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Research Article

The Effect of Non-Financial Information on Default Probability Mediated by Financial Information in Indonesian Manufacturing Companies

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Abstract: The purpose of this research was to examine the direct and indirect effects of non-financial information on the Probability of Default (PD). Financial information was used to mediate this relationship with Size and Age as control variables. Furthermore, the non-financial information consisted of Corporate Governance (CG) variables, Research and Development (R&D), Market Information, and Macro Factors. Financial Performance (FP) included Current Ratio (CR), Total Asset Turn Over (TATO), Debt to Equity (DAR), and Return on Assets (ROE).This research used a simultaneous panel model approach, while the linear and logistic regression was determined throughdiscriminant analysis. Data were collected from 19 manufacturing companies listed on the Indonesia Stock Exchange from 2009 to 2018. Importantly, the novelty of this research was the inclusion of R&D and Financial Performance as mediating variables.In the first stage of linear regression, Financial Performance was significantly influenced by Corporate Governance, R&D, and Market Information. The macro factor with a significant effect was interest, while R&D reduced Financial Performance. The second stage of logistic regression with Probability of Default as the dependent variable had a significant influence on Financial Performance, Corporate Governance, and Market Information. After mediation by Financial Performance, R&D and macro interest factors significantly influenced the Default Probability.The novelty of this research was the inclusion of R&D and Financial Performance as mediating variables.This research showed that companies should always pay attention to Financial Performance (FP) ratios to avoid default, especially in CR and DAR that have the opportunity to Profitabilities Default (PD). Creditors may easily detect the health condition of the company by constantly monitoring and evaluating Corporate Governance (CG) and FP on PD.This research is limited to direct and indirect effects through Financial Performance as a mediation on the Default Probability. Therefore, further research is recommended to make comparisons per sub-sector with the lag variable in R&D.

Keywords: *Corporate Governance, Macro Factor, Financial Performance, Market Information, Default Probability, R&D*

1. Introduction

Failure is a nightmare that may happen to both large, old, medium, small, and emerging companies. This condition is usually triggered by the lack of anticipation of rapid market changes, debt, mismanagement, and fraudulent financial statements. Additionally, it could be caused by technological backwardness (Dmd, 2016) and inability to recognize and anticipate macro factors.

Many researches have been conducted, including the analysis of loan defaults and the hazard model for bankruptcy prediction. In this case, financial ratio variables were calculated using various statistical methods, logistic regression, and adjustment of the hazard function (Benjamin P. Foster and Jozef Zurada, 2013). Furthermore, two components of default risk and how they relate to stock returns, size, and book-to-market were also investigated (Hood III, 2016). Companies could take advantage of debt that changes their incentives to innovate and make R&D decisions. Also, the capital structure has the potential to affect the overall failure of innovation competition which feeds into the policy of a company (Geelen, Thomas ; Hajda, Jakub ; Morellec, 2019). Innovation in a company is mainly based on and measured by R&D activities (Qingya & Yucheng, 2019).

Researches on defaults are fascinating with some using financial and non-financial information approaches (Fernando, Jayasurya Mahapatabendige Ruwani ; Li, Leon ; Hou, 2019). They tested the effectiveness of several corporate governance information variables to predict international comparison defaults between emerging (Sri Lanka) and mature (United States) markets.

This research is based on the problems related to the company's finances and partial or integrated financial and non-financial information. It describes both financial and non-financial information and external macro variables. Also, macro variables have an important role in influencing a company's default (Gonzales, Eduardo Acosta ; Rodriguez, Fernando Fernandez ; Ganga, 2019). Gonzales et al. (2019) conveyed the company's financial failure

prediction using macro variables and accounting data. Moreover, the role of financial, macroeconomic, and non-financial information is essential in predicting the timing of bank loan defaults (Bhimani et al., 2013).

Most previous researches used governance, market information, financial performance, and macro factors to predict the default probability. However, based on the development of science and technology that requires innovation, this research included an R&D variable to non-financial information in determining the default probability. The variable was added to determine the ability of financial information to mediate all independent variables on the default probability using linear and logistic regression.

2. Literatur Review

The first research on bankruptcy prediction was conducted in 1932 by Fitzpatrick, using economic indices to describe the default predictability of a business. Ratio analysis was used to assess a company's bankruptcy by calculating the average of cash flow to total debt, net income to total assets, and working capital to total assets ratios in the ten years before bankruptcy (Li & Wang, 2018).

Modigliani and Miller stated that debt results in bankruptcy, which cannot reduce the company's value. In a perfect market, failure shifts share ownership from shareholders to lenders without changing the sum of the values for all investors (Berk, Jonathan ; DeMarzo, 2017).

Defaults may occur when a company fails to pay interest and principal on loans to investors. This failure does not automatically affect bankruptcy but only triggers negative consequences, such as increasing cash flow volatility and default probability (Damodaran, 2015).

Supervision of the financial health of a newly-growing company is often conducted for several reasons, such as to determine the its sustainability and growth in a competitive market , identifying signs of financial distress to avoid bankruptcy, and introducing new players in the market. Moreover, financial health supervision analyzes integrated markets to attract foreign investors and assesses the reluctance to invest due to political uncertainty and coalition politics (Dhar, Pranam ; Baidya, Bidhan ; Das, Bishnupada ; Bose, 2019).

Various factors when predicting the financial failure of a company, such as ratios from the annual calculations. The current crisis has resulted in an unreasonable rise in the bankruptcy rate. This means that bankruptcy cannot be explained without macroeconomic variables as a whole economic condition because it is not only caused by the company's internal financial ratios (Gonzales, Eduardo Acosta; Rodriguez, Fernando Fernandez; Ganga, 2019).

Effective corporate governance should increase investor confidence in the economy of the company. In general, it builds credibility, ensures transparency and accountability, and maintains effective channels of information disclosure that encourage good corporate performance (Dao & Pham, 2015). Previous researches stated that governance appears due to a conflict of interest in company management. The conflict occurs between shareholders as principals and managers as agents based on an agency relationship or Agency Theory (Jensen & Meckling, 1976).

Fernando empirically showed that corporate default is associated with high ownership, low shareholder rights, financial transparency and disclosure, and less effective boards. Moreover, the research provided a test supporting additional corporate governance information on predictive standards, compared to models that only involve financial information (Fernando, JM Ruwani; Li, 2018).

Financial ratio analyses initially started by predictions of bankruptcy and failure as Fitzpatrick in 1932. It was continued by Merwin in 1942, which stated that a bankrupt company could be identified from its financial ratios. This analysis was developed by Beaver in 1966, Altman in 1968, Zavgren in 1983, Altman in 1983, and Jones in 1987. Furthermore, traditional ratio analysis was developed into a statistical technique by academicians (Altman, 1968). As a result, it started using a logistic probability model in ratio analysis (Ohlson, 1980) and continued to grow until introducing the neural network method (Wilson, Rick L.; Sharda, 1994). Information with four basic financial statements is critical in measuring relative financial performance. Also, financial ratios are used to calculate, interpret, analyze and monitor company performance (Zutter, Chad J.; Smart, 2019).

Inventions are the result of R&D activities, but not all of them are patented because they do not meet the set criteria. Another possible reason that the inventors prefer other legal ways to protect their intellectual property or other cheaper and more efficient allocation tools (Lhuillery, Stephane; Raffo, Julio Diego; Livramento, 2015). Spending on research and development is an innovative step by companies and countries. Such efforts would result in new products or processes as investments in knowledge, as stated in the Main Science and Technology Indicators Database, June 2009.

Youhong Ben (2017) showed a slow relationship between research and development investment on company performance and the effect of lag (You & Meng, 2018). Companies are the main buffer for innovation influenced by managers and capital. In this case, managers as strategists influence innovation activities with high returns and risks (T. Liang & Mo, 2017).

Previous research variables using financial ratios have been developed by adding market information to predict failure (Beaver, 1968). The market-based model that uses the Black Scholes and Merton model state that market prices describe expected cash flows and predict bankruptcy (Agarwal & Taffler, 2008). As a result, several researches have used market-based models to assess the likelihood of default (Hillegeist et al., 2004).

Changes in interest rates affect the economic cycle and default. There is evidence of feedback mechanisms between default and macroeconomic indicators using various VAR and Granger causality methods (Marcal, Emerson Fernandes; Pereira, 2016). Research on the relationship between macroeconomic factors and the frequency of defaults in the retail loan portfolio analyzed quantitative data from historical default variables, theoretically complemented by the implications of macroeconomic conditions on the payment capacity of households. The macroeconomic factors studied included gross domestic product, house price index, and repo and unemployment rates (Antonsson, 2018).

Heterogeneous effects are used to determine the financial difficulties, though this information is minimal for small companies. The company's performance is considered good when assets increase against existing liabilities or debts (Gharsalli, 2019). Alyadi discussed the determinants of bankruptcy with firm size as one of the variables, followed by another research to determine firm age (Ayadi et al., 2019). In this case, firm age is used as a control variable, significantly influencing company performance, especially in developed countries. In comparison, the level of significance is still low in developing countries because older companies are less flexible (Pervan et al., 2017), this is because they accumulate more debt that affects defaults (Gibilaro, 2019).

This research conveys the effect of the independent variable on the default from several previous researches by accommodating the R&D variable. Following the current information technology development, innovations through investment in R&D are needed for a company's growth and sustainability. However, financing R&D with debt requires good management because it is highly vulnerable to default (Bragoli, Daniela ; Cortelezzi, Flavia ; Giannoccolo, Pierpaolo ; Marseguerra, 2019). Therefore, a conceptual framework was created to describe the effect of independent variables on non-financial information. The effect was described when mediated by financial information (financial performance) using simultaneous equations and adding variables control. Non-financial information comprises GC, R&D, Market Information (MB), and Macro Factors on default probability.

The hypotheses formulated in this research are as follows:

H_1: Corporate Governance affects Financial Performance
H_2: R&D affects Financial Performance.
H_3: Market Information (MB) affects Financial Performance
H_4: Macro factors affect Financial Performance
H_5: Financial Performance as mediation affects the Default Probability
H_6: Firm Size affects Default Probability
H_7: Firm Age affects Default Probability
H_8: Corporate Governance affects Default Probability
H_9: R&D affects Default Probability
H_{10}: Market Information Affects Default Probability
H_{11}: Macro Factors Affect the Default Probability

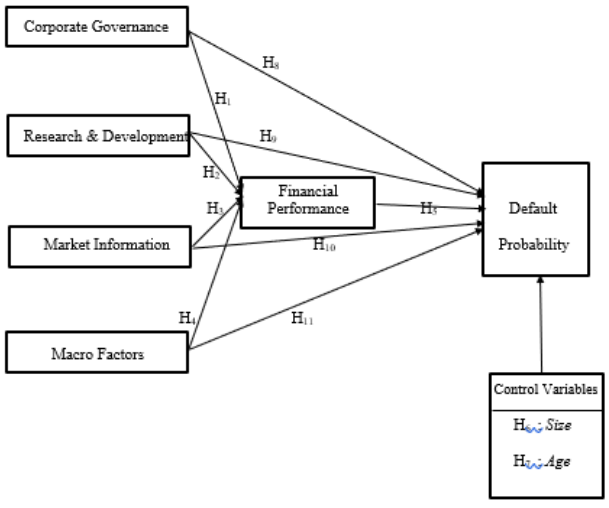

Figure 1 Conceptual Framework

3. Methodology

This research used the panel data regression analysis method with simultaneous equations to examine the direct and indirect effects of financial performance on the default independent variable. Data were collected from 171 manufacturing companies listed on the Indonesia Stock Exchange in the period 2009 – 2018, selected according to the research objectives. Furthermore, the research examined the significance level of the independent variable on the dependent variable based on the characteristics and time. It used the common, fixed, and random-effects models to determine the best and significant model. Also, the research used the time series and cross-section data from 171 manufacturing companies. The measurement of the variables to be used is in Table 1.

Table 1 Variable Measurement

Variable	Proxy	Equation
Dependent: **Default Probability**	Results of Discriminant Analysis to determine 0 and 1 Default = 0 Non-Default = 1	$Separatorvalue = \frac{(n1.C0 + n2.C1)}{n1 + n2}$
Mediation: **Financial Information** **Financial Performance**	Current Ratio	$CR = \frac{Currentasset}{scurrentliabilities}$
	Total Asset Turn Over	$TATO = \frac{Sales}{Totalassets}$
	Debt to Asset Ratio	$DAR = \frac{TotalAmountofdebt}{totalassets}$
	Return on Equity	$ROE = \frac{Netprofit}{capitalstock}$
Independent **Non-financial Information** **Corporate Governance**	Audit Committee	$AComntR = \frac{\Sigma numberofauditcommitteemembers}{\Sigma numberofcommissioners}$
	Managerial Ownership	$\frac{Totalsharesownedbymanagement}{totalofoutstandingsharesattheendoftheyear}$
Research and Development	R&D	R&D Investment Expenditure
Market Information	Market to Book Ratio	$MBRatio = \frac{marketpricepercommonshare}{bookvaluepercommonshare}$
Macro Factors :	Interest Inflation	Loan interest rate Common Inflation Rate
Control	Size Age	Total Sales Log Company Age

Data Analysis

Data were analyzed using estimates on the simultaneous equation panel data regression. The Two-Stage Least Square (TSLS) equation was used by performing a two-stage regression. The first stage consists of corporate governance, R&D, MB, and macro factors. The estimation of the first stage consists of four equations as the estimation of financial performance on CR, TATO, DAR, while ROE is shown by equations (1), (2), (3), and (4). The best model was then selected among common, fixed, and random effects models through the Chow, Hausman, and Lagrange Multiplier tests. The second stage of regression used a logistic model, where the dependent variable was transformed into a probability, Xβ, to a value of 0 to 1, where 0 = default and 1 = not default. This is explained by the estimation and odds ratio equations (5) and (6).

Financial Performance regression estimation equation:

$$CR = \propto_0 + \sum_{j=1}^{2} \propto_{1j} CG_{it} + \propto_2 RD_{it} + \propto_3 MB_{it} + \sum_{k=1}^{2} \propto_{4k} MO_{it} + €_{it} \quad (1)$$

$$TATO = \propto_0 + \sum_{j=1}^{2} \propto_{1j} CG_{it} + \propto_2 RD_{it} + \propto_3 MB_{it} + \sum_{k=1}^{2} \propto_{4k} MO_{it} + €_{it} \quad (2)$$

$$DAR = \propto_0 + \sum_{j=1}^{2} \propto_{1j} CG_{it} + \propto_2 RD_{it} + \propto_3 MB_{it} + \sum_{k=1}^{2} \propto_{4k} MO_{it} + €_{it} \quad (3)$$

$$ROE = \propto_0 + \sum_{j=1}^{2} \propto_{1j} CG_{it} + \propto_2 RD_{it} + \propto_3 MB_{it} + \sum_{k=1}^{2} \propto_{4k} MO_{it} + €_{it} \quad (4)$$

Logistic equation:

$$\frac{Pi}{1-Pi} = e^{xi\beta} \quad (5)$$

Therefore:

$$\text{Ln}\left[\frac{Pi}{1-Pi}\right] = z = X\beta = b_1X_1+b_2X_2+\ldots. \quad (6)$$

This model also analyzes probability through intercept, the impact of continuous variables on probability, and analysis of categorical variables on probability odds. The calculation of the Odds Ratio (OR) value at the output of logistic regression analysis is obtained from the coefficient value using the formula in equation (7):

$$OR = e^{\square i} \quad (7)$$

4. Results

The data description is represented by the average, standard deviation, minimum, and maximum values for each variable in the company, as shown in Table 2:

Table 2 Descriptive Statistics Results

Variable	Obs	Mean	Std. Dev.	Minimum	Maximum
Current Ratio	190	3.094718	1.755906	0.6056319 PT. Unilever Indonesia (2016)	9.344671 PT. Lion Metal Works (2012)
Total Asset Turn Over	190	1.257367	0.5103721	0.4999783 PT. Indocement Tunggal Perkasa (2017)	2.843141 PT. HM. Sampoerna (2014)
Debt to Asset Ratio	190	0.3506868	0.1734941	0.1263847 PT. Mustika Ratu (2010)	0.7471232 PT. Indo Acidatama (2013)
Return on Equity	190	0.3025611	0.3730475	-0.0546823 PT. Indofarma (2013)	1.851089 PT. Unilever (2016)
SIZE	190	6.479207	0.7573913	5.120577 PT. Pyirdam Farma (2009)	8.028335 PT. HM. Sampoerna (2018)
AGE	190	1.59714	0.1813623	1.113943 PT. Indofarma (Persero)	2.053078 PT. HM. Sampoerna
Audit Committee	190	0.7020745	0.2778017	0.2727273 Astra Autopart Tbk. (2013)	1.500000 Champion Pacific Indonesia Tbk, (2015-2016)
Managerial Ownership	83	0.0898125	0.135339	0.0000000 15 companies	0.517773 PT. Indoacitama Tbk(2017-2018)
Research & Development	165	3.947229	0.9540897	0.0000000 5 perusahaan pada beberapa tahun pertama	6.490359 PT. Unilever (2013)
Market Book Ratio	190	0.4198016	0.5628105	-0.6815192 PT. Mustika Ratu (2018)	1.916161 PT. Unilever (2017)
Interest	190	0.13252	0.0101234	0.1140000 (2018)	0.151400 (2009)
Inflation	190	0.04768	0.0212626	0.0278000 (2009)	0.0838000 (2013)
Default Probability	190	0.6052632	0.4900855	0.0000000	1.0000000

Note :*n* =190

The multiple regression analysis of panel data with the simultaneous equation of the Two-Stage Least Square (TSLS) method analyzes the direct and indirect effects. It uses two-stage regression, comprising the panel data and logistic regressions in the first and second stages, respectively.

The first stage regression analysis results are:

CR = 7.339375 - 1.388834 ACommR + 1.904103 MOwn – 1.086044 RD + 1.70165 MB + 2.105896 INT – 2.994019 INFL

TATO = 0,9283578 - 0,2296414 ACommR + 0,1042189 MOwn - 0.1249986 RD - 0,1222932 MB + 6.115859 INT + 1.637571 INFL

DAR = 0.6956139 + 0.1718217 ACommR – 0.930209 MOwn + 0.004613 RD - 0.0363989 MB – 2.944534 INT – 0.026479 INFL

ROE = 0.256857 + 0.0585055 ACommR + 0.300898 MOwn - 0.0542937 RD + 0.0798285 MB + 0.3832851 INT – 0.1044965 INFL

The results of the second stage of logistic regression are:

Logistic regression estimation results:

$\frac{Pi}{1-Pi}$ = PD = -69.24568 – 44.99217 $\widehat{CR}$ + 305.8071 $\widehat{TATO}$ - 51.33612 $\widehat{DAR}$ + 278.6718 $\widehat{ROE}$ + 1.106672 SIZE + 10.66381 AGE + 15.04425 ACommR + 94.4275 MOwn – 607.0463 MB + 0 INT - 1.153854 INFL

Logistic regression odds ratio results:

OR PD = 8.45E-31 + 2.89E-20 $\widehat{CR}$ + 6.50E+132 $\widehat{TATO}$ + 5.07E-23 $\widehat{DAR}$ + 1.10E+121 $\widehat{ROE}$ + 3.024275 SIZE + 42779.44 AGE + 3416911 ACommR + 1.02E+41 MOwn + 0 RD + 2.30E-264 MB + 1.00E+00 INT + 0.3154189 INFL

Table 3 shows the results of the first hypothesis testing with the dependent variable of financial performance (CR, TATO, DAR, and ROE) and independent variables of non-financial information (Corporate Governance (Audit Committee and Managerial Ownership), Research & Development, Market Book Ratio and Macro Factors (Interest and Inflation).

Table 3: First Stage Linear Regression Results

Dep. Var	**Financial Performance**							
	CR		TATO		DAR		ROE	
Ind. Var	Coef	p-value	Coef	p-value	Coef	p-value	Coef	p-value
CG:								
ACommR	-1.388834*	0.077	-0.2296414*	0.065	0.1718217	0.010	0.0585055**	0.049
Mown	1.904103	0.238	0.1042189	0.682	-0.930209***	0.000	0.300898	0.609
RD	-1.09E+00***	0.001	-0.1249986**	0.019	0.004613	0.868	-0.0542937***	0.000
MB	1.70165***	0.000	-0.1222932*	0.076	-0.036399	0.306	0.0798285***	0.000
Macro:								
INT	2.105896	0.872	6.115859***	0.003	-2.944534***	0.006	0.3832851	0.412
INFL	-2.994019	0.577	1.637571*	0.052	-0.026479	0.950	-0.1044965	0.585
Constanta	7.339375***	0.005	0.9283578**	0.026	0.6956139***	0.001	0.256857***	0.007

Note :*n* = 190 sample ; Significant Levels: *p<0.1, **p<0.05, ***p<0.01

Based on the hypothesis and significant test results, Table 3 could be concluded into several points:

H_1 proves that CG on AComm significantly affects FP on DAR and ROE,
while MOwn significantly affects DAR
H_2 proves that R&D significantly affects FP on CR, TATO, and ROE
H_3 proves that MB significantly affects FP on CR and ROE

H_4 proves that macro factors significantly affect FP on TATO and DAR.

Table 4 shows the results of the second stage of hypothesis testing with the dependent variable Default Probability and the independent variables Financial Performance ($\widehat{CR}, \widehat{TATO}, \widehat{DAR}, \widehat{ROE}$) and non-financial information (CG (AComm and MOwn), R&D, MB, Macro Factors (Int and Infl)), and control variables (Size and Age).

Table 4. Second Stage Logistics Regression Estimation Results

Dependent Variable			Default Probability
Independent Variable	Coefficient	Odds Ratio	P-value
Financial Performance:			
$\widehat{CR}$	-44.99217***	2.89E-20***	0.000
$\widehat{TATO}$	305.8071***	6.50E+132***	0.000
$\widehat{DAR}$	-51.33612***	5.07E-23***	0.000
$\widehat{ROE}$	278.6718***	1.10E+121***	0.000
Control Variable:			
SIZE	1.106672	3.024275	0.447
AGE	10.66381	42779.44	0.392
Corporate Governance:			
ACommR	15.04425**	3416911**	0.027
MOwn	94.4275***	1.02E+41***	0.000
RD	-2032.33	0	-
MB	-607.0463***	2.30E-264***	0.000
Macro Factors:			
INT	0	1.00E+00	
INFL	-1.153854	0.3154189	0.957
Constanta	-69.24568***	8.45E-31***	0.003

Note :*n* = 190 sample ; Significant Levels: *p<0.1, **p<0.05, ***p<0.01

Based on the hypothesis testing and significance results in Tables 3 and 4, the following conclusions are drawn:

H_5 proves that Financial Performance (CR, TATO, DAR, ROE) as a mediating variable significantly affects Default Probability.

H_6 proves that the size of the company does not affect Default Probability

H_7 proves that the age of the company does not affect Default Probability

H_8 proves that Corporate Governance in AComm and MOwn significantly affects the Default Probability

H_9 proves that R&D does not affect the Default Probability

H_{10} proves that Market Information (MB) significantly affects the Default Probability

H_{11} proves that Macro Factors (Int and Infl) do not affect the Default Probability

5. Duscussion

H_1: ***Corporate Governance*** **affects** ***Financial Performance***

CG significantly affects FP, where AComm positively and significantly affects DAR. This indicates the increasing confidence of external parties in the role of the audit committee. Another positive effect is the increase in ROE. In comparison, Mown causes a decrease in DAR due to additional share ownership of the company managers. This results in a decrease in the company's debt due to increased paid-in capital. Previous researches show the importance of information transparency on CG to achieve an optimal capital structure and reduce costs (Aflatooni & Khazaei, 2020), optimizing financial performance. This means that good CG implementation improves the company's financial performance (Kalyani, Sushil ; Mathur, 2019), (Kumari & Pattanayak, 2017), (Saidat et al., 2019), and increases investor confidence (Goel, 2018).

H_2: ***R&D*** **affects** ***Financial Performance.***

R&D significantly affects FP on the variables CR, TATO, and ROE with a negative effect. Therefore, investment costs on R&D result in a decrease in CR, TATO, and ROE, though they do not affect debt. This means

that current investment expenditures are not funded from debt but assets and relatively similar sales. Current R&D investment does not directly influence the improvement in financial performance, though it would impact the future. This is in line with (You & Meng, 2018), which stated that investment capital in R&D harms company profitability with a lag effect. Therefore, financial flexibility should deal with uncertainty in R&D investment on firm value (Lu et al., 2018).

H_3: Market Information (*MB*) affect*Financial Performance*

MB positively and significantly affects FP on CR and ROE. A good market book increases investor confidence, FP on CR and ROE. Moreover, investments funds are expected to generate profits for investors, where accounting and market-based are good and significant predictors in influencing the bankruptcy financial ratios. This is in line with (Agarwal & Taffler, 2008) and (Campbell et al., 2008), which stated that MB significantly and positively affects bankruptcy financial ratios.

H_4: Macro Factor affect*Financial Performance*

Macro factors consist of Interest (INT) and Inflation (INFL). INT is significant to FP on TATO and DAR. It positively affects TATO due to an increase in INT, resulting in more sales and higher selling prices. Moreover, the company withholds the purchase of assets, especially those funded with debt. INT harms DAR due to avoiding or decreasing debt to reduce interest expenses. This agrees with previous research, which stated that macroeconomic variables affect the company's financial performance (Oxelheim, Lars ; Wihlborg, 2011), (Issah & Antwi, 2017) and (Žiković, 2016). Another factor in the macro variable is INFL, which has no significant effect on FP because it has a larger data variation than INT data. However, the data has not changed much in the last ten years, meaning that the company's performance has a different response between INT and INFL statistically.

H_5: *Financial Performance* as mediation effect Probabilitas *Default*

Financial Performance consisting of($\widehat{CR}$, $\widehat{TATO}$, $\widehat{DAR}$, and $\widehat{ROE}$)results from the previous regression estimation. It was used to mediate the independent variables (Corporate Governance, Research & Development, Market Book ratio, Interest, and Inflation) on the default probability. The logistic regression analysis shows that the financial performance variable, which results from the first stage regression estimation, gives significant findings. Furthermore, the $\widehat{CR}$ variable as mediation affects the decrease in the probability of non-default to default. This is due to the previous independent variables consisting of CG, R&D, MB, and Macro, although only the R&D and MB variables are significant.

$\widehat{TATO}$, as one of the mediating variables in FP, influences the increase in non-default against default probability caused by CG, R&D, MB, and Macro variables.The significant variables for $\widehat{TATO}$ are R&D and INT macro factors. This shows that the R&D performed by the company results in increased use of technology and assets, lowering the TATO ratio. Furthermore, the increase in $\widehat{TATO}$ as a mediation results in high non-default against default probability, increasing sales of efficiency in assets. In the previous regression estimation, interest rates as a macro factor increase TATO due to the increase in INT. Therefore, companies must be more efficient, especially in the use of assets obtained from debt. Furthermore, $\widehat{TATO}$ mediates the increase in non-default against default odds.

$\widehat{DAR}$as a mediating variable in FP affects the default probability previously influenced by CG, RD, MB, and Macro. Moreover, significant variables AComm and MOwn on CG and INT on macro variables affect the increase in non-default probability to default by decreasing $\widehat{DAR}$. AComm positively affects $\widehat{DAR}$ as a mediation, indicating that the more proportional AComm is to the company, the more trusted by external parties. This is seen from the data on several companies with an increase in DAR and AComm. Furthermore, the increase in as mediation affects the decrease in non-default probability against default. Therefore, prudence should be exercised in managing and controlling debt to avoid default. Also, the MOwn variable harms DAR, indicating that an increase in managerial ownership affects a decrease in DAR. This is the result of increasing share ownership by managers, reducing the need for debt. The reason is that some of the funding is financed by the manager's equity participation. $\widehat{DAR}$as mediation from Mown on default probability affects the non-default probability of default due to increased debt. This condition requires an increase in managerial ownership to avoid more debt. The next step was examining the effect of the INT variable on the default probability mediated by $\widehat{DAR}$. The results show that INT harms DAR since the increase in INT makes the company to avoiding additional debt and even paying it

off. Therefore, the increase in $\widehat{DAR}$ as a mediation increases the default probability. Companies should control debt to avoid the default probability or manage it well to produce efficient productivity.

$\widehat{ROE}$ as mediation of CG, RD, MB, and Makro affect the default probability with significant AComm, RD, and MB variables. Furthermore, AComm affects the increase in ROE due to good monitoring and evaluation. Consequently, the high $\widehat{ROE}$ increases the non-default probability against default. ROE plays an essential in avoiding default probability. The higher the $\widehat{ROE}$, the better the company's ability to meet its obligations and manage capital. Additionally, in influencing the default probability, RD is influenced by the mediation of $\widehat{ROE}$, where RD harms $\widehat{ROE}$. This is due to the use of investment spending funded by debt, resulting in a decrease in ROE. As a mediation of RD on the default probability, $\widehat{ROE}$ affects the increase in the non-default probability. Furthermore, the MB variable positively affects the default probability with $\widehat{ROE}$ as a mediation. The increase in ROE was due to the relatively small share capital, resulting in a lower book price than the market price. This is good because the market responds positively to financial performance in terms of $\widehat{ROE}$, and indicates an increase in company profits with existing capital. The increase in profits has an impact on the increase in the non-default probability against default. This opportunity needs to be maximized to avoid the default probability.

Financial Performance is an important and best mediation in the early detection of the default probability. These results describe variables with no significant direct effect on the default probability, such as RD and INT. However, they become significant in influencing the default probability with financial performance mediation. The variables with a significant direct, indirect, or mediation effect are CG and MB. All companies in this research submit their financial performance regularly as a condition for continuous listing on the IDX. This allows investors to know the health of the company. However, several manufacturing companies experienced a decline in performance within the ten years.

This result is in line with previous research that used financial ratios as a mediating variable from the independent variables consisting of firm size, capital structure, GCG, and macro fundamentals in influencing a company's value (Purnomosidi et al., 2014). The research used SEM with 66 analytical units and 22 companies and found that financial performance as a mediating variable significantly influences the governance variable on firm value (Baroroh et al., 2017). Also, the same research was conducted on Islamic banks from several countries by examining liquidity risk and cost efficiency, with profitability (ROE and PBTZ) as mediating variables. The results showed that the variable of profitability could well mediate cost efficiency to liquidity risk (Ganiyy et al., 2017).

H_6: *Firm Size* affects Probabilitas *Default*

This research is in line with (Rianti & Yadiati, 2018: Osesoga, 2019), which stated that size does not affect financial distress. The reason is that there are few changes in the data on companies in Indonesia over ten years, meaning they least influence financial distress. Company default is caused by debt, meaning that large companies that are not balanced with good debt management would experience default. Several companies in Indonesia experienced default due to debts to subsidiaries of large companies.

H_7: *Firm Age* affects Probabilitas *Default*

The data processing results showed that firm age had no significant effect because the difference in the minimum and maximum values are too much in some companies. This is indicated by the standard deviation, resulting in an insignificant effect on the logistic regression. Furthermore, these results show that old companies still have to innovate technology to compete with new companies. For instance, Krakatau Steel experienced a default due to technological lag. This is in line with previous research that firm age is not significant in influencing financial distress (Sayari, Naz ; Mugan, 2013).

Company age is not a guarantee of avoiding default. Some old companies in Indonesia may experience a default due to technology lag and low competitiveness. Furthermore, old companies usually rely on family management with no good corporate governance and poor debt management.

H_8: *Corporate Governance* affects *Probabilitas Default*

CG consisting of AComm and MOwn significantly affects the Default Probability by increasing the non-default probability. This is indicated by the number of audit committees that are more than the average in the sample company. Moreover, 83 companies, or around 43%, have managerial ownership, which is expected to reduce agency costs. The corporate governance variable combined with the financial approach produces accuracy in predicting default, as indicated by several significant variables (Ciampi, 2015). Previous research used 190 independent variables X in ratios and corporate governance and found that corporate governance predicts

bankruptcy. Also, the research showed that solvency and profitability are key indicators in accounting information (Liang et al., 2016). Similarly, (Fernando et al., 2018) examined the effect of corporate governance on default prediction with the significance of the board of commissioners as one of the sub-variables.

Previous research showed that the audit committee as a variable in corporate governance produces a significant negative regression calculation on the probability of financial distress (Luqman, Rabia ; Ul et al., 2018). Also, several researches have examined the effect of corporate governance characteristics on defaults, with 70 companies failing and 70 others succeeding. The results show that the audit committee has a significant negative effect on corporate defaults (Lakshan, A.M.I. ; Wijekoon, 2012). Therefore, corporate governance, the company's manager, driver, and controller, significantly influences the default probability.

H_9: *R&D* affects Probabilitas *Default*

The analysis results show that the R&D variable provides an odds ratio value of 0, implying no chance in default probability. R&D is proxied by investment spending, is usually financed from debt, and contributes to technological development and innovation. However, only a few companies in Indonesia have conducted R&D, making it difficult to obtain sufficient data.

The company's attitude towards changes in R&D investment is determined after the leverage reaches a certain amount (Bragoli, Daniela ; Cortelezzi, Flavia ; Giannoccolo, Pierpaolo ; Marseguerra, 2019). Also, other researches stated that R&D reduces defaults, though it takes a long time. This means that generating innovation is risky and takes a long time (Cherkasova & Kurlyanova, 2019). The R&D variable does not directly affect the default probability because it is a long investment process, and the results are felt after a few years.

H_{10}: Market Information affect Default Probability

The regression estimation results show that the Market Book Ratio (MB) variable, as a proxy for market information, has a significant negative effect on the default probability. In contrast, the increase in MB affects the decrease in non-default probability to default in logistic regression. The results show that the increase in MB does not prevent the company from defaulting. According to research data on CR, some declining and relatively small companies have high stock market prices. Market information or ratios relate to the company's value, measured by the current stock price with a certain accounting value. These ratios provide insight into how investors in the market believe that companies account for risks and returns. The ratio is likely to reflect the assessment of common shareholders on all aspects of the company's past and expected performance (Zutter, Chad J. ; Smart, 2019). Furthermore, the market book is one of the tools that attract investors because it carries information on the company's risks and returns. When bad information about the company is conveyed to the public, then shareholders would withdraw their funds and become a consideration for potential investors. However, when the information is good, the shareholder investors would stay and possibly increase their shares. Moreover, potential investors would be interested in buying company shares.

The default probability occurs when many investors withdraw their funds due to bad information about the company risks. Therefore, companies need to maintain market information properly to avoid the default probability. Several researches in line with these results show the relationship between the market book and financial ratios. They include researches on the relationship between share price gains on company performance and risk. Similarly, this research shows a significant positive effect of share price gains on company performance as proxied by ROE (Zhao, 2013).

The MB ratio provides information on earnings and defaults risk four to nine quarters before the actual poor performance. A strong positive relationship exists between the standard deviation of ROA and the MB ratio. Moreover, MB provides additional explanatory power for future earnings and volatility outside the control variables. These results are economically significant since an increase in one standard deviation in the MB ratio is associated with a decrease in ROA and an increase in earnings volatility (Balasubramnian et al., 2019).

Several researches show a positive cross-sectional relationship between default risk and stock returns (Chava, Sudheer ; Purnandam, 2010). Also, calculations with logit regression on the two models show that the market to book ratio (MB) significantly affects financial ratios in bankruptcy while stock prices affect bankruptcy (Campbell et al., 2008).

H_{11}: Macro Factors affect Default Probability

The data processing results show that the interest variable is committed to collinearity. The inflation variable is insignificant, meaning that inflation does not affect the default probability. Inflation data obtained in the last ten years is relatively low and stable or has not changed much. Many researches in Indonesia describe the ineffectiveness of several macro variables on the default probability caused by macro interest and inflation data that do not change much (Rohiman & Damayanti, 2019). Some companies received foreign debt that does not affect the prevailing interest rates, this is in line with (Sulaksana, 2016). Moreover, some companies use their

capital and investors' share capital for funding (Moleong, 2018). Some company data used are pharmaceuticals, household goods, cement, and similar metals that do not significantly affect changes in inflation, which are very small and relatively stable.

6. Conclusion

This research examines the direct or indirect effect of non-financial information consisting of Corporate Governance (CG), Research & Development (RD), Market Information (MB), Macro Factors, and control variables (size and age) on the default probability (PD). The effect is mediated by financial information (financial performance (FP)) consisting of CR, TATO, DAR, and ROE. The analysis is a simultaneous equation that uses Two-Stage Least Square (TSLS). The first stage (direct) uses multiple linear regression, and the second with the mediating variable (indirect) uses logistic regression since the dependent variable is the default probability.

As evidenced by hypothesis testing, the results showed a significant effect of the variables CG, RD, MB on FP in regression stage I. The two sub-variables of CG, the Audit Committee (AComm), had a positive effect, and Managerial Ownership (MOwn) harmed DAR. This shows that the implementation of CG in AComm makes the company be trusted by external parties, which may lead to increased debt. MOwn has a negative effect, meaning that the high share ownership of the company by managers decreases the debt due to additional capital as alternative funding. The result of the significant ROE estimation is the Audit Committee with a positive influence. This means that the implementation of good CG in AComm increases the company's performance in generating profits. However, CG is insignificant in CR and TATO due to the lack of influence on the relatively stable increase in sales over ten years, causing no significant increase in liquidity.

The analysis of macro variables consisting of interest and inflation showed that the interest rates variable is significant to TATO and DAR. TATO has a positive effect indicated by the increase in interest rates, making the company not to adding its assets to existing sales. Therefore, the company performs efficiently on assets since the purchase is usually funded by debt. An increase in interest rates affects the decline in DAR due to the reduction of debt by the company to lower its interest expense. Moreover, the inflation variable does not significantly affect because the inflation data varies more than interest. It did not change much in the 10-year research period, resulting in the DAR variable being less responsive to inflation.

R&D has a significant negative effect on FP on CR, TATO, and ROE. In this research, R&D investment spending affects the decrease in CR since the funding comes from current assets. Data on Indonesian companies are still limited, especially on the allocations of R&D investment expenditure posts. The decrease in TATO due to increased R&D assets compared to relatively stable sales affects the decline in ROE at the beginning of R&D investment. Therefore, R&D would have a greater impact on improving financial performance in the future or the long term.

MB is market information with a significant and positive effect on CR and ROE. The increase in MB gives hope to investors regarding the company's good prospects in the future. It increases investor confidence to invest immediately and increases the company's CR and profits. Furthermore, changes in MB do not affect TATO and DAR because the impact is more on investors.

The hypothesis test in the second stage using logistic regression on the dependent variable of PD shows that the significant independent variable is $\widehat{FP}$. It is the estimation result in stage I as a mediating variable which is financial information. Furthermore, other significant variables are CG and MB as non-financial information. This logistic regression test is in the form of an odds ratio (OR) interpreted as the non-default probability against default from the independent variable. The independent variable consists of non-financial and financial information as a mediation on the default probability. Non-financial information is significantly mediated by financial information as the transmission in determining the default probability.

Testing the hypothesis on the default probability using the OR results on the variable $\widehat{FP}$ as mediation could be concluded as follows: $\widehat{CR}$ as mediation harms PD, meaning that an increase in $\widehat{CR}$ as mediation decreases the non-default probability against default. This results from the mediated variables, including the negative influence of RD and the positive effect of MB. Furthermore, the $\widehat{TATO}$ variable as mediation positively affects PD. This means that an increase in $\widehat{TATO}$ as mediation increases the non-default probability against default. It results from the negative effect of RD and the positive impact of INT as the mediated variables. Furthermore, the $\widehat{DAR}$ variable as mediation harms PD, meaning that an increase in $\widehat{DAR}$ as mediation decreases the non-default probability against default. It mediates the positive effect of AComm and the negative impact of Mown and INT. Furthermore, the $\widehat{ROE}$ variable as mediation positively affects PD. Therefore, an increase in $\widehat{ROE}$ as mediation increases the non-default probability against default. It mediates the positive effect of AComm and MB and the negative impact of R&D.

Variables with no significant direct effect on PD include R&D. By being mediated by FP, R&D became significant through $\widehat{CR}$, $\widehat{TATO}$, and $\widehat{ROE}$. After mediation by FP through $\widehat{TATO}$and $\widehat{DAR}$, the INT became significant to PD. Furthermore, the control variables consisting of size and age do not significantly influence PD. This shows that a company's size and age do not affect PD since the default is more caused by due to poor debt management. The evidence of the hypothesis that the R&D variable is not directly significant to PD gives an odds ratio of 0. It means that it fails to have a non-default probability of default to the default probability. This could be due to the difficulty in finding R&D variable data and its discontinuous presentation. R&D is a current investment expenditure with an impact on the future. Another insignificant variable is the macro factor, consisting of interest and inflation. Interest generates an odds ratio of 1 with a committed note due to the lack of variation in the data during the research period. Therefore, interest does not affect the default probability. Moreover, multicollinearity makes the two macro variables insignificant on the direct effect of logistic regression.

This research concludes that non-financial and financial information is essential for companies in detecting the default probability earlier. CG non-financial variables (AComm and MOwn) significantly affect the probability of non-default to default, decreasing the default probability. Furthermore, MB has a significant direct effect in lowering the non-default probability against default. This causes a default probability in case of an increase in MB. These variables also have an indirect effect. Financial performance on $\widehat{CR}$ mediates to reduce the non-default probability against default. This increases PD due to the increase in investment spending on RD and MB. Similarly, $\widehat{TATO}$ mediates by increasing the non-default probability against default. Also, it lowers PD due to a decrease in investment spending on RD and an increase in INT. $\widehat{DAR}$ mediates and lowers the non-default probability against default. It increases PD due to increased AComm's role and decreased MOwn's role and INT. Additionally, $\widehat{ROE}$ mediates in increasing the non-default probability against default, lowering PD due to the increased role of AComm and MB, and decreased RD investment spending.

Further research should compare several sub-sectors to determine any differences. For instance, comparisons should be made between companies in different countries using the lag of the R&D variable. This research was conducted for Small and Micro Medium Enterprises (MSMEs) to detect financial difficulties earlier and improve their performance.

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