

# FINANCIAL STATEMENT FRAUD DETECTION MODELS: AN EXPLORATORY STUDY

**Ms. Yamuna Parikh, Dr. Kamini Shah**

Research Scholar  
Department of Business Studies  
Sardar Patel University  
Vallabh Vidyanagar  
Gujrat-388120.  
Mobile: 8200235705  
Email: [yamunaparikh1412@gmail.com](mailto:yamunaparikh1412@gmail.com)

Associate Professor  
Department of Business Studies  
Sardar Patel University  
Vallabh Vidyanagar  
Gujrat-388120.  
Mobile: 9825271629  
Email: [kamini\\_shah@spuvvn.edu](mailto:kamini_shah@spuvvn.edu)

## Abstract

*Financial Statement Fraud (FSF) is increasing rapidly in numbers and it creates a bad impact on the economy. Hence, it is necessary to detect such activities with the help of various FSF detection models. This study aims to discuss various FSF detection models that emphasize on detection of fraud from the financial information provided by the corporate entity in their financial reports. The present study uses a descriptive research design where the information has been obtained through various sources such as research journals, thesis and news articles. This study tries to cover the conceptual information about various FSF detection model available that gives in-depth insights into the model and its workings.*

**Keywords:** Financial statement fraud, Beneish M-Score, Dechow F-Score, Pustylnick P-Score, Z-Score, Montier C-Score

## INTRODUCTION

The joint-stock company has acquired a unique identity and it is being treated as a separate legal entity. The management of the company is in the hands of the Board of Directors on behalf of the shareholders for the growth of the company and in turn maximizing wealth of shareholders. But in recent years frauds have been increased. So, to retain, attract and maintain the trust of the company's investors, creditors and employees; firms must present true and fair information in their financial statements (Omoye & Eragbhe, 2014) Financial statements are a key statutory document of the company which shows the financial performance and economic aspect of the company. Promoters and management of the company may manipulate financial statements to deceive investors and other stakeholders by overstating assets, profit, revenue, understating depreciation, losses, expenses and other liabilities. (K P, 2021) Enron, WorldCom, Tyco, HealthSouth and Lehman Brothers are the notable accounting scandals that occurred over the last two decades around the world. (Corporate Finance Institute, 2015 to 2022). In India, we have witnessed many corporate frauds in recent years such as Satyam Computers, Kingfisher Airlines, Jet Airways, Bhushan Steel, 2G Spectrum, PNB Bank, Hawala Scam, etc. (Chakraborty, 2020) These frauds harm the stock market and Indian economy as a whole. Hence, it is necessary to detect such activity with the help of various financial statement fraud detection models which provide red flags or signals of earning manipulation or mischiefs in financial reports based on financial information provided by the entity.

## REVIEW OF LITERATURE

Aghghaleh, Mohamed, & Rahmat, 2016 compared the abilities of two financial information-based models namely the Beneish M-Score and Dechow F-Score, to check, detect and predict FSF for listed companies from 2001 to 2014 in Malaysia. The study reveals that both M-Score and F-Score models are efficient in predicting fraudulent and non-fraudulent firms with an average accuracy of 73.17% and 76.22% respectively. The study

also points out that the F-Score model better performs than the M-Score model in the sensitivity of predicting fraud cases with 73.17% compared to 69.51%. On the efficiency aspect, the result of the F Score model explains lower type II error at 26.83% compared to the M Score model as it is 30.49%. This study also suggests that the F Score model is a better model to detect FSF among Malaysian companies.

Bhavani & Amponsah, 2017 attempted to compare two information-based accounting tools namely Beneish M-Score and Altman-Z Score for the effective detection of financial statement fraud in corporate entities. In this study, data was taken from Toshiba's published corporate financial statement from 2008 to 2014, the primary objectives of the study aim to detect malfeasance using the two models. The methodology used in this research is as suggested by M-Score and Z-Score. The study revealed that the Beneish model was not able to detect any fraud, the Atman Z-Score Provided some signal that the company's financial statements were flawed. Even though the Beneish model is admired for predicting fraudulent financial statements. The study suggests that selecting the right forensic tool can influence the result of the detection.

Anh & Linh, 2016 explained that earning management is one of the most significant issues related to financial statements as well as a critical topic in accounting. They examined earning manipulation detection among Vietnamese companies listed on the Hochiminh stock exchange with the help of the Beneish M-Score model for a sample of 229 non-financial Vietnamese companies listed on HOSE from 2013 to 2014. The study revealed that 48.4% of non-financial Vietnamese companies listed on the HOSE were involved in earning manipulation and the sample observation fit the Beneish M-Score model. The study suggested that the M-Score model is a useful technique for detecting earning management in a company and it could be applied for an improvement in financial reporting quality and a better guard for investors.

Mohamed & Schachelor, 2014 examined the possible means available to company managers, auditors, and regulators of detecting, preventing, and reacting to FSF in Malaysian commercial companies. The study was conducted with the help of interviews with company managers, auditors, and regulators. Findings suggest that Management integrity and the development of sound internal systems to prevent fraud in a financial statement can help to reduce the probability of financial statement fraud taking place.

Mehta, Patel, Patel, & Purohit, 2012 explain that financial statement fraud is increasing rapidly in numbers all around the world. In India Satyam computers fraud was one of the biggest frauds in past, led by its founder which result in abolish of the trust of investors and breaking down the value of stock price. This paper examines financial statement data of Indian companies listed on the Bombay stock exchange to develop a model for detecting factors associated with a fraudulent financial statement by way of exercise of Auditors report and logistic regression techniques to develop a model to find out factors associated with FFS.

## DISCUSSION OF MODELS

Numerous techniques are available to detect fraud such as data mining, machine learning, artificial intelligence, neural networks, ratio analysis so on. In this study, various financial statement fraud detection models are discussed as follows which can detect fraud with the help of information provided in an entity's financial statement.

### Beneish M-Score

Professor Messod Beneish in the year 1999, developed a model called the Beneish M-Score. This model is helpful to classify fraudulent and non-fraudulent companies with the help of information provided by the company in their financial statement. M-Score is generated with the help of eight variables that can be calculated with the information provided in the financial statements of the company (Beneish, 1999) M-Score is calculated from the following formula.

$$M = -4.84 + 0.92 \times DSRI + 0.528 \times GMI + 0.404 \times AQI + 0.892 \times SGI + 0.115 \times DEPI - 0.172 \times SGAI + 4.679 \times TATA - 0.327 \times LVGI$$

Eight variables of Banish model are described in Table 1

**Table 1 Beneish M-Score**

Name of index	Formulas
Days Sales in Receivables Index (DSRI)	$\frac{\left(\frac{\text{Net Receivables}_t}{\text{Sales}_t}\right)}{\left(\frac{\text{Net Receivables}_{t-1}}{\text{Sales}_{t-1}}\right)}$
Gross Margin Index (GMI)	$\frac{[(\text{Sales}_{t-1} - \text{Cost of Goods sold}_{t-1})/\text{Sales}_{t-1}]}{[(\text{Sales}_t - \text{Cost of Goods sold}_t)/\text{Sales}_t]}$
Asset Quality Index (GMI)	$\frac{[1 - (\text{Current Assets}_t + \text{PPE}_t / \text{Total Assets}_t)]}{[1 - (\text{Current Assets}_{t-1} + \text{PPE}_{t-1} / \text{Total Assets}_{t-1})]}$
Sales Growth Index (SGI)	$\frac{\text{Sales}_t}{\text{Sales}_{t-1}}$

<b>Depreciation Index (DEPI)</b>	$\frac{[Depreciation_{t-1} / Depreciation_{t-1} + PPE_{t-1}]}{[Depreciation_t / Depreciation + PPE_t]}$
<b>Sales, General and Administration Index (SGAI)</b>	$\frac{[Sales, general and administrative expenses_t / sales_t]}{[Sales, general and administrative expenses_{t-1} / Sales_{t-1}]}$
<b>Total Accruals to Total Assets Index (TATA)</b>	$\frac{Total\ Accruals_t}{Total\ Assets_t}$
<b>Leverage Index</b>	$\frac{[LTD_t + Current\ liabilities_t / Totals\ Assets_t]}{[LTD_{t-1} + Current\ liabilities_{t-1} / Total\ Assets_{t-1}]}$

(Beneish, 1999)

If the calculated M-Score value is greater than -2.22 it indicates that the company is likely to be manipulating its financial statement. An M-Score value less than -2.22 indicates that the company does not manipulate its financial statement. (Beneish, 1999)

#### Dechow F- Score:

The model was developed by Dechow et al. (2011) to detect the probability of fraudulent financial reporting and provide red flags and signals about probable financial statement fraud. This model examines variables that can be easily measurable from the information provided by any entity. (Dechow, GE, Larson, & Sloan, 2011). This model examined a total of 28 variables clustered around the five types of information to identify the capability to differentiate between fraudulent and non-fraudulent firms. The five types of information are (i) Accrual Quality, (ii) Financial Performance, (iii) Non-Financial Measures, (iv) Off-Balance-Sheet Activities, And (v) Market-Based Measures. Based on the examination of variables, three logistic regression models were calculated, yielding models with the highest discriminatory power of 7, 9 and 11 variables, respectively. Model 1 contains variables from the information provided by the company in their financial statement. Model 2 adds off-balance sheet and non-financial measures and Model 3 contains market-related variables. (Dechow, GE, Larson, & Sloan, 2011) In this study, Model 1 is widely used as it can detect probable manipulation using information from an entity's financial statements.

#### Calculation of Model 1:

**Table 2 Dechow F Score**

Items	Formulas
<b>RSST (Richardson, Sloan, Soliman and Tuna) Accrual</b>	$\frac{(\Delta WC + \Delta NCO + \Delta FIN)}{Average\ total\ assets}$ <ul style="list-style-type: none"> <li>• WC (Net Working Capital) = [Current Assets-Cash and Short-term Investments] - [Current Liabilities-Debt in Current Liabilities];</li> <li>• NCO (Net non-current Operating Assets) = [Total Assets-Current Assets-Investment and Advances - [Total Liabilities-Current liabilities-long term debt];</li> <li>• FIN (Net Financial Assets) = [Short term investments + Long term investment] - [Long term Debt + Debt in current Liabilities+ Preferred Stock]</li> </ul>
<b>ΔREC (Change in Receivables)</b>	$\frac{\Delta\ Accounts\ Receivables}{Average\ Total\ Assets}$
<b>ΔINV (Change in Inventory)</b>	$\frac{\Delta\ Inventory}{Average\ Total\ Assets}$
<b>Soft Assets</b>	$\frac{[Total\ assets - PPE - Cash\ and\ cash\ equivalents]}{Total\ Assets}$
<b>Δ Cash Sales</b>	Percentage change in cash sales [Sales-Δ Accounts Receivables]
<b>Δ ROA</b>	$\frac{Earnings_t}{Average\ Total\ Assets} - \frac{Earnings_{t-1}}{Average\ Total\ Assets_{t-1}}$
<b>ISSUE</b>	1 if the firm issued securities during year t, 0 otherwise
<b>Interpretation of F score</b>	
F score less than 1	Normal or below normal risk
F score ≤ 1 to ≤ 1.85	Risk is above normal level
F score 1.85 < to ≤ 2.45	High Risk
F Score > 2.45	Very High Risk

Source: (Dechow, GE, Larson, & Sloan, 2011)

$$Value = -7.893 + 0.790 \times RSST + 2.518 \times \Delta REC + 1.191 \times \Delta INV + 1.979 \times SOFTASSETS + 0.11 \times \Delta CASHSALES - 0.932 \times \Delta ROA + 1.029 \times ISSUE$$

After the getting value from the above equation, it is converted into probability as follow:

$$Probability = \frac{e^{value}}{(1 + e^{value})}$$

The probability is then divided by the unconditional probability of Misstatement (= 0.0037) to find F-Score. (Dechow, GE, Larson, & Sloan, 2011)

### Altman Z- Score:

This model was developed by Altman in the year 1968. This model helps to predict bankruptcy by the examining financial health of the company in addition to its use in detecting earning manipulation. This model is based on Multiple Discriminant Analysis, which differentiates between surviving and failing companies using the information provided by the company in their financial statement. (Saleh, Aladwan, Aladwan, & Saleh, 2021)

### Calculation of Z- Score

$$Z \text{ Score} = 1.2X_1 + 1.4X_2 + 3.3X_3 + 0.6X_4 + 1X_5$$

**Table 3 Altman Z-Score**

Sr. No.	Formulas
1.	$X_1 = \frac{\text{Working capital}}{\text{Total assets}}$
2.	$X_2 = \frac{\text{Retained Earning}}{\text{Total Assets}}$
3.	$X_3 = \frac{\text{Earning Before Interest and Tax(EBIT)}}{\text{Total Assets}}$
4.	$X_4 = \frac{\text{Market Capitalisation}}{\text{Total liabilities}}$
5.	$X_5 = \frac{\text{Net Sales}}{\text{Total assets}}$
<b>Interpretation of Z Score:</b>	
•	Z- Score is greater than 2.67 = safe zone
•	Z- Score is greater than 1.81 and less than 2.67 = grey zone
•	Z-Score is less than 1.81 = distress zone

Source: (Saleh, Aladwan, Aladwan, & Saleh, 2021)

### Pustynick P-Score:

Igor Pustynick developed a model known as P-Score model to detect earning manipulation based on the Altman Z-Score model. Pustynick in his research observed that more than 50% of the cases of manipulation are based on improperly recognized revenue or misstatement of non-current assets such as goodwill based on a Deloitte report. (Pustynick, 2011). The formula of the P-Score is as same as Altman's Z-Score but with minor modifications made by Pustynick. P-Score Model considers Revenue and Equity instead of Net Income and Working Capital. Pustynick changed these two coefficients from the Z Score model where only numerators of the fractions were modified but the numbers of coefficients were same. The first changed coefficient was Shareholder's Equity and the second was Assets Turnover Ratio. (Koshti, 2021) The P Score can be generated via following equation:

$$P \text{ Score} = 1.2 \times X_1 + 1.4 \times X_2 + 3.3 \times X_3 + 0.6 \times X_4 + 1.0 \times X_5$$

**Table 4 Pustynick P-Score Model**

Sr. No.	Formulas
1.	$X_1 = \frac{\text{Shareholder's Equity}}{\text{Total Assets}}$
2.	$X_2 = \frac{\text{Retained Earnings}}{\text{Total Assets}}$
3.	$X_3 = \frac{\text{EBIT}}{\text{Total Assets}}$
4.	$X_4 = \frac{\text{Market value of Equity}}{\text{Book Value of Total Liability}}$
5.	$X_5 = \frac{\text{Revenue}}{\text{Total Assets}}$

Source: (Pustynick, 2011)

ΔP Score is calculated with the following formula:

$$\Delta P = \frac{P(t) - P(t-1)}{|P(t-1)|}$$

$$\Delta Z = \frac{Z(t) - Z(t-1)}{|Z(t-1)|}$$

The calculated value of  $\Delta P$  is then compared with the value of  $\Delta Z$ , If the value of  $\Delta P$  would be greater than  $\Delta Z$  than there is a possibility of misstatement. (Pustynnick, 2011)

### Montier C -Score:

The C Score was developed by James Montier in year 2009 to know whether the firms are cooking its information in the financial statements or not. In it various six criteria are observed to detect the earning manipulation. These six criteria are discussed in the following table.

**Table 5 Montier C Score**

Sr. No.	Variables	Indication
[1]	Growing difference between net income and cash flow from operations.	An increasing difference between net income and cash flow from operation indicate that earnings are being manipulated. In general, management has less control over a company's cash flow than it has over its earnings. Earnings can be overstated by using highly subjective estimations such as depreciation, bad debt, and pension returns, etc. An increasing Difference between net income and cash flow from operations indicates red flags of manipulation in this Model.
[2]	Increasing days sales outstanding (DSO)	Account receivables are growing faster than sales, as seen by an increasing Days sales outstanding. The primary goal of this measurement is to detect channel stuffing. (Sending inventory to customers) An increasing Days sales outstanding (DSO) provide a signal of manipulation in this Model.
[3]	Growing day's sales of inventory (DSI)	Slowing sales are indicated by rising inventory, which is negative indication for the company. An increasing Day sale of inventory (DSI) indicates financial misstatements in this Model.
[4]	Increasing Other current assets to revenues	Top management may know that investors frequently examine DSI and DSO, thus to hide the things which they don't want investors to notice they may use other current assets. An increasing Other current asset to revenues indicates earning manipulation in this Model.
[5]	Declines in depreciation relative to gross property	Firms can easily change the estimate of useful asset life to meet a quarterly or yearly profit target. Decreasing depreciation relative to gross property provide a signal of manipulation in this Model.
[6]	High total asset growth	Some firms use their acquisition strategy to distort their earnings. High asset growth companies receive a signal of manipulation in this Model.

(Montier, 2009)

These criteria are scored in a simple binary mode, if company has increased day sales outstanding it will receive a score of 1. Then summed to all these criteria score to get the final C- Score which is bounded from 0 (no evidence of earning manipulation) to 6 (all the red flags are present) (Montier, 2009).

## CONCLUSION

Financial statement fraud is increasing rapidly in numbers and it creates a hurdle to the growth of the economy. Forensic accountants, auditors, and practitioners can detect fraud using a variety of techniques such as data mining, machine learning, artificial intelligence, neural networks, ratio analysis, and so on. This study describes the various fraud detection model such as Beneish M-Score, Dechow F- Score, Pustynnick P-Score, Altman Z-Score, Montier C-Score which provide red flags or signal of fraud with the use of information from the financial statement. From the past literature it was observed that numerous studies covering M-score are available for financial statement fraud detection while other model have lesser exposure to detect financial statement fraud such as Dechow F- Score, Pustynnick P-Score, Montier C-Score these scores are also helpful tool for predicting misstatement. In India also the M-score is explored more compare to other score. Auditors, investors, regulatory bodies can also use Dechow F- Score, Pustynnick P-Score, Altman Z-Score, Montier C-Score to detect financial statement fraud. This way probable manipulation can be detected and stricken measure can be applied to such fraudulent companies.

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