipulation, particularly in 2021 and 2022. These findings reinforce the statement by Beneish & Vorst (2022) that the application of the M-Score in the role of fraud detection tool requires a holistic approach, not only from the final score but also from the individual behavior of each variable. The implications derived from this study hold relevance for financial auditors, regulatory authorities, and market participants to not only rely on a single aggregate indicator but also to pay attention to the dynamics of internal indicators that can serve as early signals of manipulation, especially in the construction sector, which inherently has characteristics of long-term projects and complex revenue recognition (Durana et al., 2022; Cristina et al., 2021).

However, this research has limitations in the methodological aspect, as it relies solely on one statistical model (M-Score) without cross-validation from other audit techniques or qualitative analysis of financial statements. Additionally, this model is retrospective and does not take into account managerial contextual factors such as performance pressure or internal governance. Therefore, Further research should integrate the Beneish M-Score model with machine learning approaches or other detection models such as the Altman Z-Score or F-Score, as well as broaden industry coverage and include non-financial variables to obtain a more complete picture of manipulation risk (Fenyves et al., 2023; Kaab Omeir et al., 2023). This comprehensive technique considerably improves the validity and effectiveness of financial statement fraud detection.

BIBLIOGRAPHY

- Aqilah, N., Mohammed, N. F., & Kamaluddin, A. (2021). Application Of Beneish M-Score Model In Detecting Probable Earnings Manipulation In Malaysian Public Listed Companies. *Integrated Journal of Business and Economics*, 5(1), 86. <https://doi.org/10.33019/ijbe.v5i1.301>
- Beneish, M. D., & Vorst, P. (2022). The Cost of Fraud Prediction Errors. *Accounting Review*, 97(6), 91–121. <https://doi.org/10.2308/TAR-2020-0068>
- Cristina, T., Marian, S., Veronica, G., & Dan-Andrei, C. (2021). Fiscal and accounting fraud risk

- detection using beneish model. A romanian case study. *International Journal of Business and Society*, 22(1), 296–312. <https://doi.org/10.33736/IJBS.3176.2021>
- Durana, P., Blazek, R., Machova, V., & Krasnan, M. (2022). The use of Beneish M-scores to reveal creative accounting: evidence from Slovakia. *Equilibrium. Quarterly Journal of Economics and Economic Policy*, 17(2), 481–510. <https://doi.org/10.24136/eq.2022.017>
- Fenyves, V., Pisula, T., & Tarnoczi, T. (2023). Investigation of Accounting Manipulation Using the Beneish Model: Hungarian Case. *Economics and Sociology*, 16(4), 347–363. <https://doi.org/10.14254/2071-789X.2023/16-4/18>
- Halilbegovic, S., Celebic, N., Cero, E., Buljubasic, E., & Mekic, A. (2020). Application of Beneish M-score model on small and medium enterprises in Federation of Bosnia and Herzegovina. *Eastern Journal of European Studies*, 11(1), 146–163.
- Hołda, A. (2020). Using the Beneish M-score model: Evidence from non-financial companies listed on the warsaw stock exchange. *Investment Management and Financial Innovations*, 17(4), 389–401. [https://doi.org/10.21511/imfi.17\(4\).2020.33](https://doi.org/10.21511/imfi.17(4).2020.33)
- Irwandi, S. A., Ghozali, I., Faisal, & Pamungkas, I. D. (2019). Detection fraudulent financial statement: Beneish m-score model. *WSEAS Transactions on Business and Economics*, 16, 271–281.
- Kaab Omeir, A., Vasiliauskaite, D., & Soleimanizadeh, E. (2023). Detection of Financial Statements Fraud Using Beneish and Dechow Models. *Journal of Governance and Regulation*, 12(3 Special Issue), 334–344. <https://doi.org/10.22495/jgrv12i3siart15>
- Kamal, M. E. M., Salleh, M. F. M., & Ahmad, A. (2016). Detecting financial statement fraud by Malaysian public listed companies: The reliability of the Beneish M-Score model. *Jurnal Pengurusan*, 46, 23–32. <https://doi.org/10.17576/pengurusan-2016-46-03>
- Khatun, A., Ghosh, R., & Kabir, S. (2022). Earnings manipulation behavior in the banking industry of Bangladesh: the strategical implication of Beneish M-score model. *Arab Gulf Journal of Scientific Research*, 40(3), 302–328. <https://doi.org/10.1108/AGJSR-03-2022-0001>
- Lu, W. and Zhao, X. (2021), "Research and improvement of fraud identification model of Chinese A-share listed companies based on M-score", *Journal of Financial Crime*, Vol. 28 No. 2, pp. 566-579. <https://doi.org/10.1108/JFC-12-2019-0164>
- Maccarthy, J. (2017). Using Altman Z-score and Beneish M-score Models to Detect Financial Fraud and Corporate Failure: A Case Study of Enron Corporation. *International Journal of Finance and Accounting*, 6(6), 159–166. <https://doi.org/10.5923/j.ijfa.20170606.01>
- Maniatis, A. (2016). Detecting the Probability of Financial Fraud due to Earnings Manipulation in Companies Listed at Athens Stock Exchange Market. *Journal of Financial Crime*, 33, 1–22. [https://ruomoplus.lib.uom.gr/bitstream/8000/495/1/Article for RUOMO.pdf](https://ruomoplus.lib.uom.gr/bitstream/8000/495/1/Article%20for%20RUOMO.pdf)
- Marais, A., Vermaak, C., & Shewell, P. (2023). Predicting financial statement manipulation in South Africa: A comparison of the Beneish and Dechow models. *Cogent Economics and Finance*, 11(1). <https://doi.org/10.1080/23322039.2023.2190215>
- Narsa, N. P. D. R. H., Afifa, L. M. E., & Wardhaningrum, O. A. (2023). Fraud triangle and earnings management based on the modified M-score: A study on manufacturing company in Indonesia. *Heliyon*, 9(2), e13649. <https://doi.org/10.1016/j.heliyon.2023.e13649>
- Ofroi, E. (2016). Detecting Corporate Financial Fraud Using Modified Altman Z-score and Beneish M-score. The Case of Enron Corp. *Research Journal of Finance and Accounting*, 7(4), 59–65.
- Ozkan, S., & Alfathan, L. (2025). Earnings manipulation and cash holdings: a Beneish M-score analysis in G7 nations. *Cogent Business and Management*, 12(1). <https://doi.org/10.1080/23311975.2025.2502542>
- Repousis, S. (2016), "Using Beneish model to detect corporate financial statement fraud in Greece", *Journal of Financial Crime*, Vol. 23 No. 4, pp. 1063-1073. <https://doi.org/10.1108/JFC-11-2014-0055>
- Rianggi, F., & Novita, N. (2023). Fraud Hexagon Dan Fraudulent Financial Statement Dengan Pendekatan Beneish M-Score Model. *Jurnal Akuntansi Universitas Jember*, 21(2), 69. <https://doi.org/10.19184/jauj.v21i2.38089>

- Sakib, I. A., & Mollah, T. (2020). Detection of Financial Statement Frauds Using Beneish Model: Empirical Evidence from Listed Pharmaceutical Companies in Bangladesh The Economic Impact of Covid-19 Pandemic on the RMG Sector of Bangladesh View project Detection of Financial Statement Frauds Using Beneish Model: Empirical Evidence from Listed Pharmaceutical Companies in Bangladesh. *International Journal of Management, Accounting and Economics*, 7(9), 506–521. www.ijmae.com
- Shah, C., Saraswat, M., & Mehta, A. (2018). Predicting earnings manipulation using Beneish M - score of selected companies in India. *Indian Journal of Finance*, 12(4), 54–66. <https://doi.org/10.17010/ijf/2018/v12i4/122796>
- Siregar, R., Lores, L., Sari, W. P., Sagala, I. C., & Saragih, F. (2023). The Applicability of the Beneish M-Score Method for Detecting Financial Statement Fraud in Manufacturing Companies during the Covid-19 Pandemic. *Journal of System and Management Sciences*, 13(6), 622–634. <https://doi.org/10.33168/JSMS.2023.0636>