Modelling of Payout Ratio: A Panel Regression Analysis for Indonesian Listed Bank

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***Abstract*— The Indonesian economy is a bank-based economy, where the economy relies on the existence of the banking sector as a source of financing, so a healthy and efficient banking system is the key to success in the sustainability of national economic development. The company's financial performance can be improved by going public. In companies that go public, dividends are one of the motivations of investors to invest their funds in the capital market, because it is a form of return on investor investment and an increase in wealth. The purpose of this study is determining the best model of the dividend payout ratio (DPR) in the banking sector by predictor variables such as ROI, DER, ROE, PER, and CAR using panel regression analysis. Based on the results of the analysis it was concluded that the factors that influenced the banking sector DPR were ROI and CAR with a good model of 86,7%.**

***Keywords*—Bank, Panel Regression Analysis, Payout Ratio**

I. Introduction

The financial services sector is one sector that has an important role in the dynamics of a country's economy, not only as a provider of funds for national production and consumption activities but also provides an important role for the community in saving funds and facilitates economic circulation. The bank accepts deposits from the public such as savings, deposits, and current accounts. These deposits will later be distributed back to customers such as loans which can be used for capital to open businesses, and so forth. The banking sector is one of the sectors with the largest assets around 74% of the total assets of Indonesian financial institutions [1].

Company value and financial performance can be improved by going public. Companies that go public are companies that offer shares to the public at large and do not limit the number of shareholders [2]. However, to be able to run a business, the company must have a source of funds. Sources of corporate funds can be obtained from various sources, namely internal sources and external sources. Internal sources are sources that come from profits that are not shared. External sources are sources originating from the paid-in capital of owners, investors, and others. In companies that go public, dividends are one of the motivations of investors to invest their funds in the capital market, it is because for investors dividends are a form of return on their investment and an increase in wealth [3].

An evaluation of the soundness of a bank and its performance in generating bank profitability is shown in the financial statements. Financial statements are also used to evaluate the financial situation in the past to estimate and predict the condition of financial performance in the future [4]. The company's profitability will affect the company's ability to earn profits from sales related to assets and equity. The greater the profits obtained, the greater the company's ability to pay dividends [5]. The types of profitability ratios used to show how much profit is obtained from the performance of a company in influencing notes to financial statements are gross profit margin, net profit margin (NPM), return on assets (ROA), return on equity (ROE), return on sales, return on capital employed, return on investment (ROI), earnings per share (EPS) and company size [5].

Based on research [6] obtained free cash flow results and ROA is significant to the dividend payout ratio. Other research conducted by [7] shows the variable profitability, debt policy, and company size that are significant to the dividend payout ratio. Research on the factors that affect cash dividend payments using panel data regression [8] shows that the variable earnings per share, debt to equity, and ROA have a significant effect on cash dividends. Furthermore, an analysis of the Indonesian banking sector listed on the 2012-2016 Stock Exchange using panel data regression [9] found that the Operational Efficiency Ratio (OER), Capital Adequacy Ratio (CAR), and FS variables significantly influence the dividend payout ratio.

According to the previous literature, this research will conduct a dividend payout ratio modeling on banks listed on the Indonesia Stock Exchange from 2014 to 2018. This study uses panel data regression analysis because of the cross-section and time-series data structure. The advantage of this research for investors is knowing conditions dividend in the banking sector, so investor can reduce the risk of loss in the event of a decline in stock prices, as well as providing information related to dividend modeling as a consideration for maximizing profits to reduce the risk of loss for companies and investors.

The rest of the paper is structured as follows: Section 2 presents the methodology of the research, Section 3 shows the results and discussion followed by the conclusion in the Section 4.

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II. RESEARCH METHOD

The type of data used in this study is secondary data such as time series data from 2012 – 2016 and cross section data from six banks in Indonesia (BBCA, BBNI, BBTN, BBRI, and BJTM). Banks that become object observations in this research are bank that have a complete report financial and never incur loses. Those data were taken from the annual financial report of bank that listed on the Indonesia stock exchange. Literature study was taken from national and international journals, books, and other scientific literatures. Referring the result of previous research by [7], the input variables that used is return on investment (ROI), debt to equity ratio (DER), return on equity (ROE), price earnings ratio (PER) dan capital adequacy ratio (CAR).

TABLE 1.
VARIABLE OF OBSERVATION

Variables	Explanation	Data Scale
Y	Dividen Payout Ratio (DPR)	Rasio
X_1	Return on Investment (ROI)	Rasio
X_2	Debt to Equity Ratio (DER)	Rasio
X_3	Return on Equity (ROE)	Rasio
X_4	Price Earnings Ratio (PER)	Rasio
X_5	Capital Adequacy Ratio (CAR)	Rasio

Based on the previous research and the type of data used, to answer the purpose of the research is used regression data panel model which combines time series data and cross section [10]. According to Gujarati, there are two advantages in using data panel model than time series data or cross section individually [10]. First, by combining time series data and cross section in data panel, the number of observations is getting bigger, by using data panel marginal effect from explanatory variable seen from two dimensions (individual and time) so that the estimated parameter can be more accurate than the other model. Second, more significant advantage from the usage of data panel is reducing the identification problem.

2.1 Panel Regression Model

The panel data is better in identifying and measuring the effect which in a simple from cannot be done in cross section data or time series individually. The data panel is able to control the individual heterogeneity so that the estimation explicitly inserts the individual heterogeneity. Generally, panel data model can be written as [10]:

$$\mathbf{y_{it}} = \boldsymbol{\alpha}_{\mathbf{it}} + \mathbf{X_{it}}^{\mathbf{t}}\boldsymbol{\beta} + \boldsymbol{\varepsilon}_{\mathbf{it}}, \tag{1}$$

where t is number of time-series, $\mathbf{y_{it}}$ is response variable unit-i and time-t, $\boldsymbol{\alpha}_{\mathbf{it}}$ is intercept coefficient for unit-i and time-t, $\boldsymbol{\beta}$ is slope coefficient, $\mathbf{X_{it}}^{\mathbf{t}}$ is matrix predictor variable unit-i and time-t, and $\boldsymbol{\varepsilon}_{\mathbf{it}}$ is regression error for unit-i and time-t.

In estimation of the parameter, there are several techniques offered, such as Pooled Least Square (PLS) model, Fixed Effect Model (FEM), and Random Effect Model (REM) [10]. The PLS model is known as estimation common effect model is a simple regression technique by combining cross section data and time series (pooled data). This combination data is treated as one unity of observation which is used to estimate the model by using Ordinary Least Square (OLS) model. The model is called as model without individual effect and can be written as:

$$\boldsymbol{y_{it}} = \boldsymbol{\alpha} + \boldsymbol{X_{it}}^{\boldsymbol{t}}\boldsymbol{\beta} + \boldsymbol{\varepsilon_{it}}. \tag{2}$$

The FEM model using additional technique of dummy variable so that, this method if often called Least Square Dummy Variable (LSDV) model. FEM is a model that is obtained by considering that the omitted variables can caused a change in cross section and time series intercepts. The dummy variable can be added to the model to allow the intercept variables and this model is presumed with OLS which is

$$\boldsymbol{y_{it}} = \boldsymbol{\alpha_i D_i} + \boldsymbol{X_{it}}^{\boldsymbol{t}}\boldsymbol{\beta} + \boldsymbol{\varepsilon_{it}}. \tag{3}$$

On FEM the differences in individual characteristic are accommodated on in intercept, while on REM, the individual characteristic on error from the model. This technique also considers that error might be correlated during the time series and cross section. The following are the general equations of the REM model shown in Equation 4 as follows

$$\mathbf{y_{it}} = \boldsymbol{\alpha}_{\mathbf{i}} + \mathbf{X_{it}}'\boldsymbol{\beta} + \boldsymbol{\varepsilon}_{\mathbf{it}}\ ;\ \varepsilon_{it} = u_{it} + v_{it} + w_{it}, \tag{4}$$

where $u_{it} \sim N(0,\sigma_u^2)$ is the component of cross-section error; $v_{it} \sim N(0,\sigma_v^2)$ is the component of time series error and $w_{it} \sim N(0,\sigma_w^2)$ is the component of combination error. We also assume that individual error also not mutually correlated, so does the error combination. By using REM, it can save the usage the degrees of freedom and not reducing the value as conducted on the fixed effect model. This implies parameter which is the estimation result will be efficient. It will get better when the estimation is more efficient.

2.2 Simultaneous Test (*F*-Test)

Simultaneous test is a method to determine effect of predictor variables simultaneously on the response variable using the F test statistic [10]. The following test of the significance parameters simultaneously with the test statistics F shown in Equation 5 where the hypothesis is written as

H_0 : $\beta_1 = \beta_2 = ... = \beta_k = 0$,

H_1 : at least there is one $\beta_j \neq 0$, and the statistics test is

$$F = \frac{MSR}{MSE},$$
$$MSR = \frac{n\sum_{i=1}^{k}\left(\bar{y}_{i.} - \bar{y}_{..}\right)^2}{k-1}, \tag{5}$$
$$MSE = \frac{\sum_{i=1}^{k}\sum_{j=1}^{n}\left(\bar{y}_{ij} - \bar{y}_{..}\right)^2}{n-k},$$

with level of significant α and degree of freedom (df) is [k-1, n-k]. Reject H_0 if $F > F_{\alpha(k-1,n-k)}$.

Explanation:

n = number of cross sections
k = number of predictor (k = 1, 2, 3, …, p)
t = number of time series
y_{ij} = response variable
$\bar{y}$ = average value from response variable
$\bar{y}_{i.}$ = average value from response variable unit-i.

2.3. Partial Test (*t*-Test)

The partial test is a test for β_0 and β_1 separately. Partial test is used to test if the regression coefficient has a significant effect [10]. The β_j is used to test the model starting at point β_j has a significant effect on model or not significant. The partial test for the parameter β_j is explain by the following steps below

$H_0 : \beta_j = 0$

$H_1 : \beta_j \neq 0$,

where the statistics test is given by

$$t_{hitung} = \frac{\hat{\beta}_j}{SE\left(\hat{\beta}_j\right)}, \tag{6}$$

with level of significant α and degree of freedom (df) is [nt-k-1]. Reject H_0 if $\left|t_{hitung}\right| = t_{\alpha/2(nt-k-1)}$.

Explanation:

$\hat{\beta}_j$ = parameters estimate value of the j^{th} predictor variable

$SE\left(\hat{\beta}_j\right)$ = the value of standard error from parameter estimate of the j^{th} predictor variable

2.4. Multicollinearity

Multicollinearity is a strong relationship between predictor variable in regression. If there is multicollinearity the regression coefficient will have a large standard error, this means that the coefficients cannot be estimated with a high degree of accuracy [10]. Multicollinearity can be detected if the following occurs:

1. The R^2 value is high, but there is not predictor variables significant.
2. High correlation among predictor variables.
3. If the regression model obtained different sign with the regression coefficient and the correlation coefficient between the response variable and the predictor.
4. The Tolerance Value (TOL) is close to zero which indicates multicollinearity. The TOL value is the inverse of the Variance Inflation Factor (VIF) value which can be described as

$$VIF = 1 - \frac{1}{R_j^2}, \tag{7}$$

where R_j^2 is the coefficient of determination from the predictor variable which is regressed with other predictor variable. If the VIF value < 10 there is no multicollinearity. Conversely, if the VIF value > 10 then multicollinearity detect.

2.5. Homoscedasticity of Residuals

One of the panel regression assumptions must be fulfilled is that the variance of the error must be homogeneous and the average variance same from another. If the error variance is not identical, it means there is a case of heteroscedasticity. To detect heteroscedasticity used the Glejser test shown in equation 8 where the hypothesis is

$H_0 : \sigma^2_{\varepsilon_i} = \sigma^2$ (variance equal)

$H_1 : \sigma^2_{\varepsilon_i} \neq \sigma^2$ (variance not equal)

and the statistics test has the form

$$F = \frac{MSR}{MSE}, \tag{8}$$

with level of significant α and degree of freedom (df) is [k, n-k-1], where n is number of cross sections, and k is number of predictor (k = 1,2,3, …, p). Reject H_0 if $F > F_{\alpha(k,n-k-1)}$.

2.6. Non-Auto Correlation

Non-auto correlation or independent residual test there is relationship between residuals or non-auto correlation. An independent residual assumption check can be done using the Durbin Watson test [10]. The independent residual assumption test used the Durbin Watson test which can be seen in Equation 9. The hypothesis can be defined as follows

$H_0 : \rho = 0$ (Non-auto correlation)

$H_1 : \rho \neq 0$ (Auto correlation)

Statistics test:

$$d = \frac{\sum_{i=2}^{n} (\varepsilon_i - \varepsilon_{i-1})^2}{\sum_{i=1}^{n} \varepsilon_i^2}, \tag{9}$$

with level of significant is α and degree of freedom (df) is n. Reject H_0 if $d < d_{L(\alpha,n)}$ or $d > 4 - d_{L(\alpha,n)}$.

2.7. Normality Test

Normality test are used to determine if a data set is well-modeled by a normal distribution and to compute how likely it is for a random variable underlying the data set to be normally distributed. This Kolmogorov-Smirnov (KS) test allows to decide as to whether a normal distribution. It is important to know if intend to use a parametric statistical test to analysis data, because these normally work on the assumption that data is normally distributed. The normality of a data can be seen from the plot. The hypothesis is written as follows

H_0 : $F_{n(\varepsilon)} = F_{o(\varepsilon)}$ (Data normally distributed)

H_1 : $F_{n(\varepsilon)} \neq F_{o(\varepsilon)}$ (Data not normally distributed),

and the statistics test is given by

$$KS = \sup_x \left| F_{n(\varepsilon)} - F_{o(\varepsilon)} \right|, \tag{10}$$

with level of significant α and degree of freedom (df) is k and n, $F_{n(\varepsilon)}$ is the expected relative cumulative frequencies and $F_{o(\varepsilon)}$ is the observed relative cumulative frequencies. Reject H_0 if $KS > KS_{\alpha(k,n)}$.

III. RESULTS AND DISCUSSION

This research used 30 data obtained from financial report of bank in Indonesia. There are 3 points that become focus discussion. Firstly, we would find the greatest coefficient determination to choose the best model. Secondly, create the appropriate prediction model for dividend payout ratio and the last is checking the assumption of the selected model. Based on Table 1, the highest coefficient determinant belongs to FEM between individual is 94,8%. It means, the model is fit to predict dividend payout ratio.

The model to predict dividend payout ratio with the FEM approach between individuals can be written as follows

$$DPR = 51{,}1 + 4{,}30ROI - 2{,}69DER - 0{,}303ROE + 0{,}488PER - 0{,}592CAR - 18D_1 - 6{,}10D_2 + 0{,}28D_3 - 3{,}0D_4 + 6{,}0D_5.$$

The value of coefficient determinant is 94,8% means that the dividend payout ratio is explained by input variables 94,8% while the remaining 5,2% is explained by other variables exclude in the model. We select coefficient determinantion as the measurement of goodness of fit because it is useful in understanding the importance of relationships between variables and how each variable was affected by other.

TABLE 2.
COMPARISON COEFFICIENT DETERMINANT

Model	Coefficient Determinant
CEM	88,8%
FEM between individual	94,8%
FEM between time	91,2%
REM	88,47%

The parameter test used to test whether the influence of the input variables simultaneously affect the dividend payout ratio of banks from 2014 to 2018. The test statistics is shown in Table 3 as follows.

TABLE 3.
THE SIMULTANEOUS TEST OF FEM BETWEEN INDIVIDUALS

F_{test}	$F_{0.05\ (10.19)}$
34,58	2,38

Table 3 shows that based on simultaneous tests, the F_{test} value of 34.58 was greater than the value of table $F_{0.05\ (10.19)}$ of 2.38. Therefore, we reject H_0 which means there is at least one predictor variable that is expected to affect the dividend payout ratio in the banking sector. Then continue to the partial test, which is shown in Table 4.

TABLE 4.
THE PARTIAL TEST OF FEM BETWEEN INDIVIDUALS

Variables	$\lvert t_{test} \rvert$	P-value
Constant	2,87	0,10
ROI	2,83*	0,011
DER	1,20	0,246
ROE	0,75	0,461
PER	0,8	0,392
CAR	3,45*	0,003
BBCA	2,84*	0,010
BBNI	1,50	0,150
BBRI	0,08	0,939
BBTN	0,25	0,803
BJTM	0,52	0,611

*Significant by alpha 5%

Based on Table 4, it shows the value of the test statistics and p-value of each predictor variable. It found that two predictor variables have the value of $|t_{test}|$ greater than 2.09 namely ROI (2.83) and CAR (3.45) then dummy variable of BBCA (2.84). It means that ROI, CAR, and BBCA significantly affect the dividend payout ratio in the banking sector from 2014 to 2018.

After the model is determined, the last step is checking the assumption of the residuals consist of identic, independent, and normality. The fulfillment of assumption is important to see randomness in our residuals (representing the error); this can be assessed by some statistical testing. The Glejser test is used to test the identical assumption, the following test result are represented in Table 5.

TABLE 5.
THE GLEJSER TEST OF FEM BETWEEN INDIVIDUALS

F_{test}	$F_{0.05\ (10.19)}$	P-value
3,99	4,19	0,056

Table 5 shows that based on the identical assumption test, the F_{test} value of 3.99 is smaller than the $F_{0.05\ (1;\ 28)}$ value of 4.19 and the P-value of 0.056 is greater than the value of 0.05 so that it can be decided to fail to reject H_0 which means the residuals are identic.

Furthermore, testing the independency of residual can be done by the Durbin Watson (DW) test. The DW statistic is a test for autocorrelation in the residuals from a statistical regression analysis. The DW statistic will always have a value between 0 and 4. The result of the DW test is shown in Table 6. According to Table 6 below, we conclude that there is no indicate of autocorrelation because a D value of 2.96212 is greater than dL with a total data is 30.

TABLE 6.
THE DURBIN WATSON TEST OF FEM BETWEEN INDIVIDUALS

D	4-d_L	d_L
2,96212	3,2178	0,7822

The last assumption is normality test. The visualization of residual plot fit by regression line and Kolmogorov-Smirnov (KS) test are used to check the normality. This test is based on the maximum difference between the observed distribution and expected cumulative-normal distribution. Since it uses the sample mean and standard deviation to calculate the expected normal distribution, the Lilliefors' adjustment is used. The smaller the maximum difference the more likely that the distribution is normal.

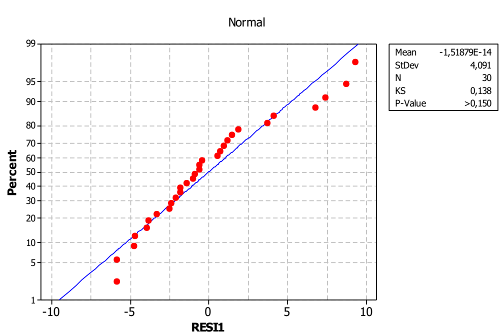

Figure. 1. Plot of residual normality test

Figure 1 shows that the KS value of 0.138 is smaller than $KS_{0.05(30)}$ of 0.242 so that it can be decided to fail to reject H_0 and visually the residual data follows a linear line which means that the residual data of this first model has followed the normal distribution.

As mentioned above, only three variables affect respond variables significantly. The last model to predict dividend payout ratio with the FEM approach between individuals with two significant predictor variables namely ROI and CAR, with dummy variable is BBCA and fulfillment of assumption of the residual is as follows.

$$DPR = 9{,}95 + 5{,}76\ ROI + 0{,}231\ CAR - 2{,}46\ BBCA.$$

The value of coefficient determinant is 86,7% means dividend payout ratio is explained by input variables by 86,7% while the remaining 13,3% is explained by other variables exclude in the model.

After the new model is determined the last step is checking the assumption of the residuals. The step by step assumption checking is same with previous model. The Glejser test result is represented in Table 7.

TABLE 7.
THE GLEJSER TEST OF FEM BETWEEN INDIVIDUALS OF THE BEST MODEL

F_{test}	$F_{0.05\ (1.28)}$	P-value
1,53	4,196	0,226

Table 7 shows that based on the identical assumption test for new model, the F_{test} value of 1,53 is smaller than the $F_{0.05\ (1;\ 28)}$ value of 4.196 and the P-value of 0.226 is greater than the value of 0.05 so that it can be decided to fail to reject H_0 which means the residuals for new model with two significant predictor and a dummy variable are identic. Furthermore, the result of the DW test is shown in Table 8.

TABLE 8.
THE DURBIN WATSON TEST OF FEM BETWEEN INDIVIDUALS OF THE BEST MODEL

D	4-d_L	d_L
1,38398	2,7163	1,2837

According to Table 8 below, we conclude that there is no indication of autocorrelation for new model because D value of 1.38398 is greater than d_L with a total data (n) of 30.

The last assumption is the normality test. The normality plot can be seen below

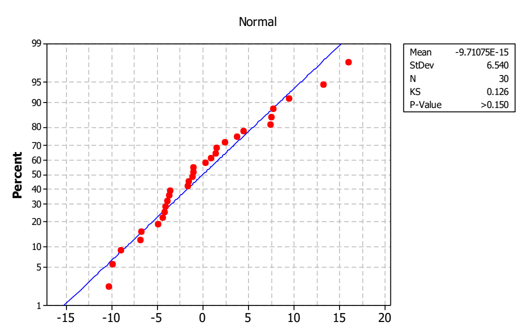

Figure. 2. Plot of residual normality test of the best model

Figure 2 shows that the KS value of 0.126 is smaller than $KS_{0.05(30)}$ of 0.242 so that it can be decided to fail to reject H_0 and visually the residual data for new model with two significant predictor follows a linear line which means that the residual data has followed the normal distribution.

IV. Conclusion

The best model was chosen using the Fixed Effect Model (FEM) approach between individuals with two predictor variables that had a significant influence on the dividend payout ratio in the banking sector were ROI and CAR and the dummy variable, namely Central Asia Bank. This model also fulfilled all assumptions. Based on this result, investors should pay more attention to ROI in determining future investments because the higher of ROI, it shows that the profits generated by the company will also increase. That will affect the amount that will come to investors each year. Apart from looking at ROI, investors also need to pay attention to CAR because the increasing value of CAR can reduce the company's burden, and the reduced burden will increase the company's profit and in the end will increase the DPR, which is expected by shareholders as an investment made.

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