www.bircu-journal.com/index.php/birci
Budapest International Research and Critics Institute-Journal (BIRCI-Journal)
Humanities and Social Sciences
ISSN 2615-3076 Online)
ISSN 2615-1715 (Print)
Budapest Institute

Comparison of the Realization of Investment Flows and Disaster Risks on the Economy of Sumatra and Java Islands in Indonesia

Febrianto Wibowo[1], Marselina Djayasinga[2], Neli Aida[3]
[1,2,3]*Master of Economics, Universitas of Lampung, Indonesia*
Wibowo.mie1001@gmail.com

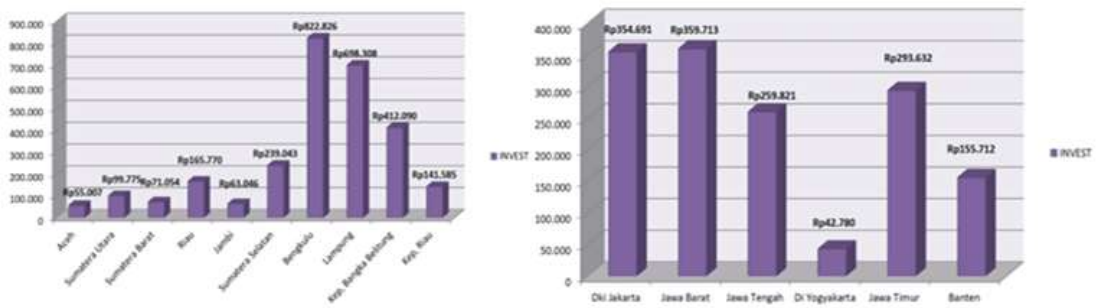
Abstract

Investment is still included in the important macroeconomic model of the region in helping to smoothen the movement of the economy, while the disaster risk side plays a role in seeing how it impacts the economic rate of a region. This study focuses on looking at the comparison of investment conditions and disaster risk on 2 major islands in Indonesia, namely the islands of Sumatra and Java on economic growth. Secondary data is used in the form of panel data, using multiple linear regression analysis tools. The area used includes 10 provinces on the island of Sumatra and 6 provinces on the island of Java in the 2015-2020 time series. The results of the study explain that the model on the islands of Sumatra and Java has a significant positive effect and the disaster risk index has a significant negative effect on economic growth. Investments in the islands of Sumatra and Java are very helpful in spurring the economy of each province, while disaster risk is a negative threat to the economy of the two islands.

Keywords
investment; disaster risk; economy

I. Introduction

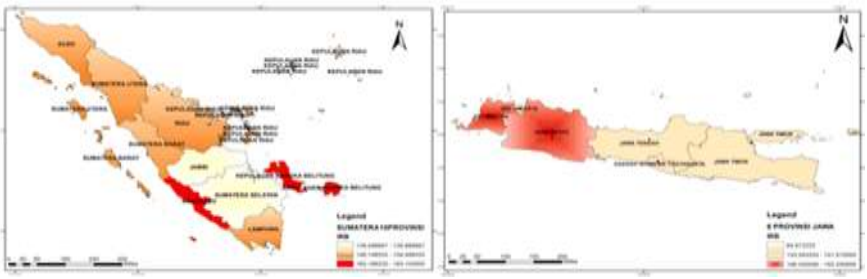
Investment activities generate investments that will continue to increase the capital stock. Furthermore, the increase in capital stock will increase productivity as well as production capacity and quality, which in turn can encourage economic growth and increase employment. In Indonesia, investment is an important part of the model that must be realized and continuously improved, because investment economic models have succeeded in providing a positive and sustainable impact for every country. The following is an overview of the average total investment of PMA and PMDN in 10 Sumatra Provinces and 6 provinces on the island of Java:



Source: Investment Coordinating Board, Sumatra and Java 2015-2020

Figure 1. *Average FDI and PMDN Investment of Provinces in Sumatra and Java Island 2015-2020*

Development is a systematic and continuous effort made to realize something that is aspired (Shah, M. et al. 2020). Economic development has several obstacles, both external and internal, at this time starting to consider the urgency of the impact of a disaster on an economy, which is allegedly having a negative impact on the economy on a large scale. Macroeconomic impacts are secondary impacts of disasters. Disasters always have a negative impact on short-term macroeconomic observations related to declining production. In developing countries, the decline in output is greater after a disaster is much greater than in developed countries (Noy, 2007). Indonesia has a level of regional vulnerability in the face of disasters. Classification of this index with points, high risk class is indicated by an IRB value of more than 141 points, moderate risk class is indicated by an IRB value between 51-140 points and low risk class is indicated by an IRB value of less than 50 points. In this case, the presentation of 10 Provinces in Sumatra and 6 Provinces in Java is a comparison of the average disaster risk index map image for 2015-2020:

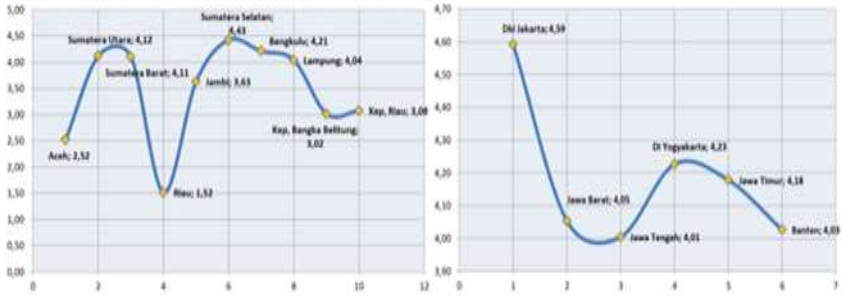


Source: BNPB, Arcgismap, processed 2022.

Figure 2. *Average Provincial Disaster Risk Index in Sumatra and Java Islands, Indonesia, 2015-2020*

The map shows the level of disaster risk index between the islands of Sumatra and Java, on the island of Sumatra 2 Provinces namely Bengkulu and Bangka Belitung Islands with an index number of 162,196-163,1250 enter the highest risk, followed by 5 Regions namely Aceh, North Sumatra, Riau Islands, West Sumatra and Riau with index numbers 146,148-154,489. At the moderate risk level, there are only 2 provinces, namely Jambi and South Sumatra with an index number of 139,598-139,888. The overall accumulation of disaster risk on the island of Sumatra does not contain areas in a low risk state. On the island of Java, 2 provinces, namely Banten and West Java, are at high risk with an index number of 146.420-155330, followed by Central Java, East Java and DI Yogyakarta with an index number of 133,342-141,5100 and followed by the region, namely DKI Jakarta with an index number of 64,9133. The island of Sumatra is a new land for the economy that will drive various economic activities while Java is the center of the Indonesian economy, these two islands are classified as very productive in terms of economic formation, but these two islands are also included in areas that are vulnerable to natural disasters that will disrupt economic stability.

Natural disasters are a matter of concern and, answer questions related to their impact on human well-being and economic growth. Economic growth is still the main variable in the study, because it looks at the influence of several variables on the macro economy, the following is a picture of economic growth between the islands of Sumatra and Java:



Source: Central Bureau of Statistics, Sumatra and Java 2015-2020.

Figure 3. *Average Provincial Economic Growth in Indonesia's Sumatra and Java Islands, 2015-2020*

Economic growth is still an important goal in a country's economy, especially for developing countries like Indonesia (Magdalena and Suhatman, 2020). Economic growth on the island of Sumatra shows that South Sumatra has the highest value of 4.43%, followed by Bengkulu at 4.21% and North Sumatra at 4.12%. The lowest growth side in Sumatra is Riau Province at 1.52% and Aceh at 2.52%. On the island of Java, DKI Jakarta has the highest growth rate of 4.59%, followed by DI Yogyakarta at 4.23% and East Java at 4.18%. The lowest growth side was in the Banten region at 4.03% and Central Java at 4.01%.

The important urgency in this study is to compare the direct impact between the two large islands that are productive and vulnerable to disasters in Indonesia, namely Sumatra and Java. In the hypothesis, the presumption forms a comparison between the two islands with an outline of how the influence of investment and the disaster risk index on economic growth on the islands of Sumatra and Java.

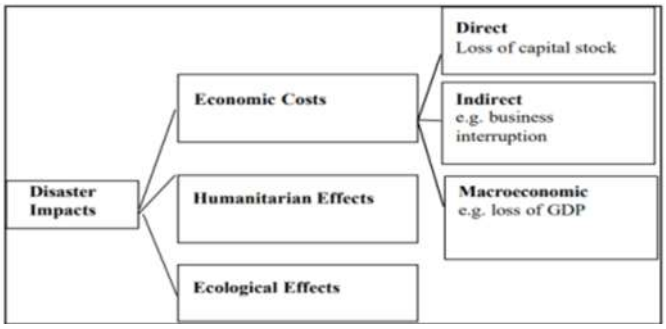
II. Review of Literature

Tambunan (2001), in increasing economic growth required an additional capital in the form of investment and savings. On the one hand, domestic savings are low, while on the other hand, the need for funds to finance large investments (continues to increase every year following population growth and market needs). This leads to a gap between saving and investment: $S-I < 0$ ($S < I$).

This means that the country is experiencing an investment-saving gap or a positive I-S gap (or a negative S-I gap). In Indonesia, like many other developing countries, this gap is covered by foreign capital inflows, ranging from grants, official loans (intergovernmental called G to G loans), to investments, both long-term (PMA) or short-term (portfolio investment). It can be said that hypothetically there is a positive correlation between the I-S gap and a country's economic dependence on funds from abroad. The deficit due to the persistent I-S gap must be financed from capital inflows so as not to interfere with foreign exchange reserves, namely by investment. Investment / capital investment is an expenditure to buy capital goods and production equipment with the aim of replacing and especially adding to the economy's capital goods that will be used to produce goods and services in the future (Sukirno, 2000).

Benson, (1997), the impact of disasters must be considered and handled properly from an economic perspective. Post-disaster development planning is an important part in the context of reshaping the economic stability of a region. (Zapata-Marti, 1997), which are divided into three groups, namely, Direct damages (direct damage, indirect damages) and Secondary effect (secondary impact).AusAID (2005) divides the macroeconomic

impacts of natural disasters into two groups. , namely the real impact and the non-significant impact.The two groups below will affect changes in macroeconomic variables:



Source: AusAID, 2005

Figure 4. *Macroeconomic Impact of Natural Disasters*

Dréze and Sen, (1989), Disasters have the potential for inflation through the capacity of the market economy, in the form of production, distribution, marketing and consumption, but inflation is often only a temporary impact. Chan (1997) and Eziyi, (2011) mention that high vulnerability in developing countries is influenced by: (1) poverty, (2) developing countries prefer to see the positive benefits of economic development, and turn a blind eye to the negative effects caused, (3) human factors such as lack of knowledge, mistakes, and carelessness are the factors that most determine the vulnerability aspect, and (4) limited availability of insurance.

III. Research Method

This type of research is descriptive quantitative research and the data source used is secondary data. This study uses the statistical analysis tool Eviews. The overall data used in this study. The data used in this study is panel data with a combination of time series data (time series) for the 2015-2020 period and cross section data for 10 provinces on the island of Sumatra and 6 provinces. in Java The data sources in this study came from various publications, the Central Statistics Agency (BPS), the National Disaster Management Agency (BNPB), the Investment Coordinating Board (BKPM) which were published on the official website.

3.1 Panel Data Analysis Method

Basically there are four models used in panel data analysis, namely pooled least square, pooling independent cross sections over times, least square dummy variable (fixed effects), and random effects. The three models can be explained with the following figure:

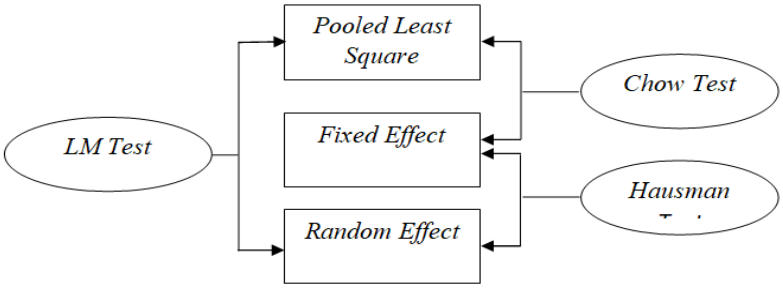


Figure 5. *Selection of Panel Data Model*

3.2 Classical Assumption Test

a. Multicollinearity Test

Detection of multicollinearity can be done by looking at the value of Variance – Inflating Factor (VIF) from the results of regression analysis. If the VIF value is > 10 then there are high multicollinearity symptoms (Widarjono, 2013). The speed of increasing variance or covariance can be seen by the Variance Inflation Factor (VIF), which is defined as:

$$VIF = \frac{1}{(1 - R^2)}$$

As R^2 approaches 1, VIF approaches infinity. This shows that as the range of collinearity increases, the variance of an estimator also increases and at a limit value can become infinity (Gujarati, 2010). H0: VIF > 10, there is multicollinearity between independent variables, Ha: VIF < 10, there is no multicollinearity between independent variables

b. Heteroscedasticity Test

Widarjono (2013) A model that is free from heteroscedasticity means that the variance of the error is constant (fixed) or can be said to be homoscedastic. The way to detect the presence of heteroscedasticity is the White test. The model is said to contain heteroscedasticity if the white statistic (n x R2) is greater than 2 table. Another way is to use the GLS Weight Cross-section method available in the EViews program output estimation. The value of Sum Square Resid (SSR) Weighted compared to Sum Square Resid (SSR) Unweighted. If SSR weighted < SSR Unweighted, it can be said that the model is free from heteroscedasticity problems.

c. Autocorrelation Test

Widarjono (2013), one of the important assumptions in the OLS method related to the disturbance variable is that there is no relationship between one disturbance variable and another disturbance variable. While autocorrelation is a correlation between members of one observation with other observations at different times. In relation to the OLS method, autocorrelation is a correlation between one disturbance variable and another disturbance variable. So with autocorrelation, the OLS estimator does not produce the Best Linear Unbiased Estimator (BLUE) only Linear Unbiased Estimator (LUE). There are several methods used to detect autocorrelation problems, namely the Durbin-Watson method, the Breusch-Godfrey method.

3.3 Panel Data Econometric Modeling

The econometric model that will be used to analyze the effect of the Multiple Linear Regression Model and Analysis Tool (OLS) with panel data is used. The analysis method used is time series data from 2015-2020 and cross section data consisting of 10 provinces on the island of Sumatra and 6 provinces on the island of Java. To determine the effect of the dependent variable on the independent variable, the panel data regression model is used with the following equation:

a. Mathematical model on the island of Sumatra:

$$PE_{it} = \beta_0 + \beta_1 INV_{SMTR_{it}} + \beta_2 IRB_{SMTR_{it}} + \varepsilon_{it}$$

b. Mathematical Model on the island of Java:

$$PE_{it} = \beta_0 + \beta_1 INV\_JWA_{it} + \beta_2 IRB\_JWA_{it} + \varepsilon_{it}$$

PE	=	Economic growth (%)
INV	=	Percentage of Realized Investment of PMA and PMDN (%)
IRB	=	Disaster Risk Index (Index)
i	=	Observations 10 on the island of Sumatra and 6 provinces on the island of Java, Indonesia (Cross section)
t	=	Research period 2015-2020 (Time Series)
β_0	=	The coefficient of the intercept constant which is a scalar
$\beta_1 \beta_2 \beta_3$	=	Regression coefficient or slope of each variable
et	=	Standard error in the mathematical model, (Error Term)

3.4 Hypothesis t test and F statistic t test

The t-statistic test is used to determine whether the independent variable is partially independent. This test is used to see the significance of the effect of the independent variable on the dependent variable individually. One-way test is used with a 95% confidence level with a hypothesis that has a significant effect on the dependent variable at the level of = 0.05. The test hypothesis is as follows: If the value of t-count > the value of t-table, then H_0 is rejected or H_a is accepted, meaning that the independent variable has a positive effect on the dependent variable. If the t-count value < t-table value, then H_0 is accepted or H_a is rejected, meaning that the independent variable has no effect on the dependent variable.

3.4 F-Statistics Test

The F-Statistic test is used to prove whether the independent variables used in the study together significantly affect the dependent variable. A large F-Statistic value is better than a small F-Statistic value. The probability value (F-Statistics) is the marginal significance level of the F-Statistics, with the following test hypotheses: If F Count > F-table, then Ho is rejected, and Ha is accepted**.** If F Calculate F-table, then Ho is accepted, and Ha is rejected At the level of = 0.05 if Ho is rejected, it means that the independent variable being tested has a significant effect on the dependent variable. If Ho is accepted, it means that the independent variable tested has no significant effect on the dependent variable at = 0.05.

IV. Results and Discussion

4.1 Results

a. Large Multiplier Test Panel Data Results

The panel data procedure was carried out to find out the best model to be used in analyzing whether the Pooled Least Square (PLS), fixed effect, or Random Effect Model (REM) model was tested using the Chow test and Hausman test. The following is a brief

summary of the best models in panel data regression in 10 provinces of Sumatra island and 6 provinces of Java island with a time series of 2015-2022:

Table 1. Evaluation of Panel Data Model Estimation

Sumatra Island Model					
No	**Test Summary**	**Chi-Sq. Statistic**	**Chi-Sq. df**	**Prob.**	**Conclusion**
1	Fix Effect Model	27,563047	9	0,0011	H_0 rejected
2	Random Effect Model	5,675042	2	0,0586	H_a accepted
Java Island Model					
3	Fix Effect Model	58,388668	5	0,0000	H_0 rejected
4	Random Effect Model	13,490304	2	0,0012	H_a rejected

Source: Eviews, Data processed 2022

Based on the results of the Fix Effect/Cow Test in 10 provinces on the island of Sumatra, the statistical Chi-square value (27.563047) > Chi-square table (16.919) at df = 9 with a probability level of 0.0011 <0.05, so causing Ho to be rejected. The results of the Random Effect / Husman Test obtained a statistical Chi-square value (5.675042) > Chi-square table (5.591) at df = 2 with a probability level of 0.0586> 0.05, thus causing Ha to be accepted. Based on the results of the Fix Effect/Cow Test in 6 Provinces of Java Island, the statistical Chi-square value (58.388668) > Chi-square table (11.07) at df = 5 with a probability level of 0.0000 <0.05, so causing Ho to be rejected. The results of the Random Effect / Husman Test obtained a statistical Chi-square value (13.490304) > Chi-square table (5.99) at df = 2 with a probability level of 0.0012> 0.05, thus causing Ho to be rejected. So the Fixed Effect model is the model that should be used, because the fixed-model number in chi is larger.

b. Classical Assumption Testing on Panel Data Model

1. Multicollinearity Test

A regression model is said to have multicollinearity if there is a perfect linear function on some or all of the independent variables in the linear function. Ways to find out whether or not there are symptoms of multicollinearity include looking at the value of the Variance Inflation Factor (VIF), if the VIF value is less than 10 then it is declared that multicollinearity does not occur. 2015-2022 time:

Table 2. Multicollinearity Test Results

Sumatra Island Model			
NO	Variables	**VIF**	**Conclusion**
1	Investment (INV)	1,00841	In the Level of Tolerance
2	Disaster Risk Index (IRB)	1,09235	In the Level of Tolerance
Java Island Model			
3	Investment (INV)	5,79575	In the Level of Tolerance
4	Disaster Risk Index (IRB)	2,18344	In the Level of Tolerance

Source: Eviews, Data processed 2022

The results of the Multicollinearity level test show that the Variance Inflation Factor (VIF) value of all independent variables has a value < 10, this explains that all variables have values within the tolerance level.

2. Heteroscedasticity Test

The white method heteroscedasticity test which is calculated manually by regressing squared residuals, aims to test whether in the regression model there is an inequality of variance from the residuals of one observation to another observation. Sumatra Island Model with Chi-square Count = Total n * Rsquare (60*0.0042851= 2.57106), In the Chi-Square table count (2.57106) < Chi Square Table (5.591) on df of independent variable = 2 with a level 5 percent significance, thus rejecting H0 which means there is no heteroscedasticity problem in the equation. Java Island Model with Chisquare Count = Total n * Rsquare (36*0,202157= 7,277652), In the Chi-Square table count (7,277652) > Chi Square Table (5,591) in df of independent variable = 2 with a level 5 percent significance, thus accepting Ha, which means there is a heteroscedasticity problem in the equation. Here are the test results in the table:

Table 3. Heteroscedasticity Test Results

Sumatra Island Model					
No	**Independent Variable**	***Chi-Square Count***	***Chi-Square Table***	**Result**	**Conclusion**
1	2	2,5710	5,591	H_0 rejected	No heteroscedasticity
Java Island Model					
2	2	7,27765	5,591	H_a accepted	there is heteroscedasticity

Source: Eviews, Data processed 2022

Description: Critical Value at 0.05.

The step used is to use the white test cure with Cross-section Weights to eliminate the heteroscedasticity problem by changing the GLS Weights to Cross-section Weights in the options panel so as to change the regression equation to be free from Heteroscedasticity problems (Widarjono, 2013).

3. Autocorrelation Test

The autocorrelation test of the Breusch-Godfrey method is calculated manually by regressing the residuals obtained from the research equation on the independent variables and the lag of the research residuals to obtain the R2 value which is then multiplied by the number of observations. Sumatra Island Model with Chisquare Count = Total n * Rsquare (50*0.00417= 0.2085), In the Chi-Square table count (0.2085) < Chi Square Table (3.84) on df humidity autocorrelation 1 with level 5 percent significance, thus rejecting H0 which means there is no autocorrelation problem in the equation. Java Island Model with Chisquare Count = Total n * Rsquare (30*0.606524= 18.19572), In the Chi-Square table count (18.19572) > Chi Square Table (3.84) on df humidity autocorrelation 1 with level 5 percent significance, thus accepting Ha, which means there is an autocorrelation problem in the equation the following table of test results:

Tabel 4. Autocorrelation Test Results

Sumatra Island Model					
No	**Independent Variable**	***Chi-Square Count***	***Chi-Square Table***	**Result**	**Conclusion**
1	1	0,2085	3,84	H_0 rejected	no autocorrelation

Java Island Model					
2	1	18,19572	3,84	H_a accepted	There is autocorrelation

Source: Eviews, Data processed 2022
Description: Critical Value at 0.05.

Autocorrelation detection was carried out and there were problems, but in the results of multiple linear regression, the final calculation model data panel was freed from the Autocorrelation problem. The step used is to use the healing coefficient covariance method to become a white cross section in the options panel so that it changes the regression equation to be free from autocorrelation problems (Widarjono, 2013).

c. Panel Data Regression Estimation Results with Fixed Effect Model

The results of this regression are to determine the direction of the relationship between the independent variable and the dependent variable and to actually see the results of the coefficients obtained in order to see the level of increase or decrease mathematically. The following are the results of the Fixed Effect mathematical model on the islands of Sumatra and Java:

Table 5. Calculation Results of Ordinary Least Square (OLS) in Fixed Effect Model

Sumatra Island Model				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	-0,395971	1,456085	-0,271942	0,7868
INV_SMTR	0,000316	9,721603	3,255608	0,0021
IRB_SMTR	-0,033566	0,016364	-2,051286	0,0457
R^2	0,426372			
F-stat	2413,470			
Java Island Model				
Variabel	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
C	1,797332	2,186594	0,821978	0,4180
INV_JWA	1,114206	0,051661	21,56761	0,0000
IRB_JWA	-0,883664	0,384223	-2,299874	0,0291
R^2	0,997950			
F-stat	1947,105			

Source: Eviews, Data processed 2022
Description: Critical Value at 0.05.

1. Sumatra Island Model:

$$PE_{it} = \beta_0 + \beta_1 INV\_SMTR_{it} + \beta_2 IRB\_SMTR_{it} + \varepsilon_{it}$$

PE_{it} = -0,395971 + 0,000316INV_SMTR_{it} + -0,033566IRB_SMTR_{it} + eit
(-0,271942) (3,255608) (-2,051286)

2. Java Island Model:

$$PE_{it} = \beta_0 + \beta_1 INV\_JWA_{it} + \beta_2 IRB\_JWA_{it} + \varepsilon_{it}$$

PE_{it} = 1,797332+ 1,114206INV_JWA_{it} + -0,883664IRB_JWA_{it} + eit
(0,821978) (21,56761) (-2,299874)

In the mathematical model on the island of Sumatra has an R-square value of 0.426372 and on the island of Java the R-square is 0.997950, this explains that 42% on the island of Sumatra and 99% on the island of Java interprets variations in the ups and downs of economic growth on the island of Sumatra and Java in 2015-2020 in the model that is formed the increase and decrease are influenced by investment and the disaster risk index explains the percentage of the influence of all independent variables on the dependent variable. In the Sumatran island model, 58% and Java 1%, the rest is influenced by other variables that are not included in the research model. The value of the coefficient that can represent the magnitude of the influence of the independent variable on the dependent variable. The interpretation of each variable is described as follows:

a) Model Coefficient on Sumatra Island:

Investment has a positive and significant effect on: 0.05% with a coefficient value of 0.000316 if investment increases by 1%, then economic growth will increase by 0.000316% with the assumption of ceteris paribus. The Disaster Risk Index has a negative and significant effect on: 0.05% with a coefficient value of -0.033566, if the Disaster Risk Index decreases by 1%, then economic growth will increase by 0.033566% with the assumption of ceteris paribus.

b) Model Coefficient in Java Island:

Investment has a positive and significant effect on: 0.05% with a coefficient value of 1.114206 if investment increases by 1%, then economic growth will increase by 1.114206% with the assumption of ceteris paribus. The Disaster Risk Index has a negative and significant effect on: 0.05% with a coefficient value of -0.883664, if the Disaster Risk Index decreases by 1%, then economic growth will increase by 0.883664% with the assumption of ceteris paribus.

d. t-Test Results (Partial)

T-statistical test on the Sumatra island model to determine whether or not there is an influence between each variable. By looking for the value of the degree of freedom, with a significance level of: 0.05 % using the formula: number of observations (n) = 60, independent variable (k) = 2, so df (n-k-1) = 57. Then the value of t -The table found is 1.672, T-statistical test on the model of the island of Java to determine whether or not there is an influence between each variable. By looking for the value of the degree of freedom, with a significance level of: 0.05 % using the formula: number of observations (n) = 36, independent variable (k) = 2, so df (n-k-1) = 33. Then the value of t -the table found is 1,692. Then the results of the statistical t test are presented in the following table:

Table 6. T-statistical Test Results

Sumatra Island Model					
Variable	**Coefficient**	**t-statistical**	**t-table**	**Prob.**	**Conclusion**
INV_SMTR	0,000316	3,255608	1,672	0,0021	H_0 rejected
IRB_SMTR	-0,033566	2,051286	1,672	0,0457	H_0 rejected
Java Island Model					
INV_JWA	1,114206	21,56761	1,692	0,0000	H_0 rejected
IRB_JWA	-0,883664	2,299874	1,692	0,0291	H_0 rejected

Source: Eviews, Data processed 2022

Description: Critical Value at 0.05.

In the test on the Sumatra island model, the investment variable has a value of 3.255608 > 1.672 and a disaster risk index of 2.051286 > 1.672 at a confidence level of: 0.05 %, then each variable rejects H0. Partially each variable has an influence on the independent variable. In the test on the Java island model, the investment variable has a value of 21.56761> 1.692 and a disaster risk index of 2.299874> 1.692 at a confidence level of: 0.05 %, then each variable rejects H0. Partially each variable has an influence on the independent variable.

e. F-Statistics Test Results

This test was conducted to determine whether the independent variables together have a significant or insignificant effect on the dependent variable. This study was conducted at a 95% confidence level (α = 0.05). In the Sumatra Island model, the numerator degree of freedom (df1) = k – 1 or (df1) = 2 – 1 = 1 and the denumerator degree of freedom (df2) = n – k or (df2) = 60 – 2 = 58. So f table value of 4.01. In the Sumatra Island model, the numerator degree of freedom (df1) = k – 1 or (df1) = 2 – 1 = 1 and the denumerator degree of freedom (df2) = n – k or (df2) = 36 – 2 = 34. So f table value of 3.28.

Table 7. Statistical F-Test Results

Sumatra Island Model			
Dependent variable	F Count	F Table	Conclusion
1	2413,470	4,01	H_0 rejected
Java Island Model			
1	1947,1	3,28	H_0 rejected

Source: Eviews, Data processed 2022

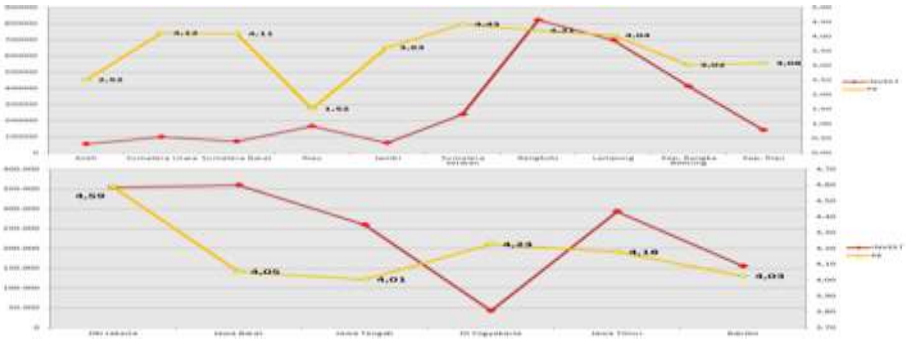
The F-table is used based on the reference to the F distribution table. The Sumatra island model F-table obtained is 4.01 with = 5 percent. Because F-statistics > F-table = 2413,470 > 4.01 then H0 is rejected, the Java Island model F-table obtained is 3.28 with = 5 percent. Because F-statistics > F-table = 1947.1 > 3.28 then H0 is rejected, meaning that the independent variables tested have a significant effect on the dependent variable, so it can be concluded that the variables, investment and disaster risk index together have an effect on economic growth.

4.2 Discussion

a. The Effect of Investment (INV) on Economic Growth

Investment is still an important part of an economic model, this is based on investment that will continue to help capital stock, which will then be able to help increase productivity, capacity and quality of a production of goods and services that will be able to help the economy. The results of the study compare 2 areas within the scope of large and productive islands in Indonesia where the island of Sumatra has a positive and significant influence and has a coefficient value of 0.000316 if investment increases by 1%, then economic growth will increase by 0.000316 % assuming ceteris paribus in 10 provinces on the island of Sumatra in 2015-2020, then on the island of Java investment has a positive and significant influence and has a coefficient value of .114206 if investment increases by 1%, then economic growth will increase by 1 ,114206% with the assumption of ceteris paribus, in 6 provinces on the island of Java in 2015-2020. The value of investment in both Sumatra and Java has succeeded in helping the movement of the economy on each of these islands, which is marked by positive results, every increase in investment will help the

economy. The following is a graph of 10 Provinces in Sumatra and 6 Provinces in Java in a comparison of the level of Investment and Economic Growth in 2015-2020:



Source: BKPM, Sumatra and Java Islands 2015-2020

Figure 6. *Comparison of the average level of investment and economic growth in Sumatra and Java in 2015-202*

The first picture explains how the movement of the investment side towards the contribution of economic growth in 10 Sumatra Island Provinces, Bengkulu Province Investment with an investment value of IDR 822.826.00 billion succeeded in spurring economic growth to become the second highest at 4.21%, followed by Lampung Province with an investment value IDR 698,308.00 billion succeeded in spurring economic growth to become the third highest at 4.04%, while the third highest investment value was in the Province of Bangka Belitung, the investment value was IDR 412,090.00 billion and spurred economic growth to become the fourth highest at 3.02%. In the second graph explains how the movement of the investment side to the contribution of economic growth in 6 provinces on the island of Java, West Java Province investment with an investment value of Rp 359,713.00 billion succeeded in spurring economic growth to become the fourth highest at 4.05%, followed by DKI Jakarta Province with an investment value of IDR 354,691.00 billion, succeeded in spurring the first highest economic growth in Java by 4.59% and East Java with an investment value of IDR 293,632.00 billion, spurring the third highest economic growth of 4.18%.

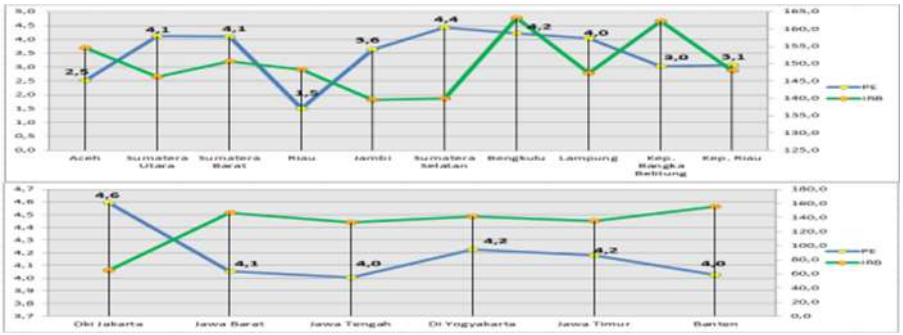
These results are in line with several findings in the area around the islands of Sumatra and Java,(Sari, 2018), Domestic and foreign investment has a positive influence on the growth rate between regions, investment has an important role in driving the regional economy, where with additional investment in Java Island with higher investment will encourage economic growth in Java Island. (Yuliana et al., 2019) that investment in districts and cities in South Sumatra has a positive and significant effect on economic growth, meaning that the higher the investment, the higher the economic growth. Investment is one of the macroeconomic variables in creating economic growth, so that investment will bring a multiplier effect on other macroeconomic variables, such as employment, consumption, exports, and so on.

b. The Effect of Disaster Risk Index (IRB) on Economic Growth

The important issue at this time is how is the vulnerability of an area to disasters, disasters become external variables that are taken into account because they are thought to be able to affect aspects of the stability of the economy of a region. The results of a comparative study of 2 areas within the scope of large productive and disaster-prone islands in Indonesia on the island of Sumatra have a negative and significant effect with a coefficient value of -0.033566, if the Disaster Risk Index decreases by 1%, then economic

growth will increase. by 0.033566% with the assumption of ceteris paribus, in 10 provinces on the island of Sumatra in 2015-2020. Furthermore, on the island of Java the Disaster Risk Index has a negative and significant effect with a coefficient value of -0.883664, if the Disaster Risk Index decreases by 1%, then economic growth will increase by 0.883664% with the assumption of ceteris paribus in 6 provinces in Indonesia. Java Island 2015-2020.

This finding indicates that if an area is less prone to disaster risk, it has a stable growth rate, when the number of disasters decreases or decreases growth tends to increase, because these external factors have a negative effect on the stability of economic growth. The following is a picture of the average of the disaster risk index and economic growth on the islands of Sumatra and Java in 2015-2020:



Source: BNPB, Sumatra and Java 2015-2020.

Figure 7. *Comparison of Average Disaster Risk Index levels and Economic growth of Sumatra and Java Islands in 2015-2020*

The first picture presents the level of disaster risk in the Province of Sumatra, 2 areas that have a high risk index that tend to have low growth, such as Aceh, which is 154.4 with the second lowest growth of 2.5%, this is because disaster vulnerability has the potential to occur not only earthquakes. and tsunamis, but also floods, flash floods, droughts, landslides, extreme waves and abrasion, extreme weather, volcanic eruptions, forest and land fires, (BPBA, 2015), while the next area is Riau with an index of 148.3 and economic growth of 1.5% having the potential for unrelenting disasters such as forest fires with smog, floods and landslides. These two areas are an illustration of disaster risk affecting the growth side, due to external factors that will hinder it. On the island of Java has an interesting phenomenon where only DKI Jakarta has the lowest disaster risk index of 64.9 and economic growth has managed to occupy the highest of 4.6%.

This is in line with several studies on the impact of disaster vulnerability in various countries,(Owusu-Sekyere et al., 2021) Finding that the direct impact of disasters does have a contemporary negative impact on economic growth in South African countries. This is because facilities and economic development are experiencing damage and losses that have quite an impact on stability. (Shabnam, 2014) Natural disasters directly have a negative effect on GDP growth. The total number of people affected by floods significantly reduces the annual GDP per capita growth rate, while the number of people killed by floods has no substantial effect on the annual GDP per capita growth rate. (H. Sadeghi, 2009), Short-term and long-term forecast models show the negative effects of the disaster on the Iranian economy, especially on investment per capita and GDP per capita. The negative impact of natural disasters on GDP per capita growth, in the first stage, was caused by a decrease in physical capital.

V. Conclusion

Investment realization, both PMA and PMDN, has a positive and significant impact on the economic growth of the provinces of Sumatra and Java. Investment is able to spur economic growth in various regions and disaster risk has a negative and significant impact on the economic growth of the provinces of Sumatra and Java, External factors in the form of disasters are a serious threat to the stability of the economy of each region, the impact of disasters is very significant in disrupting the pace of economic growth. Investment has an important role. In order to spur the entry of investment, each province, both Sumatra and Java, must be able to provide regional attractiveness through the development of production factors such as infrastructure facilities and facilities to support the needs of investors. On the problem side of vulnerability to disasters, local governments need to consider making a policy regarding the formation of a special team for disaster management and disaster mitigation that needs to be carried out by the two islands, both Sumatra and Java, on the other hand also by establishing a special preparation budget that is saved to be issued as a framework for development improvement after a disaster occurs. in every province on the islands of Sumatra and Java.

References

Agus, Widarjono. (2013). Ekonometrika Pengantar Dan Aplikasinya. Ekonosia. Jakarta.

Algifari, Guritno Mangkoesoebroto. (1998). *Teori Ekonomi Makro*. Yogyakarta: STIE YKPN.

AusAID, (May 2005).Economic Impact of Natural Disasters on Development in The Pacific.

Anthony Ilegbinosa, I., Micheal, A., & Ipalibo Watson, S. (2015). Domestic Investment and Economic Growth in Nigeria from 1970-2013: An Econometric Analysis. *Canadian Social Science*, *11*(116), 70–79. https://doi.org/10.3968/7009

Benson, Chan, (1997). The economic impact of natural disasters in the Philippines. *Working paper 99. London: Overseas Development Institute.*

BPBA. (2015). Kajian Risiko Bencana Aceh 2016 - 2020. *Badan Penanggulangan Bencana Aceh*, 49.

Drèze, J. and Sen. A., (1989). Hunger and public action. Oxford: *Oxford University Press.*

Eziyi, Offia Ibem, (2011). Challenges of disaster vulnerability reduction in Lagos Megacity Area, *Nigeria Disaster Prevention and Management,* Vol. 20 No. 1, 2011pp. 27-40.

Gujarati, D.N. dan D.C. Porter. (2010). Dasar-Dasar Ekonometrika, Edisi 5. Jakarta: Salemba Empat.

H. Sadeghi, S. E. S. and M. Z. N. (2009). Study of the Effects of Natural Disasters on Gross Domestic Product in Iran. *Journal of Applied Sciences 9 (2): 341-347, 2009 ISSN 1812-5654 © 2009 Asian Network for Scientific Information*, *9*(2), 341–347.

Magdalena, S., Suhatman, R. (2020). The Effect of Government Expenditures, Domestic Invesment, Foreign Invesment to the Economic Growth of Primary Sector in Central Kalimantan. *Budapest International Research and Critics Institute-Journal (BIRCI-Journal)*. Volume 3, No 3, Page: 1692-1703.

Noy, Ilan (2007). The Macroeconomic Concequences of Disasters, SCCIE Working Paper 07-15

Owusu-Sekyere, E., Lunga, W., & Karuaihe, S. T. (2021). The impact of disasters on economic growth in selected Southern Africa development community countries.

Jamba: Journal of Disaster Risk Studies, *13*(1), 01–10. https://doi.org/10.4102/jamba.v13i1.1081

Sari, M. A. (2018). Impact of Investment, Labor, and Infrastructure on Java Island Economic Growth 2011-2017. *Efficient: Indonesian Journal of Development Economics*, *1*(3), 230–241. https://doi.org/10.15294/efficient.v1i3.35151

Shabnam, N. (2014). Natural Disasters and Economic Growth: A Review. *International Journal of Disaster Risk Science*, *5*(2), 157–163. https://doi.org/10.1007/s13753-014-0022-5

Shah, M. et al. (2020). The Development Impact of PT. Medco E & P Malaka on Economic Aspects in East Aceh Regency. *Budapest International Research and Critics Institute-Journal (BIRCI-Journal)*. P. 276-286.

Sukirno, Sadono. (2000). Makroekonomi Modern: *Perkembangan Pemikiran Dari Klasik Hingga Keynesian Baru*, Ed. 1, Jakarta: PT Raja Grafindo Persada.

Tambunan, Tulus T.H. (2001). Perekonomian Indonesia: *Teori dan Penemuan Empiris*, Jakarta: Penerbit Ghalia Indonesia.

Yuliana, S., Bashir, A., & Rohima, S. (2019). The Effect of Investment toward Economic Growth in The Local Economy. *Jurnal Ekonomi Dan Studi Pembangunan*, *11*(1), 28–39. https://doi.org/10.17977/um002v11i12019p028

Zapata-Marti, R.,(1997). Methodological approaches: the ECLAC methodology. In Center for the Research on the Epidemiology of Disasters (CRED), *Assessment of the economic impact of natural and man-made disasters*. Proceedings of the expert consultation on methodologies, Brussels, 29–30 September, Universite Catholique de Louvain, Belgium, 10–12.