DETECTION OF FINANCIAL STATEMENT FRAUD ON ANNUAL REPORTS:A FRAUD APPLICATION MODEL TO NON-TIMELY FILING OF INDONESIAN PUBLIC LISTED COMPANIES

[1]SABAT TINO HEIDYATMOKO, [2]VITA RATNASARI

[1,2]Management Technology Department of Institut Teknologi Sepuluh Nopember Surabaya
Email: [1]heidyatmoko@gmail.com, [2]vitaratna70@gmail.com

Abstract - Few public listed companies in Indonesiawere exposed a trade suspension as consequence of non-timely filing financial statement. The tendency of a recurrence non-timely filing financial statement founds in public listed company in 2013. This study examines the characteristics of variable in financial statement that affect significantly with non-timely filing financial statement and calculate the impact of risk based on binary classification metrics. In this analysis, Logistic Regression is performed to identify non-timely filling financial statement and timely filing financial report submitted to Indonesia Stock Exchange. There are 56 public listed companies as subjects in this study where 26 companies are non-timely filing of financial statement, and the other 30 companies are timely filing financial statement.This research has found a new model that suitable in factor detection on causing the tendency of non-timely filing financial statement that could fit in current business specially on public company in Indonesia.

Keywords - BinaryClassification Metrics, Fraud Detection, Logistic Regression, Non-timely Filling, Suspension

I. INTRODUCTION

There were many cases of non-timely financial statement filing in Indonesia specifically in 2013. More than 20 public listed companies in Indonesia were exposed a trade suspensionrelated to non-timely filing of financial statement. The tendency of a recurrence non-timely filing financial statement foundalong withthe new non-timely filing company. This problem has been serious concern for investors, government regulators and other capital market stakeholders. On a different view, the bank also requires the company's financial statements as a consideration in giving bank loans. The amount of given creditsisbase on the ability of the company to repay the loan and this are reflected in the ratio of profitability from the financial statements of the company. One of the way bank decision in providing credit assistance is to see the profitability ratios of a company. Data mining has been widely applied in financial analysis. Data mining techniques are useful for predicting bankruptcy, credit card approval, lending decisions, money laundering detection, stock analysis and so on.

In fact, research related to data mining in detection financial report fraud is very limited. Fraud on the financial statements can be detected by the auditor using expertise/knowledge based on their experience in assessment. The subjective factor causing bias in the judgments process. Therefore, in this study, the authors implementing a data-driven approach that can rely on historical data of the public listed company and suspensed public listed company When data mining techniques are used to solve the problem, this technique works objectively by sorting the data recorded on suspended public listed company and non-suspended public listed company.

Earlier studyRavisankar[(9)], using35 variableswhere 7 items are financial statement account and the other 28 items are ratio that represent liquidity, activity, solvability and profitability. Spesifically, Ravisankar uses data mining techniques to identify companies that resort to financial statement fraud from 202 companies where 101 were fraudulent and 101 were non-fraudulent companies. In this study, 35 variables that represents financial ratios also used for detection financial statement fraud.

Recent study about intelligent detection of financial statement fraud conducted by Hajek[(7)] in 2017. The fraud detection systems have been developed to support decision-making of the stakeholders. Hajek also observe that both financial statements and text in annual reports can be utilised to detect non-fraudulent firms and the finding has important. The work has led to conclude that a low relative frequency of negative words in annual reports may indicate non-fraudulent firms. Meanwhile to detect fraudulent firms, it is necessary to use information extracted from both publicity financial statement and analysts' forecast of revenues and earnings.

In this study, the authors use logistic regression toanalyze35 variables of financial accounts and ratios according to the financial statements of public listed company which are non-timely filing and timely filing financial statements. As in previous research, logistic regression was a conventional method that justified scientifically and assist decision making process by management and auditors. Furthermore, this research will use performance metrics in the form of binary classification matrices to calculate the impact of the non-timely filing financial statement.

II. LITERATURE REVIEW

2.1. Financial Statements

The financial statements also show what management has done, in this case as management's responsibility for the resources entrusted to it. The shareholder will make an economic decision based on reports that have been made by management. The economic decisions include investment decisions either selling, holding and increasing/reducing the value of their investments, as well as the decision to hire or replace management.

2.1.1. Balance Sheet

According to Wild[12], balance sheet reports the financial position of a company at a point in time, usually at the end of month, quarter, or year. Balance sheet describes the position of company assets that financed by own capital or debt within a certain period. The amount of each account is vary based on the core business of the company. How big the company's assets, own capital and corporate debt and its comparison can be seen in the company's balance sheet. Based on Edmonds[4]the economic activity of a business is normally recorded and reported in money terms. Money measurement is the use of a monetary unit such as the currency instead of physical or other units of measurement. Using a particular monetary unit provides accountants with a common unit of measurement to report economic activity. Without a monetary unit, it would be imposible to add such items as buildings, equipment, and inventory on a balance sheet. The use of balance sheet is to provides information on liquidity and financial flexibility. But the Balance Sheet has its limitations: Balance Sheet does not represent current value; Balance Sheet describes the value that applies on a certain date as stated in it. The use of the acquisition cost principle also results in the inevitable elements of estimates such as patents, trademarks and others.

2.1.2. Income Statement

The Income Statement reflects the company's financial situation is experiencing a loss or gain in a certain period. Systematically the profits of the company will be subtracted by the costs incurred in the company's activities.

Income statementprovides useful information to:

[1] Measure the success of the company's operations and management efficiency in managing the company. Checking revenue and expenses indicates how the company works and compares its performance with a competitor.
[2] Estimates earnings in the future. Information on previous performance helps to present information about future performance.
[3] Measure the profitability and profitability of the capital invested by the owners of capital within the company. Profitability is the company's ability to generate profit over a certain period. While rentability is the ability of total assets owned by the company in generating profit.

2.2. Financial Ratio

Over the years, investors and analysts have developed many analytical tools, concepts and techniques to compare the relative strengths and weaknesses of a company. Analyze tools, concepts and techniques are the formation of fundamental analysis.

Ratio analysis is a tool developed to perform quantitative analysis on a number of figures obtained in the financial statements. These ratios help relate to the three financial statements together and offer a comparative picture between the company and across industries and sectors. Ratio analysis is one of the most commonly used fundamental analysis techniques.

Financial ratios according toEdwards[3]are a comparison of the number of figures contained in the financial statements in which they relate to each other. As fundamental analysis is done, it is often done by benchmarking the financial ratios of a company with another company that has the same line of business or moving in the same sector.

The classification of ratios commonly used in financial calculations:

1. Liquidity Ratio

This ratio is widely used by creditors to measure short-term ability of the company. The level of liquidity differs from industry to industry. Some industries are more liquid than others like wholesale stores are more liquid than property companies. Comparing the ratio of liquidity in different industries cannot be done.

2. Activity Ratio

This ratio is used to calculate how efficiently a company is doing its asset utilization. This ratio is generally used by investors to get a comprehensive picture of the company's operations.

3. Debt Ratio (Solvency)

This ratio measures a company's ability to meet its long-term liabilities. Solvency analysis requires an understanding of the firm's capital structure to the level of debt the company uses. Some solvency ratios allow the investor to see whether the company has sufficient cash flow to consistently pay fixed expenditures and interest.

4. Profitability Ratio

This ratio measures the company's ability to earn enough returns. This ratio is most widely used in investment analysis to measure how much profit the company has.

No	Financial Item	Description
1	Debt	Balance Sheet
2	Total Assets	Balance Sheet
3	Gross Profit	Income Statement
4	Net Profit	Income Statement
5	Primary Business Income	Income Statement
6	Cash and Deposits	Balance Sheet
7	Account Receivable	Balance Sheet
8	Inventory/Primary Business Income	Activity Ratio
9	Inventory/Total Assets	Activity Ratio
10	Gross Profit/Total Assets	Profitability Ratio
11	Net Profit/Total Assets	Profitability Ratio
12	Current Assets/Total Assets	Liquidity Ratio
13	Net Profit/Primary Business Income	Profitability Ratio
14	Account Receivable/Primary Business Income	Activity Ratio
15	Primary Business Income/Total Assets	Activity Ratio
16	Current Assets/Current Liabilities	Liquidity Ratio
17	Primary Business Income/Fixed Assets	Activity Ratio
18	Cash/Total Assets	Liquidity Ratio
19	Inventory/Current Liabilities	Activity Ratio
20	Total Debt/Total Equity	Solvency Ratio
21	Long term debt/Total Assets	Solvency Ratio
22	Net Profit/Gross Profit	Profitability Ratio
23	Total Debt/Total Assets	Solvency Ratio
24	Total Assets/Capital and Reserves	Liquidity Ratio
25	Long Term Debt/Capital and Reserves	Solvency Ratio
26	Fixed Assets/Total Assets	Liquidity Ratio
27	Cash and Deposits/Current Assets	Liquidity Ratio
28	Capital and Reserves/Total Debt	Solvency Ratio
29	Account Receivable/Total Assets	Liquidity Ratio
30	Gross Profit/Primary Business Profit	Profitability Ratio
31	Undistributed Profit/Net Profit	Profitability Ratio
32	Primary Business Profit/Primary Business Profit of Last Year	Profitability Ratio
33	Primary Business Income/Last year's Primary Business Income	Profitability Ratio
34	Account Receivable/Account Receivable of Last Year	Liquidity Ratio
35	Total Assets/Total Assets of Last Year	Liquidity Ratio

Table1
Financial Item as indicator variables

The data set used in this research was obtained from 56 companies that were listed in Indonesia Stock Exchange (IDX), of which 26 were non-timely filing financial statement and 30 were timely filing. The 35 variables that represent the account financial statement and ratios are prepared as shown in Table 1.

III. METHODOLOGY

Sample data were collected from balance sheet and income statement of public listed company as shown in Table 2. Each public listed companies are classified base on their sector and compared between non-timely filing and timely filing.

According to Benoit[(1)] the entire collected sample data were transformed by log transformation to reduce its dimension. Normality test were performed to the independent variables of the original data set during the preprocessing stage. Then data mining techniques were performed using Logistic Regression to find characteristic of significant variables.

No	Akun Keuangan	PLC A
1	*Debt*	2.664.051.000.000
2	*Total Assets*	5.020.824.000.000
3	*Gross Profit*	913.472.000.000
4	*Net Profit*	346.728.000.000
5	*Primary Business Income*	4.056.735.000.000
6	*Cash and Deposits*	316.590.000.000
7	*Account Receivable*	904.695.000.000
8	*Inventory/Primary Business Income*	0,2524
9	*Inventory/Total Assets*	0,2039
10	*Gross Profit/Total Assets*	0,1819
11	*Net Profit/Total Assets*	0,0691
12	*Current Assets/Total Assets*	0,4871
13	*Net Profit/Primary Business Income*	0,0855
14	*Account Receivable/Primary Business Income*	0,223
15	*Primary Business Income/Total Assets*	0,808
16	*Current Assets/Current Liabilities*	1,7503
17	*Primary Business Income/Fixed Assets*	2,8102
18	*Cash/Total Assets*	0,0631
19	*Inventory/Current Liabilities*	0,7327
20	*Total Debt/Total Equity*	1,1304
21	*Long term debt/Total Assets*	0,2523
22	*Net Profit/Gross Profit*	0,3796
23	*Total Debt/Total Asset*	0,5306
24	*Total Assets/Capital and Reserves*	2,4952
25	*Long Term Debt/Capital and Reserves*	0,6296
26	*Fixed Assets/Total Assets*	0,2875
27	*Cash and Deposits/Current Assets*	0,1295
28	*Capital and Reserves/Total Debt*	0,7553
29	*Account Receivable/Total Assets*	0,1802
30	*Gross Profit/Primary Business Profit*	1,4896
31	*Undistributed Profit/Net Profit*	1,4263
32	*Primary Business Profit/Primary Business Profit of Last Year*	1,3338
33	*Primary Business Income/Last year's Primary Business Income*	1,4765
34	*Account Receivable/Account Receivable of Last Year*	1,6154
35	*Total Assets/Total Assets of Last Year*	1,2982

Table 2
Data Collection Summary

Table 3 shows basic descriptive statistics of sample. The most striking result to emerge from the data is that non-timely firm experienced a high total debt and a low net profit, cash & deposits, respectively.

Financial Item	Non-Timely	Timely	Financial Item	Non-Timely	Timely
TD	12,3347 ± 0,14778	11,9858 ± 0,23328	C&D/TA	-1,6648 ± 0,10575	-1,2035 ± 0,8950
TA	12,5293 ± 0,12177	12,3320 ± 0,22681	Inv/CL	-1,1329 ± 0,16204	-0,6184 ± 0,12517
GP	12,5412 ± 0,50181	13,0787 ± 0,1884	TD/TE	1,3326 ±0,5789	1,4286 ± 0,00662
NP	12,5657 ± 0,50318	13,1341 ± 0,1396	LTD/TA	2,5480 ± 0,00022	2,5484 ± 0,001
PBI	11,9332 ± 0,17036	11,9869 ± 0,20952	NP/GP	3,7122 ± 0,00021	3,7125 ± 0,0001
C&D	10,8638 ± 0,16838	11,1285 ± 0,21994	TD/TA	-0,1945 ± 0,5872	-0,3462 ± 0,04343
AR	11,1060 ± 0,21637	11,1105 ± 0,21048	TA/Cap&Res	0,4196 ± 0,06197	0,7259 ± 0,6940
Inv/PBI	0,0943 ± 0,2657	0,0846 ± 0,1637	LTD/Cap&Res	0,4427 ± 0,2956	0,4905 ± 0,03428
Inv/TA	0,305 ±0,00739	0,395 ± 0,00696	FA/TA	-0,5005 ± 0,09076	-0,7205 ± 0,11284
GP/TA	0,2771 ± 0,1180	0,3161 ± 0,00606	C&D/CA	-0,9430 ± 0,07327	-0,7581 ± 0,09893
NP/TA	2,2306 ± 0,00013	2,2310 ± 0,0004	Cap&Res/TD	-0,2251 ± 0,9798	-0,3798 ± 0,08563
CA/TA	-0,6929 ± 0,09867	-0,4454 ± 0,05157	AR/TA	-1,424 ± 0,13617	-1,2221 ± 0,10584
NP/PBI	0,87 ± 0,03607	0,9341 ± 0,00149	GP/PBP	1,5882 ± 0,09178	1,7331 ± 0,00388
AR/PBI	-0.8272 ± 0,10202	-0,8763 ± 0,7925	UP/NP	1,9599 ± 0,7841	2,04 ± 0,00027
PBI/TA	-0,5961 ± 0,11151	-0,3451 ± 0,7526	PBP/PBP last year	1,2920 ± 0,5885	1,33444 ± 0,00819
CA/CL	-0,2163 ± 0,11027	0,2581 ± 0,05954	PBI/PBI last year	0,007 ± 0,04802	0,1084 ± 0,03915
PBI/FA	-0,0955 ± 0,15269	0,3754 ± 0,10701	AR/AR last year	-0,155 ± 0, 11988	0,1876 ± 0,6081
			TA/TA last year	0,571 ± 0,032685	0,0587 ± 0,1019

Table 3
Descriptive statistics (Mean ± St. Dev.) on log transformation financial variables

IV. EXPERIMENTAL RESULTS

Hosmer[2] interpret logistic regression is the regression analysis to conduct when the dependent variable is binary. It is a discriminative classifier that is linear in its parameters and is used to explain the relationship between one dependent binary variable and one or more metric (interval or ratio scale) independent variable. Logistic regression was used in this paper in a similar way to Hajek[7] and Ravinsakar[9] in transforming the dependent variable probability to a totally continuous one.

The odd proportional odd ratio[6] is pedagogocally introduced with formula and graphics. How ever the associated test is not developed enough, the generalized logit model is presented where the logistic procedure is more suitable when the explanatory variable is numeric. Variables that become models in detecting the tendency of non-filing financial statements summarized in Table 5.

Variables	B	S.E.	Wald	df	Sig.	Exp(B)
Inventory/Current Liabilities	2,392	,885	7,304	1	,007	10,931
Total Debt/Total Assets	-3,388	1,200	7,974	1	,005	,034
Total Capital&Reserves/Total Debts	-1,700	,724	5,516	1	,019	,183
Constanta	2,685	1,018	6,961	1	,008	14,661

Table 5Model Summary

The model describes in a function as described on Table 5. There are three variables that significantly affected to non-timely filing financial statement.

$$f = 2{,}685 + 2{,}392(\text{Inventory/Current Liabilities}) - 3{,}388(\text{Total Debt/Total Asset}) - 1{,}7(\text{Total Capital \& Reserves/Total Debt}) \quad (1)$$

This measure the impact of the variables that affect thetendency of non-timely filing financial statements interpreted as:The increase of the Current Inventory / Liabilities ratio by 0.5 will increase the risk or opportunity unsuspendarround 3 times.The increase of the ratio of Total Debt / Total Assets by 0.5 will increase the risk or chance for the occurrence of suspension arround 10 times. The increase in the ratio of Capital and Reserves / Total Debt by 0.5 will increase the risk for the occurrence of suspension arround 2 times.

Observed		Predicted		
		Suspend	Clean	Percentage Correct
		,00	1,00	
Suspend	,00	19	7	TPR 73,1
Clean	1,00	7	23	TNR 76,7
Accuracy				75,0

Table 6Binary Classification Metrics

The results of the logistic regression classification are presented in Table 6 where the classification of the model obtained accuracy 75%. This means the model defined as well classified.

A Receiver Operating Characteristics (ROC) graph[5] is a vizualize technique in organizing and selecting classifier based on their performance. It is conceptually simple as a guide in a research, but there are some non-obvious complexity that come up when they are used in a research.

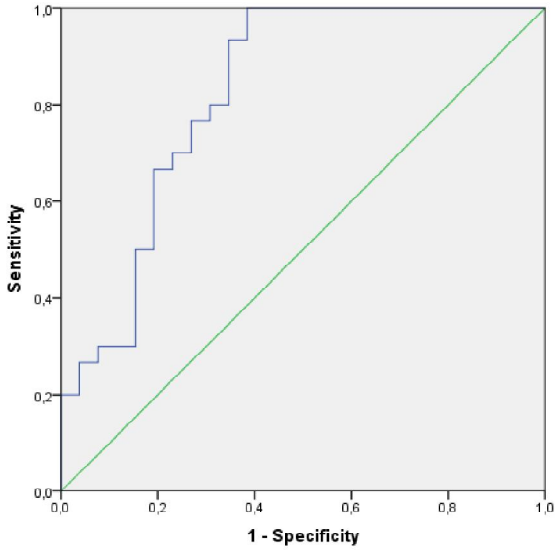


Fig.3. ROC Curve

The description of an ideal condition is at the point of intersection between Sensitivity and Specificity above the green line representing the probability line. In Figure 3 it appears that the optimal condition is obtained by sensitivity of 73.1% and close to the value 1. Sensitivity shows the correct signal while the wrong signal is shown in FPR (1-Specificity).

The area under the ROC curve (AUC) is between 0.5 and 1.0. This area measures the accuracy of the model predictions. When in the area of 0.5 means the classificationmodel is obtained random (random classification model). When AUC is below 0.5 or less then the model obtained has no meaning. In this study the AUC curve is between 0.5 and 1.0 this means that the prediction accuracy is compatible with a good model.

CONCLUSIONS

In this study, we examine the characteristics of non-timely filing financial report and timely filing financial report variables in case study of Indonesian Stock Exchange 2013 are Inventory/Current Liabilities, Total Debt/Total Assets, and Total Capital and Reserves/Total Debt. This study examined whether an improved non-timely filing detection tool that developed by combining specific features derrived from financial information and corporate annual reports. The current research was not specifically designed to evaluate the fraudulent company caused by non-timely filing financial report,

thus evaluate significant variable of non-timely filing financial report.

ACKNOWLEDGMENTS

We gratefully acknowledge the help provided by constructive comments of the anonymous referees. This work has been done to accomplish post-graduate program in Institute of Technology Sepuluh Nopember Surabaya.

REFERENCES

[1] Benoit, K., "Linear Regression Models with Logarithmic Transformation",London School of Economics, pp. 1-8, 2011.
[2] D.W. Hosmer, S. Lameshow, Applied Logistic Regresion, 2nd ed, John Wiley & Sons, New York, 2000.
[3] Edwards, D.J, and Hermanson, R.H, Accounting Principles: A Business Perspective, Volume 1, Houston, 2015.
[4] Edmonds, Thomas P.,Fundamental Financial Accounting Concepts, 8th edition, McGraw-Hill/Irwin, New York, 2013.
[5] Fawcett, Tom, An Introduction to ROC Analysis, Pattern Recognition Letters 27, pp. 861-874, 2006.
[6] Panik, M. J., Regression Modelling. Methods, Theory, and Computation with SAS, CRC Press Taylor & Francis Group, New York, 2009.
[7] Hajek, Petr, dan Henriques, Roberto, Mining Corporate Annual Reports for Intellegent Detection of Financial Statement Fraud – A Comparative Study of Machine Learning Methods, Knowledge-Based System, Vol.128, pp. 139-152, 2017.
[8] Novy-Marx, R., The Other Side of Value: The Gross Profitability Premium,NBER Working Paper Series, pp. 58-65, 2012.
[9] Ravisankar, P., Ravi, V., Rao, R.G., dan Bose, I.,Detection of Financial Statement Fraud and Feature Selection Using Data Mining Techniques.Decision Support Systems,Vol.50, pp. 491-500, 2011.
[10] Skousen, et al., Detecting And Predicting Financial Statement Fraud: The Effectiveness Of The Fraud Triangle And SAS No. 99, Advances in Financial Economics, Vol. 15, pp. 1-40, 2008.
[11] West, Jarrod, dan Bhattacharya, Maumita, (2015), Mining Financial Statement Fraud: An Analysis of some Experimental Issues, IEEE 10th Conference on Industrial Electronics and Applications, hal. 461-466.
[12] Wild, John J., Shaw, Ken W., dan Chiappetta, Barbara, Fundamental Accounting Principles, 22nd edition, McGraw-Hill, New York, 2015.

★★★