

ANALYSIS OF INDONESIA ECONOMIC GROWTH BASED ON INVESTMENT VALUE AND HUMAN DEVELOPMENT INDEX USING AN ECONOMETRIC APPROACH

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Abstract: The study aims to determine the effect of the Human Development Index (HDI) variable and investment variables which include Domestic Investment and Foreign Investment on the Gross Regional Domestic Product (GRDP) of 34 provinces in Indonesia in 2015-2019. The method used in this research is panel regression analysis. The results of the study indicate that the best panel data regression model for modeling GRDP is the Random Effect Model (REM). Based on the model formed, it is known that the variables HDI, Domestic Investment, and Foreign Investment have a significant positive effect on GRDP. These results are consistent with the theory and hypothesis that the higher the value of the HDI, Domestic Investment, and Foreign Investment, the higher the value of the GRDP variable. The coefficient of determination shows a moderate value of 58.9%, so it is suspected that there are other variables that can affect GRDP. Based on the regression model formed, if all independent variables have the same value for all provinces, then the province with the highest GRDP value is Jakarta.

1. INTRODUCTION

The condition of economic growth becomes the main discussion in a region. It relates to the existence of the value of economic growth as one of the determinants of the welfare of a country or region. In general, economic growth is a change of a country's economic conditions towards a better condition over a certain period [1]. Economic growth can also refer as one aspect of calculating the success of country economic. One indicator that can be used to measure economic growth at the state level is the Gross Domestic Product (GDP). Meanwhile, the decrease in GDP that can be used to measure the economic growth of a region on a regional scale is the Gross Regional Domestic Product (GRDP).

According to the Statistics Indonesia [1], GRDP is the total added value of goods and services produced by various production units in the territory of a country in a certain period (usually one year). GRDP has the same role as GDP. If GDP acts as an indicator of economic success in a country, then GRDP acts as an indicator of economic success in a region (provinces and districts/cities). In general, GRDP consists of two types, namely GRDP at Current Prices and GRDP at Constant Prices. GRDP at current prices illustrates the added value of goods and services calculated using prices in the current year. Then, GRDP at constant prices shows the added value of these goods and services calculated using prices prevailing in a particular year as the base year [2]. GRDP at current prices and constant prices has different roles and

functions. In general, GRDP at current prices contributes to knowing the ability of economic resources, shifts, and the economic structure of a region. Meanwhile, GRDP at constant prices is used to determine real economic growth from year to year, or economic growth that is not influenced by price factors. So, the analysis of the economic growth in the region can be carried out using GRDP at constant prices.

In its development, the GRDP condition, especially in Indonesia, is also influenced by several other variables that are very related. In general, the calculation of GRDP values conceptually uses three kinds of approaches, namely the production approach, the expenditure approach, and the income approach. The calculation of GRDP using the production approach has the concept that GRDP is the added value of goods and services produced by various production units in the territory of a country in a certain period (usually one year). The calculation of GRDP using the expenditure approach is a calculation of economic value based on regional spending, including household and local government consumption expenditures, as well as imports and exports of goods and services. Meanwhile, the calculation of GRDP using the income approach is the amount of remuneration received by production factors that participate in the production process in a country within a certain period (usually one year) [2]. Conceptually, these three approaches will produce the same figure between the amount of expenditure and the number of final goods and services produced, and must also be the same as the amount of income (remuneration) for the factors of production [3].

The calculation of GRDP with these three approaches has encouraged several researchers to conduct studies related to modeling economic growth, both GDP and GRDP. In modeling GRDP, researchers try to analyze GRDP by associating its influence with other variables. Previous studies, for example, regarding the influence of investment, labor, inflation, and exports on economic growth in 33 regencies/cities in East Java Province [4]. The results of this study indicate that the variables of investment, labor, inflation, and exports can significantly influence economic growth in the agricultural and industrial sectors. In addition, Indasari [5] also conducted research on the economic growth of districts/cities in Central Java, using the panel data regression method. The results indicate that capital expenditure, labor force, and education variables can significantly influence economic growth. Other research was conducted by Setyorini [6] on modeling the economic growth of provinces on the islands of Sumatra, Java, and Kalimantan. By using dynamic panel data regression analysis, it can be concluded that government spending and exports have a significant effect on GRDP.

Furthermore, this research will model the economic growth of 34 provinces in Indonesia which are thought to be influenced by investment variables, namely Foreign Investment and Domestic Investment, and the Human Development Index (HDI) variable. Investment as a factor of production is a very important factor in increasing regional GRDP [6]. Investment is a source of financing that is urgently needed to support regional development, bearing in mind that regions in Indonesia still need capital and financial support to develop their territories. Meanwhile, HDI is an important indicator for measuring success in efforts to build the quality of human life (community/population) [1]. HDI can also be defined as a measure to see the impact of regional development performance, which has a wide dimension because it shows the quality of the population of a region in terms of life expectancy, education, and decent living standards [6]. Therefore, the high or low HDI also has an impact on the pros and cons of economic conditions in a region that comes from the support of the quality of human resources in that region.

This study uses an econometric approach using a panel regression model. The use of the panel data regression model is based on the research data structure, namely panel data. The

data used is a combination of cross-sectional data consisting of 34 provinces and time series data consisting of annual data series from 2015 to 2019. Thus, the purpose of this study is to determine the effect of variables investment and HDI on GRDP. It can also find out the GRDP condition of each province based on investment and HDI variables through panel regression modeling of each province. Therefore, this research is expected to provide a scientific contribution to economics, mathematics, and statistics or econometrics. Thus, it can provide insights for local governments regarding economic development within their territory.

2. LITERATURE REVIEW

4.2 Panel Regression Model

The analytical method used in this study is panel data regression analysis. The use of the panel data regression model starts from the data used, namely panel data which is a combination of cross-sectional data and time series [7]. The use of panel data regression has several advantages, including increasing the sample size very much, being able to study cross-sectional observations, time series, or a combination of the two types of data, and panel data is more suitable for studying the dynamics of change and studying the behavior of more complex models [8].

The general form of the panel data regression model as follows.

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \dots + \beta_k X_{kit} + \varepsilon_{it} \quad (1)$$

where:

Y = dependent variable

X = independent variable

β = regression coefficient

ε = residual model

i = province index, where $i = 1, 2, 3, \dots, n$

t = time index, where $t = 1, 2, 3, \dots, T$

There are several types of panel data regression models, namely the Common Effect Model (CEM), Fixed Effect Model (FEM), and Random Effect Model (REM). CEM is an approach to estimating simple panel data, where all data is combined without regard to individuals and time [8]. The CEM model equation as follows.

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \dots + \beta_k X_{kit} + \varepsilon_{it} \quad (2)$$

FEM is a panel data regression with the assumption that the constant values of unit cross-sections or time series are different but with fixed coefficient values [8]. The general form of the FEM model is as follows.

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \dots + \beta_k X_{kit} + \beta_{k+1} D_{1i} + \dots + \beta_l D_{li} + \varepsilon_{it} \quad (3)$$

where D is a dummy variable for each cross-section and time series observation. The FEM model approach for panel data can cause problems with the loss of degrees of freedom from the model. Moreover, the dummy variable can prevent knowing the original model. Thus, estimation needs to be done using the error component or random effects model using the REM model. The REM model equation as follows.

$$Y_{it} = (\beta_0 + u_i) + \beta_1 X_{1it} + \dots + \beta_k X_{kit} + \varepsilon_{it} \quad (4)$$

where u_i is the error component of the cross-sectional data [9].

4.3 Best Model Selection

Selection of the best model is carried out using three tests, namely the Lagrange Multiplier (LM) Test, Chow Test, and Hausman Test [7].

1. LM test

The LM test is used to determine the best model between the CEM model and the REM model. The hypothesis used in the LM test is as follows.

H_0 : CEM model is better than REM model

H_1 : REM model is better than CEM model

In this test, the decision used is to reject H_0 if the probability value of Breusch-Pagan has a value of less than 0.05.

2. Chow test

The Chow test is used to determine the best model between the CEM model and the FEM model. The hypothesis used in the Chow test is as follows.

H_0 : CEM model is better than FEM model

H_1 : FEM model is better than CEM model

In this test, the decision used is to reject H_0 if the probability value of the Cross-section Chi-square has a value of less than 0.05.

3. Hausman test

The Hausman test is used to determine the best model between the REM model and the FEM model. The hypothesis used in the Hausman test is as follows.

H_0 : REM model is better than FEM model

H_1 : FEM model is better than REM model

In this test, the decision used is to reject H_0 if the probability value of a random cross-section has a value of less than 0.05.

4.4 Parameter Significant Test

Simultaneous hypothesis testing is used to determine whether the independent variable influences economic growth (GRDP) simultaneously. The simultaneous test hypothesis is as follows [10, 11].

$H_0 : \beta_1 = \dots = \beta_k = 0$ (There are no independent variables that affect the dependent variable)

$H_0 : \text{at least one of } \beta_i \neq 0, i = 1, 2, \dots, k$ (There is at least one independent variable that affects the dependent variable)

The decision used to draw conclusions is to reject H_0 if the probability value of the F-statistics is less than 0.05. While the partial hypothesis test is used to determine which independent variables have a significant effect on economic growth (GRDP). The hypothesis used is

$$H_0 : \beta_i = 0, i = 1, 2, \dots, k$$

$$H_1 : \beta_i \neq 0, i = 1, 2, \dots, k$$

the decision used to draw conclusions is to reject H_0 if the probability value of the t-statistics is less than 0.05. In addition, to find out the goodness of the panel data regression model formed by the data, an analysis of the coefficient of determination (R^2) is carried out.

3. METHODOLOGY

The data used in this study is secondary data obtained from the Statistics Indonesia (BPS). This data consists of 34 provinces in Indonesia with annual data series from 2015 to 2019. The variables used in this study are given in Table 1 below.

Table 1. Research Variables

Variable	Symbol	Information	Data unit
Dependent	Y	Gross Regional Domestic Product (GRDP)	Million USD
Independent	X_1	Foreign Investment	Million USD
	X_2	Domestic Investment	Million USD
	X_3	Human Development Index (HDI)	Percentage

Source: Statistics Indonesia, 2022 [1]

The specifications of the panel data regression model in this study are as follows.

$$Y_{it} = \beta_{0it} + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \varepsilon_{it} \quad (5)$$

with the expected parameters sign are $\beta_1, \beta_2, \beta_3 > 0$, with the explanation that:

1. There is a positive influence of the Foreign Investment variable on GRDP
2. There is a positive influence of the Domestic Investment variable on GRDP
3. There is a positive influence of the HDI variable on GRDP

4. RESULTS AND DISCUSSION

4.1 Multicollinearity Test

The multicollinearity test is used to determine the relationship between independent variables, namely foreign investment, domestic investment, and HDI variables. The correlation analysis used is Pearson's correlation with the results in Table 2 below.

Table 2. Correlation Values

Independent variables		Correlation value
Foreign investment	Domestic investment	0.733
	HDI	0.279
Domestic investment	HDI	0.379

Based on Table 2, it can be seen that the relationship between the independent variables shows a value of less than 0.8 (for all independent variables). It indicates that the assumption of no multicollinearity between independent variables has been fulfilled. The foreign investment and domestic investment variables tend to have a fairly high correlation because the two variables are still in the same field cluster, namely investment.

4.2 Best Model Testing

From the multicollinearity test, all independent variables are free from multicollinearity, then all variables will be included in the panel data regression modeling. Selection of the best model in the case of modeling economic growth is done by testing the best model using the LM, Chow, and Hausman test.

1. LM test

The LM test is used to determine the best model between the CEM model and the REM model. In this test, the decision used is to reject H_0 if the probability value of Breusch-Pagan is less than 0.05. The results of the LM test are given in Table 3.

Table 3. The Result of LM Test

Statistics Test	Probability
Breusch-Pagan	0,000

Based on the probability value of Breusch-Pagan, it produces a value of 0.000. Thus, the decision can be taken to reject H_0 with the conclusion that the REM model is better than the CEM model.

2. Chow test

The Chow test is used to determine the best model between the CEM model and the FEM model. In this test, the decision used is to reject H_0 if the probability value of the Cross-section Chi-square has a value of less than 0.05. The Chow test results are given in Table 4 as follows.

Table 4. The Result of Chow Test

Statistics Test	Probability
Cross section-chi square	0,000

Based on the probability value of the Cross-section Chi-square it produces a value of 0.000, which indicates a value of less than 0.05. Thus, the decision can be taken to reject H_0 with the conclusion that the FEM model is better than the CEM model.

3. Hausman test

The Hausman test is used to determine the best model between the REM model and the FEM model. In this test, the decision used is to reject H_0 if the probability value of a random cross-section has a value of less than 0.05. The results of the Hausman test are given in Table 5 below.

Table 5. The Result of Hausman Test

Statistics Test	Probability
<i>Cross-section random</i>	0,334

Based on the probability value of the random cross-section, it produces a value of 0.334, which indicates a value of more than 0.05. Thus, the decision failed to reject H_0 with the conclusion that the REM model is better than the FEM model.

A summary of the three best model tests is given in Table 6 below.

Table 6. Selection the Best Model

Test type	Result
LM test	The REM model is better than the CEM model
Chow test	The FEM model is better than the CEM model
Hausman test	The REM model is better than the FEM model

Based on Table 6, it can be concluded that the best model for modeling economic growth in Indonesia is panel data regression using the REM model.

4.3 Parameter Significance

In this section, parameter significance testing is carried out through simultaneous tests (F test) and partial tests (t-test) of the REM model.

1. Simultaneous Hypothesis Test (F-test).

Simultaneous hypothesis testing is used to determine whether the independent variable influences simultaneously/simultaneously on economic growth (GRDP). The hypothesis used is:

$H_0 : \beta_1 = \beta_2 = \beta_3 = 0$ (There are no independent variables that affect the dependent variable)

$H_0 : \text{at least one of } \beta_i \neq 0, i = 1, 2, 3$ (There is at least one independent variable that affects the dependent variable)

Simultaneous test results can be seen from the probability value of F-statistics with the following results.

Table 7. Simultaneous Results

<i>F-statistics</i>	<i>Probability</i>
78,785	0,000

The decision that can be taken based on simultaneous testing is to reject H_0 because the probability value (F-statistics) shows less than 0.05. Therefore, the simultaneous test concludes that there is at least one independent variable that affects the dependent variable. Furthermore, to find out which independent variables have a significant effect on GRDP, further testing can be carried out with the partial test (t-test).

2. Partial Hypothesis Test (t-test)

Partial hypothesis testing is used to determine which independent variables have a significant effect on economic growth (GRDP). Partial test results are given as follows.

Table 8. Partial Results

Variable	Coefficient	T-Statistics	Probability
Domestics investment	0,280	8,262	0,000
Foreign investment	1,030	2,288	0,023
HDI	1513,253	8,214	0,000

a. The effect of the domestic investment variable on GRDP

Hypothesis:

$H_0 : \beta_1 = 0$

$H_1 : \beta_1 \neq 0$

Based on the test results, it can be seen that the test decision is to reject H0 because the probability value for the domestic investment variable shows a value of less than 0.05. The result showed that the domestic investment variable has a significant positive effect on GRDP. It is following the expected model and hypothesis that the domestic investment variable has a positive effect on GRDP. These results are consistent with the research of Sodik and Didi [12] with the result that domestic investment affects regional economic growth or GRDP. According to Jonaidi [13], if the investment value increases, then economic growth will also increase. Increased domestic investment will have an impact on sources of funds originating from within the country and affect economic growth.

b. The effect of foreign investment variables on GRDP

Hypothesis:

$$H_0 : \beta_2 = 0$$

$$H_1 : \beta_2 \neq 0$$

Based on the test results, it can be seen that the test decision is to reject H0 because the probability value for the foreign investment variable shows a value of less than 0.05. The foreign investment variable has a significant positive effect on GRDP. It refers to the expected model and hypothesis that the foreign investment variable has a positive effect on GRDP. This is supported by the high level of public consumption which tends to favor foreign goods, thus causing an increase in foreign investment which in turn affects the increase in GRDP derived from the profits of the foreign investment. The results are in line with the previous research by Laksmi [14]. There is a significant and positive relationship between foreign investment and GRDP because if foreign investment increases, it will increase the number of products and services and indirectly increase economic growth.

c. The effect of the HDI variable on GRDP

Hypothesis:

$$H_0 : \beta_3 = 0$$

$$H_1 : \beta_3 \neq 0$$

Based on the test results, it can be seen that the test decision is to reject H0 because the probability value for the HDI variable shows a value of less than 0.05. The HDI variable has a significant positive effect on GRDP. It is in line with the theory that the higher the HDI, the economy of a region will also increase. For increase the HDI of a province, it is necessary to develop human resources through education and training so that they have high competitiveness and can manage factors of production well so that later they can encourage the economic development of a region through increasing GRDP [15].

4.4 Goodness of Fit

The goodness of fit of the regression model can be seen from the value of the coefficient of determination (R^2) with the following results.

Table 9. Goodness of Fit

Criteria	Value
R^2	0.589

Based on Table 9, it is showed that the coefficient of determination (R^2) is 0.589. It indicates that the foreign investment, domestic investment, and HDI variables are able to explain the GRDP variable by 58.9%. While, 41.1% is explained by other variables outside the model used. The R^2 value shows a moderate value, meaning that there are still variables that are suspected of influencing GRDP which can explain the goodness of the regression model with a higher value.

4.5 Interpretation of Regression Model

The panel data regression model with the best REM model will form two regression models, namely the general and the specific model for each province. The general model equation for panel data regression with the model of the GRDP variable is

$$y_{it} = 0,00224 + 0,280x_{1it} + 1,030x_{2it} + 1513,253x_{3it} + \varepsilon_{it}$$

or

$$GRDP_{it} = 0,00224 + 0,280\text{domestic investment}_{it} + 1,030\text{foreign investment}_{it} + 1513,253HDI_{it} + \varepsilon_{it}$$

From the general regression model, it can be seen the following interpretation.

1. Foreign investment, domestic investment, and HDI variables show a significant positive effect on GRDP
2. Every increase in the foreign investment variable by 1 unit will increase the GRDP variable by 0.280 units for all periods and all provinces
3. Every increase in the domestic investment variable by 1 unit will increase the GRDP variable by 1,030 units for all periods and all provinces
4. Every increase in the HDI variable by 1 unit will increase the GRDP variable by 1513.253 units for all periods and all provinces

After compiling the general regression model equation, the next step is the regression model for each province.

$$GRDP_{ACEH,t} = -16039,14 + 0,280\text{domestic investment}_{ACEH,t} + 1,030\text{foreign investment}_{ACEH,t} + 1513,253HDI_{ACEH,t} + \varepsilon_{ACEH,t}$$

⋮

$$GRDP_{PAPUA,t} = -21144,03 + 0,280\text{domestic investment}_{PAPUA,t} + 1,030\text{foreign investment}_{PAPUA,t} + 1513,253HDI_{PAPUA,t} + \varepsilon_{PAPUA,t}$$

When viewed from the constant value, if all independent variables have the same value for all regions, then the province that has the highest GRDP value is Jakarta. This is consistent with the existence of Jakarta's GRDP, which always has the highest value compared to the GRDP of other provinces.

5. CONCLUSION

Modeling of economic growth in Indonesia can be seen from the GRDP (Gross Regional Domestic Product) value of each province. GRDP growth is influenced by several variables, which in this study are thought to be influenced by foreign investment, domestic investment, and Human Development Index (HDI). The data used is annual data from 2015 to 2019 in 34 provinces in Indonesia. In the multicollinearity test it can be seen that all independent variables do not have a high correlation value, so the assumption of no multicollinearity has been fulfilled. The results of modeling with panel regression showed that

the best model to determine the effect of foreign investment, domestic investment, and HDI variables on GRDP is to use the Random Effect Model (REM). The results of the parameter significance test showed that the foreign investment, domestic investment, and HDI variables have a significant positive effect on GRDP. These results are consistent with the theory and hypothesis if the value of the foreign investment, domestic investment, and HDI variables is increased, then the value of the GRDP variable is increased. The coefficient of determination shows a moderate value of 58.9%, so it is suspected that other variables can affect GRDP which can explain the goodness of the higher model. Based on the regression model formed, if all independent variables have the same value for all regions, then the region with the highest GRDP value is Jakarta.

REFERENCES

- [1] Statistics Indonesia, 2022, Available: www.bps.go.id.
- [2] Z. Arifin, "Memahami PDRB sebagai Instrumen untuk Mengukur Pertumbuhan Ekonomi di Daerah". Bappeda.jambiprov.go.id, 2009, Available: https://bappeda.jambiprov.go.id/welcome/Dokumen_artikel_bappeda.
- [3] Statistics Indonesia – Yogyakarta, Analisis Produk Domestik Regional Bruto Kota Yogyakarta menurut Penggunaan, 2012-2016, Yogyakarta: Badan Pusat Statistik Kota Yogyakarta, 2017.
- [4] F. A. Prasetyo, Analisis Faktor-faktor yang mempengaruhi Pertumbuhan Ekonomi di Jawa Timur. Jurusan Ekonomi, Surabaya: UPN Veteran, 2010.
- [5] V. Indasari, Analisis Faktor-faktor yang Mempengaruhi Pertumbuhan Ekonomi Provinsi Jawa Tengah, Semarang: Universitas Diponegoro, 2011.
- [6] M. W. Setyorini, Pemodelan Pertumbuhan Ekonomi di Indonesia menggunakan Regresi Panel Dinamis, Surabaya: ITS Surabaya, 2017.
- [7] D. Rosadi, Ekonometrika dan Analisis Runtun Waktu Terapan dengan Eviews, Yogyakarta: Andi Offset, 2012.
- [8] D. N. Gujarati dan D. C. Porter, Basic Econometrics, New York: McGraw-Hill Education, 2004.
- [9] C. Hsiao, Analysis of Panel Data (2nd ed.), New York: Cambridge University Press, 2003.
- [10] R. E. Walpole, Pengantar Statistika, edisi ke-3, Jakarta: Gramedia Pustaka Utama, 1995.
- [11] Setiawan dan D. E. Kusri, Ekonometrika, Yogyakarta: ANDI, 2010.
- [12] J. Sodik, dan D. Nuryadin, Investasi dan Pertumbuhan Ekonomi Regional (Studi kasus pada 26 Propinsi Di Indonesia, Pra dan Pasca Otonomi), Semarang: Universitas Semarang, 2005
- [13] A. Jonaidi, Analisis Pertumbuhan Ekonomi dan Kemiskinan Di Indonesia. Jurnal Kajian Ekonomi, vol 1(1), pp. 140-164, 2012.
- [14] S. D. Laksmi, Pengaruh PAD, PMA, Dan Inflasi Terhadap Pertumbuhan Ekonomi Provinsi Bali, E-Jurnal EP Unud, vol 2(11), pp. 502-512, 2013.
- [15] A. Mulyasari, Pengaruh Indeks Pembangunan Manusia dan Angkatan Kerja terhadap Produk Domestik Regional Bruto, Economics Development Analysis Journal, vol 5(4), 2016.