

MODELING THE PROFITABILITY OF TELECOMMUNICATION SUB-SECTOR STOCKS USING PANEL DATA REGRESSION ANALYSIS

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Abstract. *The Covid-19 outbreak in Indonesia has wreaked havoc on the financial market, causing turbulence in the stock market. One industry that did not endure instability was the telecommunications sub-sector due to government initiatives connected to online learning and office tasks performed on a Work From Home basis, which increased internet usage during online learning and Work from Home. Online learning and office activities carried out on a Work From Home basis have increased the sector's profitability and breathed new life into the world of stock investment. When purchasing stocks, an investor always seeks to generate a profit. The profitability ratio reveals the profitability of the business. Profitability and investment decisions are linked as a result of a budget plan and profit forecast. This study aims to model the profitability of telecommunications sub-sector companies listed on the Indonesian stock exchange using panel data regression analysis. The panel data regression analysis mixes cross-section data and time series data in which the same cross-section unit is sampled at various times. Therefore, investors must be aware of the profitability of the sub-sector of the telecommunications industry to make an investment decision. This research will generate a model of the profitability of sub-sector enterprises in the telecommunications industry. Based on the R square value of 0.8752, the results of this study indicate that Ln equity, inflation, CR, and DER can explain 87.52 percent of the variation in ROA. In comparison, the remaining 12.48 percent is impacted by factors not included in the model.*

Kata Kunci: Panel data regression, telecommunications, profit

1. Introduction

Panel Data Regression is a method to determine the influence of independent variables on dependent variables using Ordinary Least Square (OLS) regression analysis on models with a combination of time series and cross-sections.

According to [1], there are several advantages gained by using panel data. First, the panel data combines two cross-section data, and the time series can provide

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more data to result in greater freedom. Second, combining data information from cross-sections and time series can solve the problems that arise when there is a variable omission problem.

According to [2], using data panels in economic research provides several significant advantages over cross-section and time series data. First, it can give researchers a high number of observations, enhance the degree of freedom, raise the variability of the data, and lower the cohabitation between explanatory factors, which can lead to accurate econometric estimates. Second, the data panel can provide additional information that cross-section or time series data alone cannot. Thirdly, data panels can provide greater precision in dynamic change inference than cross-section data.

The Covid-19 pandemic in Indonesia affected the capital market. It caused a change in trading time on the Indonesia Stock Exchange, a negative signal (bad news) that caused investors to be more interested in selling their shareholdings [3]. The Covid-19 pandemic has also affected market dynamics, causing stock exchanges around the world to decline [4]. In Indonesia, this also has a destructive impact on the capital market, which has caused the stock market to experience turmoil.

However, not all sectors experienced turmoil, one of which was the telecommunications sub-sector due to the online policy in learning carried out so that internet use during Work from Home (WFH) and learning from home was highest. This has resulted in increased profits from this sector and provided fresh air to the world of stock investment.

In making stock investments, an investor always strives to make a profit. The profit of one of the companies can be seen from the profitability ratio. This ratio provides an important role in the effort to attract stock investors. A profitability ratio is a ratio that aims to determine the company's ability to make a profit during a specific period and also provides an overview of the level of effectiveness of management in carrying out the company's operational activities. Profitability is the result of several policies and decisions of the company's management, so it says profitability is the company's ability to obtain a net profit from activities carried out during the accounting period [5].

The level of profitability is important for efforts to achieve the company's goals. A company must be in good condition because without profit, it will be difficult for the company to attract investors to invest its funds in its shares. Therefore, efforts to increase profitability are important for the sustainability and future of the company. The ability of an enterprise to make a profit in a period reflects the company's ability to increase its value of the company, which is reflected in the stock price. With this in mind, the purpose of this study is to model the profitability of telecommunications sub-sector companies on the Indonesian stock exchange with Panel Data Regression Analysis. This research will produce a model of the profitability of telecommunications sub-sector companies. From the resulting model, it is hoped that it can provide an overview for investors to take action on investing in shares in the telecommunications sub-sector.

2. Theoretical Foundations

2.1. *Panel Data Regression Model*

Panel data, commonly called longitudinal data, combines time series data and cross-section data. Using panel data helps explain two types of information: information between units on subject differences and information between times on subject changes over time. Another benefit is the quantity of data available for analysis [6].

Regression-based on panel data mixes cross-sectional and time series data in a single equation. This regression was created to address a number of issues, including insufficient data availability, heteroscedasticity issues, and auto-correlation issues. In addition, this analysis method was designed to maximize efficiency [6]. The model for panel data regression can be expressed as follows.

$$Y_{ij} = \beta_{0ij} + \sum \beta_k X_{kij} + \epsilon_{ij}.$$

2.2. *Panel Data Estimation Method*

2.2.1. *Common Effect Model*

The most straightforward and naive approach is to disregard the space and time dimensions of the pooled data and estimate the usual OLS regression [7]. Before regressing panel data, the first thing that must be done is to combine two data characters, cross-section data and time series, or called a data pool, to produce a panel data structure. The data is then treated as a unit of observation to estimate the model with the Ordinary Least Square (OLS) method [6].

2.2.2. *Fixed Effect Model*

By assigning a value to each item, the least-square dummy variable (LSDV) model creates heterogeneity between participants. The term fixed effect is used because, despite the fact that the interception is unique for each subject, the interception of each instance does not vary over time, which is known as a time-invariant [8]. The constants in the fixed effect model remain big throughout multiple time periods. The regression coefficient is also constant, indicating that the magnitude does not change over time (time-invariant). A pseudo-variable (dummy) is used to differentiate between two distinct objects [9].

2.2.3. *Random Effect Model*

In the random effect model, it is assumed that the discrepancy between intercepts and constants is due to residual / error due to randomly occurring changes in units and periods. The random effect model is also known as the error correction model on this basis (ECM) [6].

2.3. *Panel Data Regression Model Selection*

To achieve the optimal panel data regression analysis between common, fixed, and random effect models, model selection strategies are employed. Several experiments

can be conducted to determine the optimal model for processing panel data, such as:

2.3.1. *Chow Test*

The Chow test was run to determine whether the common effect or fixed effect model is more appropriate for use in this study [9]. These are the theories tested in this study:

H_0 : The common effect model is the best model,

H_1 : The fixed effect model is the best model.

The following guidelines are utilized when generating conclusions: If the probability value of the Chi-Square Cross-section is greater than the significance value (0.05), H_0 is accepted, and the common effect model is utilized. If the Probability value of the Chi-Square Cross-section is less than the significance value (0.05), then H_0 is disregarded, and a fixed effect model is utilized [9].

2.3.2. *Hausman Test*

The Hausman test is used to determine whether of the random effect model and the fixed effect model is more appropriate. Following are the hypotheses utilized in this test [9].

H_0 : The Random effect model is the best model,

H_1 : The Fixed effect model is the best model.

The Hausman test is represented by the probability values F and Chi-Square, with the following assumptions: If the probability value of chi-square is greater than the significance value (0.05), H_0 is accepted or a random effect model is utilized. If the chi-square probability value is less than the significance level (0.05), then H_0 is discarded or a fixed effect model is utilized [9].

2.3.3. *LM (Lagrange Multiplier) Test*

The Lagrange Multiplier test is used to determine whether of the Common Effect Model (CEM) and Random Effect Model (REM) is superior (REM). Following are the hypotheses tested in this experiment [9].

H_0 : The Random effect model is the best model,

H_1 : The common effect model is the best model.

The LM test can be observed under the following conditions: If the value of the cross-section F is greater than the significance level (0.05), then H_0 is accepted or a random effect model is utilized. If the cross-section value F is less than the significance level (0.05), then H_0 is rejected and the common effect model is applied [9].

2.4. Profitability

The ultimate objective of a business is to achieve maximum profit or profit. The company can do more for the welfare of its owners and employees, increase product quality, and make new investments if it achieves its intended maximum profit. To determine the profit level of a business, utilize the profit ratio or profitability ratio.

A profitability ratio is a ratio used to measure a company's capacity for profit-seeking. This ratio also measures the effectiveness of an enterprise's management. This ratio is demonstrated by the sales and investment money earned. The purpose of using this ratio is to determine the enterprise's efficiency. Profitability ratios can be calculated by comparing the various components of the financial statements, particularly the balance sheet financial statements, and the profit and loss statements. Several operational periods can be evaluated. The objective is to observe the company's growth during a specified period, whether a drop or a rise, and to determine the cause of the change [10]. In order to measure profitability, one of the ratios is employed as a proxy for profitability. Return On Assets is utilized as a proxy for profitability in this study. According to [11], Return on Assets (ROA) is a measure that indicates the return on the number of corporate assets. Following is the formula for calculating the return on assets [10]:

$$\text{Return on Assets} = \frac{\text{Profit before tax}}{\text{Average total assets}}.$$

2.5. Equity (Capital)

A company's equity consists of the deposit capital of agio shares, the retained profits branches, the profit reserves, and other components [10].

2.6. Inflation

Inflation can be interpreted as continuously increasing the price of goods and services over a certain period [12]. Deflation is the opposite of inflation, namely the general and continuous decline in the price of goods. The Consumer Price Index (CPI) is one of the economic indicators used to measure the level of price change (inflation/deflation) at the consumer level. With changes in public consumption patterns, starting in January 2020, inflation measurement in Indonesia uses the CPI for the base year 2018 = 100. Some fundamental changes in the calculation of CPI (2018 = 100) compared to (CPI 2012 = 100), especially in terms of scope, classification of commodity groupings, methodology for calculating CPI, commodity packages, and weighing diagrams. The change is based on the Cost of Living Survey (SBH) conducted by BPS in 2018 as one of the primary basic materials for calculating the CPI [13].

2.7. Current ratio

A current ratio or ratio measure is a ratio that measures a company's ability to pay short-term obligations or debts that are immediately due at the time of collection. In

other words, how many current assets are available to cover short-term, immediately due liabilities? Calculating the current ratio involves comparing a company's total current assets to its total current liabilities. The current ratio can be viewed as a measure of a company's security. Following is the formula for calculating the current ratio [10]:

$$\text{Current ratio} = \frac{\text{Current assets}}{\text{Current Liabilities}}.$$

2.8. Debt to Equity ratio

The ratio determines the relationship between total debt and own capital. This ratio indicates how much of a company's assets are financed by debt [10]. This ratio is used to determine the number of funds the borrower provides to the owner of the Company. In other words, this ratio serves to find out every rupiah's capital that is used for debt guarantees. For banks, the greater this ratio will be, the more unprofitable because, the greater the risk borne for the failures that may occur in the Company. But for the Company, the bigger the ratio, the better. Conversely, with a low ratio, the higher the funding provided by the owner and the greater the security limit of the borrower in case of loss or depreciation to the value of assets. This ratio also provides a general clue about the Company's financial feasibility and risks. The Debt to equity ratio for each Company is undoubtedly different, depending on the characteristics of the business and the diversity of cash flows. Companies with stable cash flow usually have a higher ratio than those with less stable cash. The formula for finding the Debt to equity ratio can be used as a comparison between total debt and total equity as follows [10]:

$$\text{Debt to Equity ratio} = \frac{\text{Debt}}{\text{Equity}}.$$

3. Research Methods

In this study, the independent variables were equity, inflation, Current Ratio (CR), and Debt to Equity Ratio (DER), and the dependent variable was Return on Assets (ROA). Its population consists of stock issuers from the telecommunications subsector, including PT. Telkom Indonesia (Persero) Tbk, PT. Indosat Tbk, PT. XL Axiata Tbk, and PT. The data utilized is secondary data consisting of yearly report information acquired via *www.idnfinancials.com* for the years 2013 – 2021.

4. Discussion

4.1. Data Description

Figure 1 shows that PT. Telkom Indonesia (Persero) Tbk has the highest return on assets (ROA) compared to other stocks. ROA for PT. Smartfren Telecom Tbk shares is the lowest of all stocks. In Table 1, the highest return on assets is 16.48 percent and the lowest is -17.07 percent. The average return on assets for these four stock issuers is 1.45 percent.

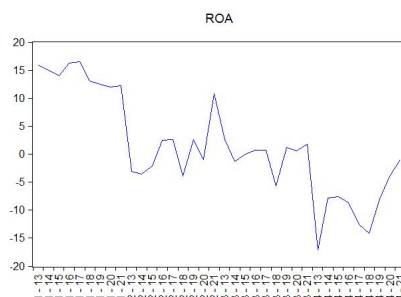


Figure 1. Return On Assets

Figure 2 demonstrates that PT Telkom Indonesia (Persero) Tbk has the largest equity when compared to other equities. Meanwhile, the company with the least equity is PT. Pt. Smartfren Telecom Tbk. Equity has a minimum value of 3,049,945 million rupiahs and a maximum value of 145,000,000 million rupiahs, according to Table 1. The average equity of these four stock issuers is 37,241,513 million rupiahs based on this value.

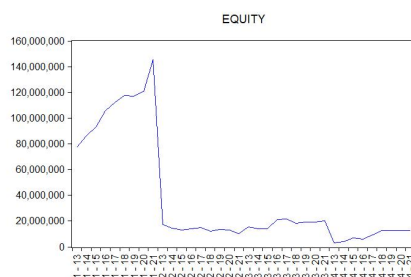


Figure 2. Equity

Table 1 and Figure 3 show that inflation can be as low as 1.70 percent and as high as 8.40 percent. The average of all of these numbers is 4,19 percent.

Figure 4 indicates that PT. Telkom Indonesia (Persero) Tbk has the greatest CR shares in comparison to other companies. Meanwhile, PT. Smartfren Telecom Tbk's CR shares are the lowest. According to Table 1, CR's minimum value is 24.18 percent and its maximum value is 135.29. The average CR of these four stock issuers is 58.82 percent of this value.

Figure 5 indicates that PT. Telkom Indonesia (Persero) Tbk's DER shares are the lowest in comparison to other equities. DER has a minimum value of 64.92 percent and a maximum value of 515.34, as shown in Table 1. The average DER for these four stock issuers is 217.06 percent of this total value.

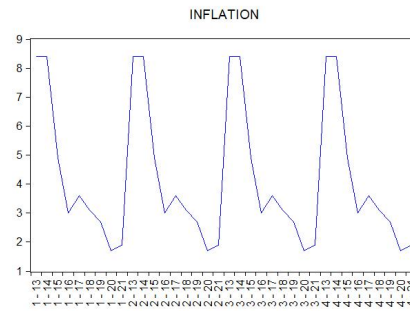


Figure 3. Inflation

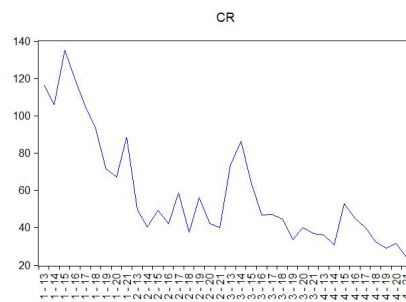


Figure 4. Current Ratio

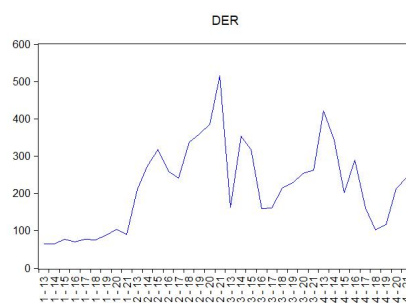


Figure 5. Debt to Equity Ratio

4.2. Multicollinearity Testing

This test is designed to determine whether or not there is a strong correlation between independent variables. Multicollinearity exists when an independent variable has a correlation value greater than 0.80.

Table 2 shows that the correlation between independent variables is less than

Table 1. Descriptive Statistics

	ROA	Equity	Inflation	CR	DER
Mean	1.45	37,241,513	4.19	58.82	217.06
Median	0.61	14,557,045	3.10	47.09	213.46
Maximum	16.48	145,000,000	8.40	135.29	515.34
Minimum	-17.07	3,049,945	1.70	24.18	64.92
Std. Dev.	9.10	43,002,259	2.45	29.16	115.95

Table 2. Correlation Coefficients

	ROA	Ln Equity	Inflation	CR	DER
ROA	1.00	0.88	-0.11	0.78	-0.46
Ln Equity	0.88	1.00	-0.16	0.77	-0.74
Inflation	-0.11	-0.16	1.00	0.26	0.04
CR	0.78	0.77	0.26	1.00	-0.56
DER	-0.46	-0.74	0.04	-0.56	1.00

Table 3. Lagrange Multiplier test results

	Statistic	Prob.
Breusch-Pagan Cross-section	1.752250	(0.1856)

0.8. This means that there are no cases of multicollinearity in this study.

4.3. Selection of the Best Model

In the analysis of panel data regression, three models were analyzed: the common effect model (CEM), the fixed effect model (FEM), and the random effect model (REM). On the basis of the Hausman test, the Chow test, and the Lagrange Multiplier test, the second-best model was selected. This study did not employ the Hausman test since the number of independent variables was equal to the amount of cross-sectional data collected, rendering this test inapplicable.

In Table 3, the Lagrange Multiplier test yields a probability cross-section value of 0.1856 > 0.05, indicating that the CEM model is superior to the REM model.

Table 4's Chow test yielded a Chi-square Cross-section probability of 0.7609 > 0.05, indicating that the CEM model is superior to the FEM model. Based on the outcomes of these two experiments, it can be stated that the CEM model is best suited for panel data modeling.

4.4. Testing Classical Assumptions

Using the least-squares approach, the CEM model estimation must pass the classical assumption test, which consists of a normality test (jarque bera test), a heteroskedasticity test (glejser test), and an autocorrelation test (Durbin Watson

Table 4. Chow Test Results

Effects Test	Statistic	df	Prob.
Cross-section Chi-square	1.166962	3	0.7609

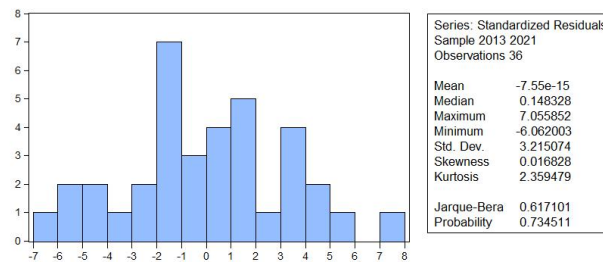


Figure 6. Normality Test

Table 5. Heteroskedasticity Testing Results

Variable	Coef	SE	t	Prob.
C	2.651733	11.44863	0.231620	0.8184
Ln Equity	-0.120805	0.678035	-0.178169	0.8597
Inflation	0.186063	0.156353	1.190019	0.2431
CR	0.004681	0.020306	0.230546	0.8192
DER	0.004405	0.003862	1.140630	0.2628

test). Figure 6's normality test with the fallow jarque method returns probability = 0.7345 > 0.05, indicating that the residual has a normal distribution.

The heteroskedasticity test in Table 5 returns probabilities greater than 0.05 for all independent factors, indicating that none of the independent variables influences the absolute residual price. These results indicate that the test for heteroskedasticity is satisfied.

Table 6's autocorrelation test revealed a Watson Durbin statistic of 1.9092. The dU and $4-dU$ for $n = 36$ and $k = 4$ are $dU = 1.724$ and $4-dU = 2.276$, respectively. Since Watson's d-value of 1.9092 falls between $1.724(dU)$ and $2.276(4-dU)$, this model does not exist in instances of autocorrelation.

Table 6. Autocorrelation Test Results

Dw	dU	4-dU
1.909188	1.724	2.276

Table 7. Results of Estimation of Parameters of the CEM model

Variable	Coef	SE	t	Prob.
C	-154.0456	22.44967	-6.861821	0.0000
Ln Equity	8.537627	1.329561	6.421386	0.0000
Inflation	-0.144000	0.306592	-0.469680	0.6419
CR	0.084778	0.039818	2.129143	0.0413
DER	0.032597	0.007572	4.304829	0.0002
R-squared	0.875169	F-statistic		54.33388
Adjusted R-squared	0.859062	Prob(F-statistic)		0.00000

4.5. Model Significance Testing

A simultaneous test was conducted to investigate the simultaneous impact of the variables ln equity, inflation, CR, and DER on ROA. The probability value of the statistical F in Table 7 is $0.000 < 0.05$, which shows that Ln Equity, inflation, CR, and DER all influence ROA simultaneously.

The partial test is designed to determine in part the influence of the variables ln equity, inflation, CR, and DER on ROA. The following are the outcomes of the examination:

- (1) A probability value for ln equity smaller than 0.05 implies that Ln equity affects ROA.
- (2) A probability Value for inflation greater than 0.05 suggests that inflation has no impact on ROA.
- (3) A probability value for CR less than 0.05 implies that CR influences ROA.
- (4) A probability value for DER less than 0.05 implies that DER has an effect on ROA.

Based on Table 7 and the *t*-test results, the panel data regression equation can be expressed as follows:

$$ROA_{it} = -154.046 + 8.538 \ln \text{Equity}_{it} - 0.1444 \text{Inflation}_{it} + 0.085 \text{CR}_{it} + 0.033 \text{DER}_{it} + \epsilon_{it}.$$

Constant has a value of -154.046 . Due to the negative value, this value cannot be deciphered.

The significance of the regression coefficient value of 8.538 for the ln equity variable might indicate that the equity variable positively affects the ROA variable. This indicates that if equity increases, so will ROA. In addition, the ROA will rise by 8.538 percent if ln equity increases by 1 unit.

The significance of the regression coefficient value of -0.1444 for the inflation variable indicates that the inflation variable negatively influences the ROA variable, but this influence is not statistically significant.

The significance of the regression coefficient value of 0.085 for the CR variable indicates that the CR variable positively affects the ROA variable. Therefore, if CR increases, ROA will also increase. Moreover, ROA will increase by 0.085 percent if CR grows by 1 percent.

The significance of the regression coefficient value of 0.033 for the DER variable indicates that the DER variable positively affects the ROA variable. This indicates that if the DER increases, so will the ROA. Moreover, if DER grows by 1 percent, ROA will increase by 0.033 percent.

The R square value in Table 7 of 0.8752 indicates that the ln equity, inflation, CR, and DER can explain the variability/variation of the ROA of 87.52 percent and other variables outside the model influence the remaining 12.48 percent.

5. Conclusion

The regression model on the panel best suited for modeling the profitability of shares of the telecom sub-sector is the CEM model. The same is the regression of the panel data was obtained. Simultaneously, all independent variables affect ROA. Meanwhile, only the inflation variable does not affect the ROA. The R square value obtained of 0.8752 means that the ln equity, inflation, CR, and DER can explain the variability/variation of the ROA of 87.52 percent, and other variables outside the model influence the remaining 12.48 percent.

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