# The Analysis of Fraud Detection Using the Beneish Ratio Index and the F Score Model Method on the Financial Statements of the State-Owned Insurance Companies Registered in Indonesia

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**Abstract.** This study aims to see a company that is trying to manipulate the presentation of the accounting report seen from the financial ratios of the Beneish M Score and Dechow F Score models. The Beneish M- Score Model is a model that uses eight ratios related to asset changes and sales growth consisting of DSRI, GMI, AQI, SGI, DEPI, SGAI, LVGI, and TATA. If the score obtained is above -2.22, the company is said to tend to manipulate or manipulate. Meanwhile, the F Score Model is a financial report fraud detection model developed using a scaled logistic probability technique where financial reports with an F score of more than one should be suspected of containing fraud. The seven ratios are RSST accruals, changes in receivables, changes in inventory, percentages of soft assets, changes in cash sales, changes in return on assets, and issuance. The results of using both methods show that companies suspected of manipulating financial statements are the same companies, which are PT Asuransi Jiwasraya (Persero) and PT Asabri (Persero). The calculation method for the two different methods also shows that the company is the same, and the research results show that the company presents a good report, which is PT Taspen (Persero). PT Asuransi Jiwasraya (Persero) produces the M Score of 0.808, while the F Score model produces a score of 1.852. PT. Asabri (Persero) produces an M Score of -1,388, while the F Score model produces a score of 1,563. The two companies have been calculated using both calculation methods and produce a score that exceeds the predetermined amount of cut-off.

**Keywords**: Beneish M Score; Dechow F Score; Fraud; Annual Report

## 1 Introduction

Fraud is a criminal act known for manipulation, misstatement, or breach of trust that does not affect threats of violence or physical force. A fraud financial report is an act of financial statements content manipulation where the contents are manipulated so that it is better and does not explain the real situation, and this can harm the other party who made as decisions and financial fraud. Fraud is a false representation of material facts created by one party to another party to deceive and persuade the other party by using the fact that harm him. The statement made by management is known as management fraud, so they are more publicly monitored following an increase in numbers of companies that have fallen due to fraud management (Fadilah, et al., 2019).

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Fraud also occurred in Indonesia last 2019 that reported by the Ministry of State- Owned Enterprises. Indication of fraud on PT Asuransi Jiwasraya (Persero) to the Attorney General's Office in November 2019 by the Ministry of State-Owned Enterprises. It was done after the Ministry of State-Owned Enterprises did a review of a not transparent managed financial statement. Some facts were found among them there are several company assets to invest prudently. Furthermore, Jiwasraya had time to issue an insurance product that offers a high return to the customer. This what makes Jiwasraya experiencing liquidity pressure lately. Companies are forced to postpone claim payments to their customers. The government, as the holder of Jiwasraya shares, is now looking for a scheme to improve the company's finance. The Ministry of State-Owned Enterprises is coordinating with the Ministry of Finance and the Financial Services Authority (OJK) to map the strategy that will be carried out later. Currently, Jiwasraya has formed a subsidiary named Jiwasraya Putra for financial assistance parent company. It is just that the Ministry of State-Owned Enterprises also mentioned that it is not enough to improve Jiwasraya's finances fully (Wicaksono, 2019).

Indonesian General Insurance Association (AAUI) said that the general insurance industry has the potential to suffer losses up to billions of rupiahs throughout 2018. This loss due to an act of fraud or fraud carried out by several customers. There are three lines of business general insurance which is often an easy target rogue customer to trick the company. The three sectors including travel insurance, vehicles motorized, and shipping. The act of fraud occurs in the motor vehicle insurance sector occurs to the customer by making a fake damage complaint vehicle so that customers can apply claims to insurance companies. Another fraud also occurs in the owner of shipping products by faking the identity of the ship's age becomes younger, so it deserves to be insured. Furthermore, the customer claims for the risk that did not happen. Indonesian General Insurance Association (AAUI) reported so far, 14 companies reported fraud acts to the police. A fraud incident like this has been investigated by Indonesian General Insurance Association (AAUI) since 2017 but has not been detected until finally the detection was done in 2018 (Agi, 2019).

The research was conducted by Shabnam Fazli Aghghaleh and colleagues in 2016 by examining data on fraud that occurred in Malaysia. The results of these studies indicated that Dechow F-score's ability to detect fraud was 73.17% higher than the model Beneish that can predict correctly was 69.51% of the fraud data contained in Malaysia. Therefore, it can be concluded that The Dechow F-score is more suitable for fraud cases of financial reports occurring in Malaysia from 2000 to 2014. Deficiencies in existing research performed by Shabnam Fazli Aghghaleh and colleagues is a limitation on financial data; therefore, non-financial data that plays a significant role in detect fraud is ignored (Aghghaleh, et al., 2016).

The academic literature shows that financial reports presented by the company can be analyzed to get the score of whether the score of a company can be categorized as manipulator firms that tend to commit fraudulent financial statements. Score that is known as the Beneish M-Score developed by Professor Messod Daniel Beneish. This model uses 8 financial ratios to get a certain score for the identification of fraud possible in the company. The eighth financial ratio is the Receivable Days Sales Index, Gross Margin Index, Asset Quality Index, Grow Sales Index, Depreciation Index, general and administration Sales Index, Leverage Index, Total Accrual to Total Assets Based on the score obtained. Furthermore, a company can be grouped as a manipulator and a non-manipulator company. Beneish M-Score itself is a probabilistic model (Santosa, et al., 2019).

Based on these reasons, stakeholders need a way to help them to detect fraud/report manipulation finance. Messod Daniel Beneish in his research entitled "The Detection of Earnings Manipulation" in 1999 found a way to identify which financial statements in the case

are faked. Beneish conducted a study against companies that make fake reports, finances, then compared to companies that are registered with Compustat in the period 1982-1992. The results showed Beneish found the characteristics of manipulated financial statements, such as an unnatural increase in accounts receivable, a decrease in gross profit and assets, increased growth sales, as well as an increase in accruals. (Beneish, 1999)

Based on these characteristics, Beneish formulated the Beneish Ratio Index and M- score, which are eight variables (in the form of a formula) that can be applied to catch the presence of steeping fraud reports, finance (Beneish, 1999). Beneish, ratio index consists of DSRI (ratio of accounts receivable to sales), GMI (gross profit ratio), AQI (quality ratio assets), SGI (sales growth ratio), DEPI (ratio depreciation rate), SGAI (cost of sales ratio, administration, and general), LVGI (leverage ratio), and TATA (the ratio of accruals to total assets). The results of the Beneish ratio index will collect companies based on their status, namely as a manipulator or non-manipulator. The level of accuracy of the Beneish ratio index in identifying manipulator companies up to 71% (Beneish, 1999). Even though it has not reached 100% yet, the ability of the Beneish ratio index helps stakeholders much to avoid malefic decision making (Apriani, et al., 2019).

Based on the background above, the researchers are interested in re-examining the “Fraud Detection Analysis by Using the Beneish Ratio Index and Method of F Score Model on Financial Statements State-owned insurance company registered in Indonesia".

## 2 Methodology

The population and sample in this study is the Indonesian state-owned insurance company. The sample in this study is the state-owned insurance company with the most recent appropriate financial reports with the issuance date of the company's financial statements.

The selection of sample criteria in this study using the purposive sampling method where the sample is selected based on the sample criteria contains all the data required in counting the Beneish M-Score and Dechow F- Score model.

There are eight state-owned insurance companies now. Each company is engaged in various insurance fields, whether health, safety, or insurance in the future. The eight companies are presented in the following table.

**Table 1.** List of State-Owned Insurance Companies

| No | Name of the State-Owned Insurance Companies |
|---|---|
| 1 | Perum Jamkrindo |
| 2 | PT Asabri (Persero) |
| 3 | PT Askrindo (Persero) |
| 4 | PT Asuransi Ekspor Indonesia (Persero) |
| 5 | PT Asuransi Jasa Indonesia (Persero) |
| 6 | PT Asuransi Jasa Raharja (Persero) |
| 7 | PT Asuransi Jiwasraya (Persero) |
| 8 | PT Taspen (Persero) |

**Source:** The Ministry of State-Owned Enterprises

**2.1. Beneish M-Score Ratio**

a. Days' sales receivables index (DSRI)

Days' sales in receivables index or DSRI is the ratio of the number of sales days in accounts receivable in the first year (year t) to the measurement of the previous year (year t-1). DSRI is an index of the number of days on credit sales in the first year the manipulation was suspected profit compared to the previous year. DSRI can be obtained by the formula below:

$$DSRI = \frac{\frac{Receivables\ (t)}{Sales\ (t)}}{\frac{Receivables\ (t-1)}{Sales\ (t-1)}}$$

Information:

t = period t

t-1 = period t-1

A high DSRI score indicates the changes to the company's credit policy to drive sales. However, an increase in disproportionate accounts receivable can be concluded as an indication of revenue inflation. The cut-off DSRI score (Beneish, 1999: 27) is described as follows:

a. DSRI < 1,031 = non-manipulator
b. DSRI > 1,031 = manipulato

**2.2. Gross Margin Index (GMI)**

Gross Margin Index or Gross Profit Index or GMI is a measure of the level of profitability company. GMI is the gross margin ratio in the previous year (year t-1) where there was a first-year gross margin (year t). This index is the comparison of changes in gross profit in one year with the previous year. GMI bias was obtained by the following calculations:

$$GMI = \frac{\frac{Sales\ (t-1) - Coset\ of\ Goods\ Sol\ (t-1)}{Sales\ (t-1)}}{\frac{Sales\ (t) - Cost\ of\ Goods\ Sol\ (t)}{Sales}}$$

Information:

t = period t

t-1 = period t-1

If the GMI score passes the cut-off point, which is 1.014 then it is a sign that the company experienced a decrease in gross profit that means a negative signal for the company's prospects in the future. Beneish assesses companies with excellent prospects worse, more potential for manipulation income. GMI cut-off score (Beneish, 1999: 27) is described as follows:

a. GMI < 1,014 = non-manipulator
b. GMI > 1,014 = manipulator Assets Quality Index (AQI)

Assets Quality Index or the Asset Quality Index or AQI is a comparison of non-current assets besides fixed assets with total assets in this year with the previous year. AQI is a non-

current asset ratio (not include plant, property, and equipment) to the total assets that measure the proportion of total assets to future advantages. The AQI score can be formulated as follows:

$$AQI = \frac{\text{Current Asset (t)} = \text{PPE (t)}}{\text{(Total Assets (t2-}} \frac{\text{Current Asset (t-1)} + \text{PPE (t-1)}}{\text{Total Assets (t-1)}}$$

Information:
t = period 1
t-1 = period t-1

AQI shows changes in assets besides currents assets and fixed assets in the total asset for the year compared to the previous year. Then, AQI can be used to indicate how much the proportion of other assets in total assets. The high AQI indicates the company is doing deferral of expense. Deferral of expenses will make a greater profit and it is one of the ways to commit fraud reports finance. AQI cut-off score (Beneish, 1999: 27), described as follows:

a. AQI <1.039 = non-manipulator
b. AQI> 1.039 = manipulator

### 2.3. Sales Growth Index (SGI)

SGI is an index that focuses on observing the ups and downs of company sales. The SGI score is obtained by the following formula:

$$SGI = \frac{\text{Sales (t)}}{\text{Sales (t-1)}}$$

Information:
t = period t
t-1 = period t-1

SGI is the ratio of sales in the first year (year t) to the sales of the previous year (year t-1). The SGI score that is more than 1,134 indicates an increase in sales from last year. Companies that experience an increase in sales tend to maintain this condition and more motivated to commit fraudulent financial statements. It is because the company's financial position and the need for capital put pressure on managers to achieve targets, so the possibility of fraud is quite large. The cut-off score of the SGI (Beneish, 1999: 27) is explained as follows:

a. SGI <1,134 = non-manipulator
b. SGI> 1.134 = manipulator

### 2.4. Depreciation Index (DEPI)

Depreciation Index or DEPI is the ratio of depreciation expense to fixed assets before depreciation between periods. The Index Depreciation can be obtained by the formula:

$$DEPI = \frac{\text{Depreciation (t1)}}{\frac{\text{Depreciation (t-1)} + \text{ppe ( t-1)}}{\frac{\text{Depreciation (t)}}{\text{Depreciation (t)} + \text{ppe (t)}}}}$$

Information:
ppe = plant, property, and equipment (fixed assets)
t = period t
t-1 = period t-1

If the DEPI ratio exceeds 1.001, this indicates that the company is making an effort to postpone the recognition of depreciation expense, or in other words, to increase the life of the assets. In addition to this possibility, the DEPI ratio also indicates the company's effort by applying new methods to increase revenue. The cut-off score of DEPI (Beneish, 1999: 27) is explained as follows:

a. DEPI <1,001 = non-manipulator
b. DEPI> 1,001 = manipulator

### 2.5. Sales, General, and Administrative Expenses Index (SGAI)

Sales, General and Administrative Expenses Index or SGAI is an index that measures the comparison between selling, administrative and general expenses to sales between two periods. The calculation for getting SGAI is as follows:

$$SGAI \frac{\frac{\text{Sales, General and Administrative Expenses (t)}}{\text{Sales}}}{\frac{\text{Sales, General and Administrative Expenses (t-1)}}{\text{Sales (t-1)}}}$$

Information:
SGAI : Sales General and Administrative
Expense t = period t
t-1 = period t-1

The SGAI index that is more than or equal to 1 indicates an increase in spending on marketing and administration costs. It shows a decrease in efficiency in the use of marketing and administrative costs, indirectly reflecting the increased risk of loss that the company will experience in the future. This company conditions tend to commit fraudulent financial statements. The SGAI cut-off score (Beneish, 1999: 27) is explained as follows:

a. SGAI <1,054 = non-manipulator
b. SGAI> 1.054 = manipulator

### 2.6. Leverage Index or Debt Index (LVGI)

Leverage Index or debt index or LVGI is the ratio of total debt to total assets this year and the previous year. It illustrates the level of debt the company has against total assets from year to year. LVGI is obtained by the following calculations:

$$LVGI \frac{\frac{\text{Long term Debt (t) + Current Liabilities (t)}}{\text{Total Assets (t)}}}{\frac{\text{Long term Debt (t-1) + Current Liabilities (t-1)}}{\text{Total Assets (t-1)}}}$$

Information:
t = period 1
t-1 = period t-1

LVGI is a ratio that compares total debt to total assets. The LVGI score that more than 1 indicates an increase in leverage. High leverage indicates the risk of debt or the need to pay the high debt so that companies will tend to manipulate financial statements. The LVGI cut- off score (Beneish, 1999: 27) is described as follows:

a. LVGI <1,037 = non-manipulator
b. LVGI> 1,037 = manipulator

### 2.7. Total accrual total assets or Total Accrual Index (TATA)

Total accruals to total assets or Total Accrual Index to Total Assets or TATA. Total accruals are a component of the number of accrual earnings. The high number of total accruals illustrates the portion of cash in generated earnings. TATA knows the income from accruals (accounting profit) and not from cash profit. TATA is obtained with the following formula:

$$TATA = \frac{\text{Net Income- Cash Flow from Operation}}{\text{Total Assets (t)}}$$

Information:
t = period t
t-1 = period t-1

TATA measures the ratio of a company's accruals to total assets. The inclusion of the accrual aspect because there is a large opportunity/gap in accruals to commit fraud. TATA knows the income from accruals (accounting profit) and not from cash (cash profit). The cut-off score of TATA (Beneish, 1999: 27) is explained as follows:

a. TATA <0.018 = non-manipulator
b. TATA> 0.018 = manipulator

The results of the eight Beneish ratio indexes can be used to find the M-Score with the mathematical equation as shown below:

M-Score = -4,84 + (0,92 x DSRI) + (0,528 x GMI) + (0,404 x AQI) + (0,892 x SGI) + (0,115 x DEP) – (0,172 x SGAI) + (4,679 x TATA) – (0,327 x LVGI). The cut-off score of M-Score is as below:

1. M-Score < -2,22; categorized as non-manipulator.
2. M-Score > -2,22; categorized as manipulator
3. M-Score = -2,22; categorized as grey area (grey company)

### 2.8. Dechow F Score

The F score model is a financial report fraud detection model developed using a scaled logistic probability technique. The score of F can be counted using the following formula:

Predicted : -7,893 + 0,790 (RSST_Acc) + 2,518 (ch_rec) + 1,191 (ch_inv) + 1,979 (soft_assets) + 0,171 (ch_cs) + (-0,932) (ch_ROA) + 1,029 (issue)

**a. RSST Accruals**

This variable measures the changes of current assets with the formula as below:
RSST = ΔWC + ΔNCO + ΔFIN Average Total Assets
WC = [Current Assets – Cash and Short term Investment] – [Current Liabilities – Debt in Current Liabilities]
NCO = [Total Assets – Current Assets – Investment and Advances – [Total Liabilities – Current Liabilities – Long term Debt]
Fin = [Short-term Investment + Long-term Investment] – [Long-term Debt + Debt in Current Liabilities + Preferred Stock]
Average Total Asset = Total Asset t + Total Asset t-1/2

**b. Changes in Receivables**

Changes in receivable from last year to this year are scaled against the average of total assets. It indicates a big change in accounts receivable that shows the income and income manipulation. The changes in accounts receivable formulated with the following model:
Ch_Rec = Account Receivables Average Total Assets

**c. Changes in Inventories**

The change in inventory from last year to this year is scaled against the average of total assets. Big changes in inventory can indicate a surplus, shortage, obsolescence, or liquidation. The change in inventory is obtained by the following formula:

$$INV = \frac{\Delta Inventory}{Average\ Total\ Assets}$$

**d. Percentages of Soft Assets**

This measure is as total assets minus total cash and cash equivalents (scaled against total assets). The ratio of the current asset can be obtained with the following formula:

$$Soft\ Assets = \frac{Total\ assets - PPE - Cash\ and\ cash\ equivalents}{Total\ Assets}$$

**e. Changes in cash sales**

This measure is the change percentage in cash sales from last year to this year. The formula used to get the change in cash sales are as follows:

$$\frac{Cash\ Sales = Sales_t - \Delta\ Accounts\ Receivables_t}{Sales_{t-1} \Delta\ Accounts\ Receivables_{t-1}}$$

**f. Changes in Return on Assets**

This measure is the percentage calculated as revenue divided by total assets this year less than the same measure last year. Volatile income might be an indicator of revenue manipulation. The formula is as below:

$$Change\ ROA = \frac{earnings_t - Average\ total\ asset_t}{earnings_{t-1} - Average\ total\ asset_{t-1}}$$

g. **Issuance**

This measure is a dummy variable that is 1 if additional securities were issued during the year of the manipulation and 0 if there are no securities issued. Issuance = 0 or 1 (Score = "1" if bonds or shares are issued);

## 3 Results And Discussions

### 3.1. Beneish M Score

The Beneish M-Score Model is a mathematical model used to detect fraud in financial statements. Beneish stated that generally, the financial statements of companies that manipulate earnings will show a significant increase in revenue and a significant decrease in expense accounts between accounting periods. Beneish uses eight ratios related to asset change and sales growth to measure the Beniesh M Score. If the score obtained is above -2.22, the company is said to tend to manipulate or manipulator. Meanwhile, if the company's Beneish M-Score is less than -2.22, it can be said that the company is not manipulating or in the non-manipulator group of companies.

After knowing the score of the eight variables, the calculation results using the Beneish M-Score are obtained to classify the sample companies include companies indicated as manipulators, non-manipulators, and gray companies. The results of the Beneish M Score

calculation for state-owned insurance companies registered in Indonesia can be classified based on the M Score score obtained by each company which is presented in the following table.

**Table 2.** The Classification of Companies Based on the Beneish M Score

| No | Name of the Companies | M-*Score* |
|---|---|---|
| 1 | Asabri | -1.388 |
| 2 | Asei | -2.435 |
| 3 | Askrindo | -2.301 |
| 4 | Jamkrindo | -2.264 |
| 5 | Jasa Raharja | -2.236 |
| 6 | Jasindo | -2.844 |
| 7 | Jiwasraya | 0.808 |
| 8 | Taspen | -3.458 |
| Manipulator marked as | | |
| Non-Manipulator marked as | | |
| Grey Company marked as | | |

Source: Processed Data

From the table above, it can be seen that the Asabri and Jiwasraya companies produce M Score more than the predetermined cut-off, which -2,220, so the company can be said to be manipulating in the presentation of financial statements detected using the Beneish M Score Method. The higher the M-Score, the more that a company will falsify its financial statements. The M Score is obtained from eight Beneish ratio index variables. The size of each variable will affect the M-Score, and the cut-off of each variable will show the gap where the company is committing fraud. The results showed that the company with the highest M-Score was PT Asuransi Jiwasraya (Persero) with an M Score is 0.808 and followed by PT Asabri (Persero) with an M Score is -1.388.

### 3.2. Clinical Assumption Test

The F-Score model is a development of the Beneish M-Score model that is specifically designed so that users can get the score directly without using an index in the calculation. The F Score model is a financial report fraud detection model developed using a scaled logistic probability technique where financial reports with an F score of more than one should be suspected of containing fraud.

After knowing the score of the seven ratios contained in the F Score model, which is RSST accruals, changes in receivables, changes in inventory, percentages of soft assets, changes in cash sales, changes in return on assets, and issuance. Below is the result of the Dechow F Score calculation, then it can be grouped into companies that are indicated as manipulators or non-manipulators.

**Table 3.** The Classification of Companies Based on the Dechow F *Score*

| No | Name of the Companies | F *Score* |
|---|---|---|
| 1 | Asabri | 1.563 |
| 2 | Asei | -0.788 |
| 3 | Askrindo | -0.656 |
| 4 | Jamkrindo | -0.569 |
| 5 | Jasa Raharja | -0.461 |
| 6 | Jasindo | -1.204 |
| 7 | Jiwasraya | 1.852 |
| 8 | Taspen | -2.651 |
| | Manipulator marked as | |
| | Non-Manipulator marked as | |

Source: Processed Data

From the table above, it can be seen that the Asabri and Jiwasraya companies produce F Score more than the predetermined cut-off, so the company is suspected of manipulating the detected financial statements using the F Score Model. The Fraud Score model or F-Score is a composite measure that is claimed as a tool to detect material misstatements in financial statements. The variable component on the F-Score includes two things in the financial statements. They are accrual quality as proxied by RSST and a financial performance that proxied by changes in accounts receivable, changes in inventory accounts, changes in cash sales accounts, changes in the F Score model are the summation of two variables which is the quality of accruals and financial performance (Indriani, et al., 2017).

The results of processed data show that PT Asuransi Jiwasraya (Persero) with an F score of 1,852 and followed by PT Asabri (Persero) with an F score of 1,563. The F Score model is a financial report fraud detection model developed using a scaled logistic probability technique where finance reports with an F score of more than one should be suspected of containing fraud. Therefore, according to the results of calculations using the F Score Model method, it was found that the two companies were suspected of manipulating financial statements

## 4 Conclusions

From the results of testing and analysis, it can be concluded that the Beneish M-Score Model is a model that uses eight ratios related to asset changes and sales growth to measure the Beniesh M Score. If the score obtained is above -2.22, the company tends to manipulate or manipulator. Meanwhile, if the company's Beneish M-Score is less than -2.22, it can be said that the company is not manipulating or in a non-manipulator group of companies.

From the results of both methods, the company suspected of manipulating the financial statements is PT Asuransi Jiwasraya (Persero) and PT Asabri (Persero). The method of calculating the two methods is different with different details but results in a prediction for the same company. The suspected companies that present financial reports well, seen from the use of the two methods, also come from the same company, which is PT Taspen (Persero).

PT Asuransi Jiwasraya (Persero) produced an M Score of 0.808, which is more than the cut- off score in the Beneish M Score Model. It shows that PT. Asuransi Jiwasraya undertakes

efforts to manipulate company reports as seen from the eight financial ratios that have been taken into account in the M Score model. Whereas in the F Score model, PT Asuransi Jiwasraya (Persero) also produced a score that exceeds the cut-off of the Model F Score, which is equal to 1,852. The cut-off score in the Model F Score is 1. If there is more than one, then the company is suspected of having attempted to manipulate the presentation of the company's financial statements.

PT. Asabri (Persero) also produced a calculated value using the M Score and F Score Models with the results exceeding the cut-off. In calculations using the M Score Model, PT Asabri (Persero) produces a score of -1,388. This score is bigger than the cut-off for the M Score Model calculation, which is -2.22. Therefore, PT Asabri (Persero) should be suspected of doing business in manipulating company reports as seen from the eight financial ratios that have been calculated in the M Score model. Whereas in the F Score model, PT Asabri (Persero) also produces a score that exceeds the cut-off of the Model F Score, which is worth 1.563, which exceeds the cut-off amount in the Model F Score of 1. The calculation results use the F Score Model with more than one result. The company is alleged to have attempted to manipulate the presentation of financial statements.

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