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Financial Performance in Manufacturing Company with Multiple Linier Regression and MARS

Abstract

The purpose of this research is to analyze the influence of environmental disclosure and environmental performance on economic performance with firm size as a control variable. The environmental disclosure was measured by GRI index, environmental performance measured by PROPER index, firm size measured by ln total assets and economic performance measured by economic performance index. The sample of this study consists of 32 companies listed on the IDX 2013-2016. The criteria of the research sample are manufacturing companies that follow PROPER index, issuing financial statements with rupiah currency, publish a complete annual report. The results of this study inform that the performance of Multivariate Adaptive Regression Spline (MARS) is better than multiple linear regression. The result of multiple linear regression informs that not all classical assumption requirements are fulfilled. This results in a non-significant regression model, small R-square, and many predictor variables have no effect on response variables. MARS is one of the alternative methods to overcome the lack of multiple linear regression methods. MARS is not a requirement with classical assumptions because it includes one of the non-parametric regressions. MARS results informed that the MARS model is significant, R-square is large and the variables that affecting the economic performance are environmental disclosure and environmental performance while the most influential is the environmental performance.

Keywords: environmental disclosure; environmental performance; economic performance; firm size

JEL Classification: F64; G30

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Abstrak

Tujuan penelitian ini adalah mengetahui pengaruh pengungkapan lingkungan dan kinerja lingkungan terhadap kinerja ekonomi dengan ukuran perusahaan sebagai variabel kontrol. Pengungkapan lingkungan diukur dengan indeks GRI, kinerja lingkungan diukur dengan indeks PROPER, ukuran perusahaan diukur dengan ln total aset dan kinerja ekonomi diukur dengan indeks kinerja ekonomi. Sampel penelitian ini terdiri dari 32 perusahaan yang terdaftar di BEI periode 2013–2016. Kriteria sampel penelitian adalah perusahaan manufaktur yang ikut PROPER, menerbitkan laporan keuangan dengan mata uang rupiah, serta mempublikasikan laporan tahunan lengkap. Hasil penelitian menginformasikan bahwa kinerja Multivariate Adaptive Regression Spline (MARS) lebih baik dari pada regresi linier berganda. Hasil regresi linier berganda menginformasikan bahwa tidak semua syarat asumsi klasik terpenuhi. Hal ini mengakibatkan model regresi tidak signifikan, R-square kecil dan banyak variabel prediktor tidak berpengaruh terhadap variabel respon. MARS salah satu metode alternatif untuk mengatasi kekurangan metode regresi linier berganda. MARS tidak syarat dengan asumsi klasik karena termasuk salah satu regresi non-parametrik. Hasil MARS menginformasikan bahwa model MARS signifikan, R-square besar dan variabel yang berpengaruh terhadap kinerja ekonomi adalah pengungkapan lingkungan dan kinerja lingkungan, sedangkan yang paling berpengaruh adalah kinerja lingkungan.

Keywords: pengungkapan lingkungan; kinerja lingkungan; kinerja ekonomi; ukuran perusahaan

Economic performance of the company is a description of the condition of a company that is analyzed by means of financial analysis so that it can be known either the bad state of a company's economy that reflects the economic performance in a certain period (Tristianasari & Fachrurrozie, 2014). It is very important that resources can be used optimally in the face of environmental change. The performance of the company is relatively firm (changing from year to year) in a similar industry group (industry engaged in the same business) characterized by the company's annual return (Almilia & Wijayanto, 2007). The economic performance will then be disclosed in the company's financial statements and can be measured by various techniques. Economic performance or economic performance is disclosed in the company's annual financial statements. By seeing a good economic performance can provide a good picture and clear about the success of a company. The company's economic performance is a positive signal for capital owners such as investors to invest funds into the company. If the calculation of the ratios to the financial statements to produce good, then the capital owner will add capital, on the contrary if the measurement of financial ratios give unfavorable results, then the owners of capital will rethink in making investments. Handoko (2014) concluded that the company is not an entity that only operates for its own benefit but must provide benefits to the stakeholders (creditors), consumers, suppliers, governments, the public analyst and others. Angelia & Suryaningsih (2015) states that companies that perform better environmental performance will get good response from stakeholders that can generate long-term revenue increase. The better the company does its environmental performance, it will have a good impact on the long-term corporate financial development.

In Indonesia, macroeconomic policies related to the management of nature conservation began to be considered by the government. The latest UU No. 32 of 2009 on the protection and management of the environment, as well as its application in the

industry with the government regulation of the Republic of Indonesia No.101 of 2014 on the Management of Hazardous and Toxic Materials as evidence that the government cares about environmental management. However, these laws and regulations need to be evaluated for their effectiveness in the field related to environmental management so that in practice it is not only a regulation. The government through the Ministry of Environment (KLH) has even established a program called the Environmental Performance Appraisal Program or Program Penilaian Kinerja Lingkungan Hidup (PROPER) as a form of environmental compliance of companies in Indonesia. This is done in assessing the environmental performance of the company and encourage companies to better care for the environment. Good response to the PROPER program as an assessment of the company's environmental performance continues to increase from year to year. It is shown with PROPER conducted assessment to 1930 companies that follow this program. The results of the assessment 2015-2016, shows the level of obedience reached 84.75%. This means it increased from last year about 11.24%.

In the field of accounting, accountants become important parties because of the access for them to enter into the financial information of a company. Assessment and calculations made by the accountant will make it easier for managers in making decisions related to management policies and environmental preservation. In addition, in accounting science disclosure environmental costs have long been formulated and its existence is felt increasingly important. Accounting has an important role as a media accountability (public accountability) on environmental management by the company. Oktafianti & Rizki (2013) concludes that corporate environmental disclosure is currently still voluntary, causing mutual accusations and throwing responsibility between government, corporations, and society against environmental damage. This phenomenon occurs because the disclosure is considered self-serving and not careful in reporting the financial per-

formance of the company. Until now there is no universally agreed system and format based on the stakeholder theory which is seen from the measurement of environmental disclosure and environmental performance influence on economic performance.

Several studies on the effects of environmental disclosure on economic performance show different results (research gap) such as research Purnomo & Widianingsih (2012), Haryati & Rahardjo (2013), Tristianasari & Fachrurrozie (2014), Angelia & Suryaningsih (2015), Rohmah & Wahyudin (2015), Bahri & Cahyani (2016), and Hastawati & Sarsiti (2016) stated that environmental disclosure has an effect on economic performance while in research Almilia & Wijayanto (2007), Nofianto & Agustina (2014), and Setyaningsih & Asyik (2016) stated that environmental disclosure no effect on economic performance.

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In this study, the environmental disclosure measurements use Corporate Social Responsibility Disclosure Index based on Global Reporting Initiatives (GRI) indicator. Some previous research using Corporate Social Responsibility Disclosure Index based on Global Reporting Initiatives (GRI) indicator to measure environmental disclosure among others (Julianto & Sjarief, 2016; Suhardjanto & Permatasari, 2010). Environmental performance

measurements in the study using PROPER. Some previous researchers using PROPER to measure environmental performance include Wany, Murni, & Kholidah (2013), Tristianasari & Fachrurrozie (2014), Bahri & Cahyani (2016), and Hastawati & Sarsiti (2016). While the measurement of economic performance in this research use Economic performance index (EcP index) based on Al-Tuwaijri, Christensen, & Hughes (2004) and Alvarez et al. (2014)

HYPOTHESES DEVELOPMENT

The Effect of Environmental Performance on Economic Performance

In conventional accounting, the center of attention the company serves is its stakeholders and bondholders, while others are often ignored. Companies are not only concerned with the interests of management and owners of capital (investors and creditors) but also employees, consumers and society. The company has a social responsibility to parties outside the management and owners of capital. However, companies sometimes forget on the grounds that they do not contribute to the survival of the company.

According to Wulandari & Hidayah (2013), the greater the share of companies in environmental activities, the better the company image of stakeholders and users of other financial statements. With such a positive image, it will be able to attract the attention of the stakeholders and the public users of financial statements. With the company's improved corporate performance, the better the company's economic performance, so the market will respond positively through the fluctuation of stock price followed by the increase of stock return. Relatively many investors are interested to buy shares of the company to invest, this is a reflection of achievement of economic performance.

H₁: there is a significant influence of environmental performance on economic performance

The Effect of Environmental Disclosure on Economic Performance

In Indonesia the way corporate social responsibility disclosure, especially open companies use different media. The cause of the uniformity of corporate social responsibility disclosure, because there is no clear rules on how to represent it. The company discloses social information in order to build an image of the company and get attention from the community. The company requires a fee in order to provide social information, so the reported profit in the current year becomes lower. When companies face contract costs and low oversight fees and high political visibility will tend to disclose social information.

According Haryati & Rahardjo (2013) states that Based on the influence of Environmental Disclosure companies assessed as a high-risk company is the company's model production process directly utilize natural resources. Companies with high environmental disclosures in their financial statements will be more reliable. The reliable financial statements will positively affect the economic performance, in which investors will respond positively with higher stock price fluctuations, and vice versa. If the disclosure of a company's environment is low, then investors will respond negatively with fluctuations in stock prices declining from year to year.

By applying CSR, it is expected that the company will gain social legitimacy and maximize its financial strength in the long term. Environmental disclosure which is part of CSR disclosure, will in

theory affect the financial performance of the company. Stakeholder theory states that the amount of environmental information disclosed by the company will affect the stakeholders, resulting in stock prices and affect the annual return of the company.

H₂: there is a significant influence of environmental disclosure on economic performance

METHODS

The population observed in this research is a manufacturing company listed on the Indonesia Stock Exchange (IDX) 2013-2016. Selection of research samples conducted by purposive sampling technique, namely the selection of samples based on certain criteria. The criteria used in this study are manufacturing companies that participate in PROPER in the period of 2013-2016. Publish financial statements and use rupiah currency in the period of 2013-2016. Publish full annual report in 2013-2016. Research data obtained from the financial statements and annual reports of companies on the website Indonesia Stock Exchange (IDX) and www.proper.menlh.go.id. The number of samples used in this study is detailed in Table 1.

The variables in this study consist of response variables, predictor variables and control variables. Response variable in this research is economic performance measured by economic performance index while the predictor variable in this research is environmental disclosure measured by GRI index, environmental performance measured by PROPER index and control variable in this study is company

Table 1. Number of research samples

Sample Criteria	Total	Accumulation
manufacturing company listed on the Indonesia Stock Exchange (IDX) 2013 - 2016	153 x 4 years	612
Manufacturing companies that do not follow PROPER programs listed on the IDX during the period 2013-2016	110 x 4 years	(440)
Companies that do not use the rupiah currency in the financial statements	11 x 4 years	(44)
Total of observations		128

size measured by ln of total assets. Operationalization and measurement of variables are presented in Table 2.

Multiple Linear Regression Analysis Method

The method used in this research is multiple linear regression and MARS. Multiple linear regression is one of the parametric regression with the classical assumption of normality, heteroscedasticity, autocorrelation and multicollinearity. The criteria of the classical assumption test of multiple linear regression are: (1) Regression model error is normally distributed if the significance value of Kolmogorov-Smirnov $\geq \alpha = 0,05$. (2) There is no case of heteroscedasticity if all significance of t test (result of residual absolute regression with predictor variable) > 0.05 . (3) No autocorrelation occurs if the significance value of test run $i \geq 0.05$. (4) There is no case of multicollinearity if all Variance Inflation Factor (VIF) values < 10 and all tolerance values > 0.10 . Multiple linear regression analysis that is, fit model test, coefficient of determination and hypothesis test. The criteria of multiple linear regression analysis

are: (1) The model is fit / feasible if the significance value of F test < 0.05 . (2) The influence of the predictor variable to the response variable is to be weak if the R-square value $< 0,5$, Enough if $0.5 \leq R\text{-square} < 0.7$, Strength if $0.7 \leq R\text{-square} \leq 0.8$, very strong if $R\text{-square} > 0.8$. (3) Hypothesis test, predictor variables are said to have an effect if the significance value of t test < 0.05 . (4) the most influential predictor variable to the response variable is the largest partial correlation value.

MARS Method

MARS is one of the nonparametric regression methods that can be used as an alternative method to fill the weakness of parametric regression method (multiple linear regression) whose condition will be classical assumption. The MARS modeling stage is performed by combining maximum number of Base Function (BF), Maximum Interaction (MI) and Minimum Observation (MO) between knots to obtain optimal model with minimum GCV. The functional base (BF) used is 2x, 3x, and 4x the number of predictor variables corresponding to Friedman (1991),

Table 2. Operationalization and Measurement of Variables

Variable	Proxy	Measurement
Economic Performance	Index of Economic Performance	$Ecp = \frac{(P1 - P0)}{P0} - RI$ EcP: economic performance P ₁ : End-year stock price (adjusted dividend) P ₀ : Initial stock price RI: Industry return (Stock return)
Environmental Performance	Proper	1. Gold: Absolutly Great , score= 5 2. Green: Very good, score = 4 3. Blue: Good , score = 3 4. Red: Poor, score = 2 5. Black: Very poor, score = 1
Environmental Disclosure	Indeks GRI	$GRI = \frac{\text{Total item used by the company}}{\text{Total item GRI disclosure}}$
Firm size	Total Aset	LN Total Aset

which suggests the selection of the maximum number of base functions two to four times the number of predictor variables Maximum interaction (MI) used in the study are 1, 2 and 3. Because if there are more than 3 interactions, it will lead to very complex model interpretation. For minimum observation (MO) used is 5, 10, 20 so that at these points obtained minimum GCV value (Sutikno, 2008). Determine the best model of possible combinations of BF, MI, and MO values with minimum GCV value criteria and parameter estimates. The best model selection criterion is to compare minimum GCV, if it has the same value can be seen with the consideration of the smallest MSE value. MARS analysis that is, fit model test, coefficient of determination and hypothesis test. The criteria of MARS analysis are: (1) the best model MARS fit / feasible if the value $F_{count} > F_{tabel}$. (2) The influence of the predictor variable to the response variable is weak if the R-square value $< 0,5$, enough if $0.5 \leq R\text{-square} < 0,7$, strength if $0.7 \leq R\text{-square} \leq 0,8$, very strong if $R\text{-square} > 0,8$. (3) Hypotheses test, predictor variance have an effect if it is included in relative importance variable. (4) The most influential predictor variable to the response variable is the greatest GCV value on the relative importance variable.

RESULTS

Based on data obtained from IDX website that is www.idx.co.id manufacturing companies listed on the Indonesia Stock Exchange (IDX) during the period of study year 2013-2016 is 153 companies. The data used is the company's annual report issued by the company on the IDX website (www.idx.co.id). The company was selected again in accordance with the specified sample criteria, the

total number of samples fulfilling the criteria was 32 companies (128 samples). Preliminary analysis conducted on this research by conducting descriptive analysis. Descriptive analysis of the variables used in the study aims to provide an explanation of the independent variables, control variables and dependent variables during the study period undertaken and in can be seen in Table 3.

Based on Table 3 informed that the number of samples selected in accordance with the criteria that have been set at the beginning of 128 companies. Descriptive statistical results show that the economic performance (EcP) variable has a minimum value of -0.8422 because the company still can not run its operational activities well and the maximum value of 7.0539. The average value of the economic performance variables of 1.4177 <standard deviation value of 4.8804 (heterogeneous) means that some firms have low asset returns because the firm has the low stock price.

Descriptive statistical show that descriptive statistics show that the environmental performance (EP) has a minimum value of 2 that means the company is less concerned in environmental management. While the maximum value of 5 which means the company has paid attention to environmental management. The average of environmental performance (EP) variable is 3.14, Most of company rank in PROPER is in blue rank. The average value is greater than the standard deviation value, it informs that the company's environmental performance varies greatly.

Descriptive statistical show that the environmental disclosure has a standard deviation of 0.6314, the minimum value of 0.2352 and the maximum value of 0.5588 is a companies that do the disclosure of the environment in accordance with the required

Tabel 3. Descriptive Analysis

Variable	N	Minimum	Maximum	Mean	Std. Deviation
Environmental Performance	128	2.00	5.00	3.14060	0.64886
Environmental Disclosure	128	0.23529	0.55882	0.36971	0.63144
Economic Performance	128	-0.84224	7.05391	1.41775	4.88040

disclosure item. The average size of environmental disclosure variables is 0.3697, while firms that disclose more than the average value <50%, this result shows the average environmental disclosure on manufacturing companies PROPER participants in Indonesia is still not good. This occurs because the preparation of environmental disclosure information in the company's annual report has not fully utilized the GRI (Global Reporting Intivative) reporting standard.

Multiple Linear Regression

Multiple linear regression is one of parametric regression. Parametric requirements are expected to be fulfilled, for instance, residuals follow the normal distribution, residuals do not occur autocorrelation, residual does not occur heteroscedastisity, among predictor variables does not occur cases of multicollinearity and the relationship between predictor variables to linear response variables. Multiple linear regression model can be fit / decent, If all parametric requirements are fulfilled and known by BLUE (Best Linear Unbias Estimation). The results of multiple linear regression analysis in this study began by testing the classical assumptions, model analysis and hypothesis testing.

Multiple linear regression modeling in this study was conducted

Table 4 shows that in the initial model, the error is not normally distributed so in need of model modification. One way to normalize the data is to remove the outlier data. After the outlier, the normal distributed error of the other cases such as heteroscedasticity and autocorrelation still occur. This is one of the causes that the model does not fit, which means, the model is not able to explain the influence of predictor variables to the response variable. In addition, the coefficient of determination is very low at 2.7%. Another thing due to the classical assumption test that is unfulfilled, many predictor variables have no effect on the response variable. It can be concluded that the analysis of factors affecting economic performance using multiple linear regression with the sample of this study is not feasible to use.

One of the alternative methods used to fill the shortcomings of multiple linear regression methods is MARS. MARS is one of the nonparametric regression so it does not require a classical assumption test. One of the supporting factors to do influence test with MARS method by looking at each plot matrix of predictor variable to response variable in Figure 1.

Tabel 4. Multiple linear regression analysis

	Initial Model		After Outlier 5x	
	Sstatistic Value	Information	Statistic value	Information
Classic Assumption Test				
Normality	0.000	Not Normal	0.200	Normal
Heteroscedasticity	All sig value >0.05	Not Heteroscedasticity	There is a sig value <0.05	Heteroscedasticity
Autocorrelation	Sig = 0.001	Autocorrelation	Sig = 0.005	Autocorrelation
Multicollinearity	All VIF value >10	Not Multicollinearity	All VIF value >10	Not Multicollinearity
Regression Model Analysis				
R-square	R ² = 0.004	Very weak	R ² = 0.027	Very weak
Fit model test	Sig = 0.908	Not Fit model	Sig = 0.382	Not Fit model
Hypotheses test				
LnTA → EcP	Sig = 0.942	Not Significant	Sig = 0.163	Not Significant
ED → EcP	Sig = 0.746	Not Significant	Sig = 0.406	Not Significant
EP → EcP	Sig = 0.531	Not Significant	Sig = 0.321	Not Significant

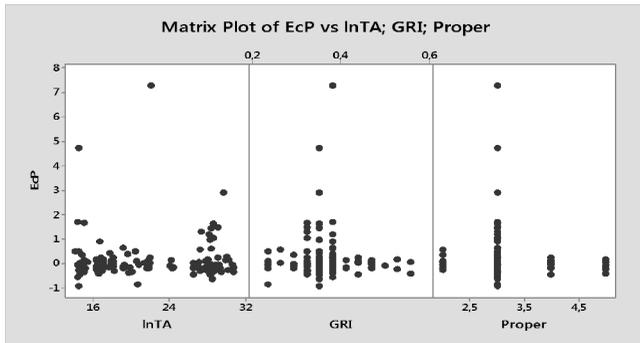


Figure 1. Plot predictor of response

From the result of plot of LnTA variable, GRI and PROPER Index to EcP shows that plot tendency does not form a certain pattern. Given the limited information about the function form and the unclearness of some relationship patterns between predictor variables to response variables, this is a consideration of nonparametric regression (MARS) used to model the data, in addition to unfulfilled parametric assumptions.

In the analysis of economic performance with MARS method obtained the best model with the smallest GCV on the combination of BF = 6, Mi = 2 and Mo = 5 with GCV = 0.477 and MSE = 0.431. Furthermore, comparison of multiple linear regression model results after outliers and MARS model is presented in Table 5.

Table 5 shows that MARS method performance is better than multiple linear regression in this study sample. MARS results show that the fit model with the value Fcount = 174.205 > F (0.05; 2; 125) = 3.068689 with the value of R-Square = 0.736. This shows that the MARS method is able to explain the effect of firm size variables proxied by LnTA, environmental disclosure proxied with GRI index and environmental performance proxied with PROPER index to economic performance well. The magnitude of firm size, environmental disclosure and environmental performance toward economic performance is 73,6%. The result of hypotheses test shows that environmental disclosure and environ-

Table 5. Multiple Linear Regression Analysis VS MARS

	Multiple Linear Regression Model After Outlier 5x		Multivariate Adaptive Regression Spline (MARS) Model	
	Statistic value	Information	Statistic value	Information
Classic assumption test				
Normality	Sig = 0,000	Normal	-	Not Tested
Heteroscedasticity	All sig value < 0.05	Heteroscedasticity	-	Not Tested
Autocorrelation	Sig =	Autocorrelation	-	Not Tested
Multicollinearity	All VIF value >10	Not Multicollinearity	-	Not Tested
Regression Model Analysis				
R-square	R ² = 0,027	Very weak	R ² = 0,736	Strong
Fit model test	Sig = 0,382	Not fit model	Sig = 0.99 E-15	Fit model
Hypotheses test				
LnTA → EcP	Sig = 0,163	Not significant	Enter in relative variabel importance	Significant
ED → EcP	Sig = 0,406	Not significant	Enter in relative variabel importance	Significant
EP → EcP	Sig = 0,321	Not significant	Enter in relative variabel importance	Significant

mental performance are included in table relative importance variable. This shows that environmental performance has an effect on economic performance (H_1 accepted) and environmental disclosure has an effect on economic performance (H_2 accepted). In the table of relative importance variable, highest value of GCV is PROPER, it shows that environmental performance variable with PROPER proxy most influential to economic performance.

DISCUSSION

Effect of Environmental Performance on Economic Performance

Environmental performance is the company's performance to create a green environment (Angelia & Suryaningsih, 2015). Environmental performance is one of the company's important steps in achieving business success. Environmental performance is a measurable outcome through an environmental management system based on environmental policy, environmental objectives and environmental targets (Bahri & Cahyani, 2016). Environmental management systems have standards that describe a system that helps companies to achieve better environmental performance. Based on testing with MARS method that has been analyzed above concluded that environmental performance has an effect on economic performance. The test results indicate that environmental performance has significant effect on economic performance. The results of this study are in accordance with the results of research Lindrianasari (2007), Wany, Murni, & Kholidah (2013), Tristianasari & Fachrurrozie (2014), and Bahri & Cahyani (2016). The results of this test indicate that the high low stock prices are influenced by PROPER ratings obtained by the company. In carrying out activities the company must consider all stakeholders because the influence of these stakeholders is very large for the survival of a company. This is in line with the theory of legitimacy of companies that want to survive in the long term, in addition to pursuing economic benefits the company

must also pay attention to the existing assessment in the environment of the company, the community environment will recognize the authority and policy of the company to the community and involved in the fulfillment of welfare stakeholders contribute actively in preserving the environment.

Effect of Environmental Disclosure on Economic Performance

Based on the testing with MARS method that has been analyzed above concluded that Environmental Disclosure has an effect on economic performance. The test results show that Environmental Disclosure proved to have a significant effect on economic performance. The results of this study are in accordance with the results of the study Tristianasari & Fachrurrozie (2014), Angelia & Suryaningsih (2015), Rohmah & Wahyudin (2015), Bahri & Cahyani (2016), and Hastawati & Sarsiti, (2016) found the influence of environmental disclosure to economic performance. From an economic perspective, the company will disclose an information if the information will increase the value of the company. By applying environmental disclosure, it is expected that the company will gain legitimacy and maximize its financial strength in the long term. It is expected that stakeholders consider the environmental disclosure information disclosed in the company's annual report, so that in decision-making the investor is not merely based on profit information alone. The annual report is one of the media used by companies to communicate directly with investors. Disclosure of environmental disclosure information is expected to provide additional information to investors other than those already covered in accounting earnings.

CONCLUSIONS AND SUGGESTIONS

Conclusion

The results of the study informed that the performance of MARS method is better than mul-

tiple linear regression method. MARS one method that can be used as an alternative method to fill the weaknesses of multiple linear regression method. The result of multiple linear regression method informed that the classical assumption requirement fulfilled is normality and multicollinearity while the unqualified classical assumption is heteroscedasticity and autocorrelation. This results of multiple linear regression model is insignificant that means multiple regression model is unable to explain the relationship of environmental disclosure and environmental performance to economic performance, R-square is very small, and all predictor variables have no effect against the response variable. The result of MARS method informs that MARS model is significant which means, MARS model able to explain relationship of influence of environmental disclo-

sure and environmental performance to economic performance. The big R-squares and the variables affecting the economic performance are environmental disclosure and environmental performance. The most influential variable on economic performance is the environmental performance.

Suggestions

The sample of future research can use a mining company. Environmental disclosure in mining companies since 2014 has become an obligation to be reported. Further research on environmental disclosure measurements can use measurement of the index while the measurement of economic performance can use the ratio of liquidity, profitability ratio, solvency ratio and activity ratio. The next research method can use Structural Equation Modeling - Partial Least Square (SEM-PLS).

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