Macroeconomic Factors Influencing the Fisheries Sector Investment in Bandung City of West Java, Indonesia

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Abstract. This research is intended to analyze how macroeconomic factors influence the level of fisheries investment in Bandung city. Economic factors analyzed in this study include inflation, interest rates, and Gross Domestic Regional Product (GDRP) in Bandung city in the period 2010-2017. The method used throughout this research is the Literature Survey method by using multiple linear regression analysis methods. The results of multiple linear regression tests through the F-test and T-test showed that there was no significant positive relationship between inflation and the level of fisheries investment in Bandung city. The results of the multiple regression test also showed an insignificant negative relationship between the interest rate and the level of investment in the fisheries sector in Bandung city. GDRP had a significant positive relationship with the level of fisheries investment in Bandung city. R Square Test (R^2) showed a value of 0.913 which means that 91.3% of the proportion of investment in the fisheries sector from 2010-2017 can be attributed to the variable inflation, interest rates, and GDRP. While 8.7% is due to other variables outside the tested model.

Keyword. Fisheries investment; gross regional domestic product; inflation; interest rates; macroeconomics.
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INTRODUCTION

Economic development requires investment support which is part of the main sources of economic growth (Berggren, 2012). Investment is essentially the placement of several funds at this time in the hope of obtaining future profits. Generally, investment is divided into two, namely: investment in financial assets (financial assets) and investment in tangible assets (Hempel & Pauly, 2004; Collins et.al., 2005). Investment activities produce investments that will continue to be the capital stock (capital stock). Furthermore, an increase in capital stock will improve productivity and capacity and quality of production, which in turn can encourage economic growth and increase employment (Collins et al., 2005; Berggren, 2012; Rizal et al., 2019).

Investing in the capital market requires sufficient knowledge, experience, and business sense to analyze which securities will be bought, sold, and still possibly owned. Those who were interested in participating in the sale and purchase of shares must leave the culture of going along, gambling, and so that is not rational, as investors must be rational in dealing with the stock market. Besides, investors must have a definite sense of the future of the company whose shares will be bought or sold (Rizal et.al., 2017; Rizal & Nurruhwati, 2018). Therefore, investors should be mindful of various factors that affect investment. One of the factors that influence investment was the macroeconomic factor (Collins et.al., 2005; Berggren, 2012).

Gross Domestic Regional Product (GDRP) is the total value increased in goods and services produced from all economic activities in an area. GDRP calculation uses two types of prices, namely the current price and constant price. GDRP at current prices is the added value of goods and services calculated using prices in force in the year concerned, while GDRP at constant prices is calculated using prices in a certain year as a base year and currently utilizes 2010 (CBS, 2018). GDRP calculation can be done with four methods of approach namely; 1. Production approach; 2. The income approach; 3. Expenditure approach; 4. Allocation Method. By knowing the value of GDRP that is presented regularly, it will be interesting to know the level of inflation and deflation of a region. Data on inflation, interest rates, and GDRP can be used to analyze macroeconomic factors that affect investment. Knowing the factors that influence investment in the fisheries sector is important before investing because it can be used by government agencies and

fisheries sector investors in maintaining the sustainability of financial sector growth and maintaining economic stability (CBS 2002-2012).

The study was designed to determine and analyze the factors that can affect the level of investment in the fisheries sector in the past 8 years, namely from 2010 - 2017. From this research, then it can be determined what policies should be enacted in the future. The hypothesis proposed in this study revealed that inflation and interest rates harm investment in the fisheries sector, while the GDRP has a positive effect on investment in the fisheries sector.

METHOD

The data used throughout this study were secondary data, namely the Gross Regional Domestic Income Table in the fisheries sector in Bandung city in the past 8 year intervals (2010-2017). The research method used case studies and was accompanied by quantitative descriptive analysis. Data analysis was performed using economic mathematics and quantitative analysis.

The sampling method used was purposive sampling. According to Rizal and Nurruhwati (2019), purposive sampling is a technique for determining research samples with certain considerations aimed at ensuring that the data obtained later more representative. The data collection method in this study utilized the literature study method where the researcher took the data that have already been made in research-related offices, as well as information relating to research such as previous research literature and web sites.

The analytical tool used to analyze data was multiple regression because the dependent variable Y depends on two or more of the independent variables X. The regression function used is as follows:

$$Y = b_o + b_1 X_1 + b_2 X_2 + b_3 X_3 + e_i$$

Where:

Y : Fisheries sector investment in billions of Rupiah (IDR)

X_1 : Inflation rate in percent

X_2 : Interest Rate in percent

X_3 : GDRP in billions of Rupiah

b_o : Free coefficient of regression (Intercept)

b_1 : Inflation Coefficient

b_2 : Real interest rate coefficient

b_3 : GDRP level coefficient

e_i : error term

In this analysis several tests were carried out, namely (Gujarati, 2004):

T-test

The partial T-test was used to determine whether the independent variable in the regression model has an individual influence on the dependent variable by taking into account the presence of other variables in the model.

F-test

F-test in regression served as a simultaneous test, which was to determine whether all independent variables simultaneously have a significant influence on the dependent variable can be seen from the results of the F-test.

Determination Coefficient Test (R^2)

This test was used to see how well the sample matches the data. If the estimated coefficient of determination is greater (close to number 1), it indicates that the estimation results will approach the actual situation or the chosen variable can explain related or vice versa.

Correlation Coefficient Test (r)

The r test was used to determine the closeness (strength and weakness) of the relationship between the dependent variable and the independent variable.

Heteroscedasticity tests

It is used to test for heteroskedasticity in a linear regression model and assumes that the error terms are normally distributed. It tests whether the variance of the errors from a regression was dependent on the values of the independent variables. Or there was or not an inequality of the variance of the residuals from one observation to another observation. If the variance of the residual value of another observation was fixed, it was called Homocedasticity. If the variance differs from one observation to another, then it was called Heteroscedasticity.

Normality test

The normality test was used to test whether in the regression model there are confounding or residual variables that have a normal distribution. A normality test can be done in several ways. One of them is the Kolmogorov Smirnov test.

Multicollinearity Test

The multicollinearity test was used to test whether the regression model found a correlation between independent variables.

Autocorrelation Test

Autocorrelation test aimed at testing whether the linear regression model has a correlation between the error of the intruder in period t with the error of the intruder in the period t-1 (the previous period). If there is a correlation between them, then it is called an autocorrelation problem.

RESULTS AND DISCUSSION

Bandung City is located in the West Java region and is the capital of West Java Province. Astronomically, Bandung City is in 1070 36' East Longitude and 60 55' South Latitude. Based on geographical position, Bandung City are within these boundaries: North - West Bandung District; South - Bandung District; West - Cimahi City; East - Bandung District. Bandung City is located at an altitude of 700 meters above sea level (asl). The highest point is Ledeng Subdistrict, Cidadap Sub-district with an altitude of 892 meters above sea level and the lowest is Rancanumpang Sub District, Gedebage Subdistrict with an altitude of 666 meters above sea level.

The total area of Bandung City is 167.31 km2 which is divided into 30 sub-districts covering 151 urban villages. The widest district is the Gedebage sub-district with an area of 9.58 km2. While the smallest sub-district is the Astanaanyar sub-district, with an area of 2.89 km2. In 2017, relative rainfall took place throughout the year with varying intensity each month. Extreme rainfall occurred in April, which amounted to 559.6mm. While the lowest rainfall was located in December where rainfall only reached 59.9mm. During 2017, the average temperature of Bandung City was 23.8^{o}C. The highest temperature reached 30.5^{o}C in September and the minimum temperature was 18.8oC in August 2017 (CBS, 2018).

Built on the regulation of the Republic of Indonesia Government Number 16 of 1987, the area of Bandung Administration is extended to 16,729.65 Ha. According to Bandung City Regulation number 06/2007 concerning the Division and establishment of working areas of sub-districts and villages within the Bandung City Government, Bandung City Region is divided into 30 Districts and 151 Sub-Districts.

It is a common notion that uncertainty plays an important role in deepening the recent Great Recession and inhibiting economic recovery. Consequently, there has become a growing research effort in macroeconomics and in finance to understand the implications of volatility shocks.

Macroeconomic studies typically show that increasing volatility is associated with lower investment and output. In asset pricing, most studies revealed that volatility drops asset-valuation ratios and raises the risk premium (Rizal, et.al 2018). In this study, it was found that contrary to the typical view, volatility is not necessarily contradictory. It was shown that whether volatility is linked to good or bad economic times, it depends both empirically and theoretically on its sectoral origin.

To find out how the macroeconomic factors influence the investment in the Bandung city multiple regression was used. The investment data of the fishery in the city of Bandung were recorded with inflation data, interest rate data, and GDRP of Bandung city in 2010-2017. Before running model to the conversion, investment data and the GDRP data were transformed in the form of logs, so that the unit could be likened to inflation and interest rate.

Table 1. Data on the growth of fisheries sector investment, inflation, interest rate GDRP year 2010-2017

Year	Growth of fisheries sector investment (%)	Inflation (%)	Interest rate (%)	Growth of GDRP (%)
2010	641	4.53	2.78	102,154,915
2011	729	2.75	7.34	110,234,438
2012	803	4.02	11.77	119,632,250
2013	870	7.97	14.34	129,005,462
2014	915	2.34	9.13	138,960,942
2015	983	3.93	12.28	149,580,379
2016	1003	2.93	12.11	161,227,832
2017	1400	3.46	10.01	172,851,961

Source: Department of Agriculture and Food Security of Bandung (2018), Central Bureau of Statistics Bandung (2018).

Table 1 above shows that investments, inflation, interest rates, and gross Regional domestic product during 2010-2017 were relatively fluctuative. Dependent Variable or Y variable in the calculation was an investment in the fisheries sector in the city of Bandung that has been transformed into Log. While the independent variables are the X1 and X2 variables, respectively, the inflation and interest rate values and the X3 variables were the Gross Domestic Regional Product value that has been turned into the Log form.

Before using multiple regression analyses, a classical assumption test was carried out to determine if a linear regression model could be called a fit model. A double linear regression model can be called a fit model when the model meets BLUE criteria (Best Linear Unbiased Estimator). BLUE can be achieved when fulfilling the classic assumption. The following were the test results of classical assumptions. Test normality can be made in several ways. One is by testing the Kolmogorov Smirnov. Here was a test of normality using the calculation of Kolmogorov Smirnov.

The ratios of Kolmogorov and Smirnov may indicate whether or not a data distribution was normal. The basic concept of normality test using Smirnov Kolmogorov was to compare data distribution (which will be tested in its normal) with a regular raw distribution. The default normal distribution was the data that has been transformed into the form of Z-Score and was assumed to be a standard form. The application of the Smirnov Kolmogorov test was that if the significance below 0.05, it means that the data to be tested had a significant difference with normal raw data, or it can be said the data that was normalized was abnormal. According to Kolmogorov Smirnov test results of 0.146 and ASYMP. Sig. of 0.200, where the test result was worth more than 0.05. Thereby it can assume that the residual with the normal distribution.

Table 2. Results of normality test calculation

		Unstandardized Residual
N		8
Normal Parameters[a,b]	Mean	0.000
	Std. Deviation	0.030
Most Extreme Differences	Absolute	0.146
	Positive	0.146
	Negative	-0.125
Test Statistic		0.146
Asymp. Sig. (2-tailed)		0.200[c,d]

The multicollinearity test was used to test whether a regression model finds a correlation between independent variables.

Table 3. Multicollinearity Calculation results

Coefficients					
Term	Coef	SE Coef	T-Value	P-Value	VIF
Constant	-7.48	2.085	-3.59	0.023	
LogX1	0.041	0.099	0.41	0.701	1.16
LogX2	-0.027	0.091	-0.30	0.778	1.86
LogX3	1.284	0.261	4.92	0.008	1.93

The multicollinearity test was obtained by looking at the VIF value of each independent variable. If the value of the VIF is < 5, it can be inferred there was no the multicollinearity symptom. From the table above, it is known that the VIF values of each variable are 1.16, 1.86, and 1.93 which are the three VIF values < 5. Then it can be assumed that the data are free from the symptoms of multicollinearity.

The autocorrelation test is intended to test whether a linear regression model has a correlation between errors in the T-period errors in the T-1 period (previous period). In the case of correlation, the problem is called autocorrelation (Gujarati, 2004).

Table 4. Autocorrelation Results

S	R-sq	R-sq (adj)	Durbin-Watson
0.039	91.3%	84.8%	1.989

Durbin-Watson Test (DW test) was used to indicate the presence of autocorrelation between variables. The dU value and the Durbin Watson table for n = 3 and n = 8 are dU = 2.286 and dL = 0.367. The value of DW resides between dL and dU (0.367 < 1.989 < 2.286) and is included in the zone of indecision or the data cannot be concluded.

Heteroscedasticity Test aimed at testing whether in a regression model there is a variance inequality of the residue from a single observation to another observation. If the variance of the residual value of another observation is worth it, then it is called Homoscedasticity. If the variance differs from one observation to another, it called Heteroscedasticity.

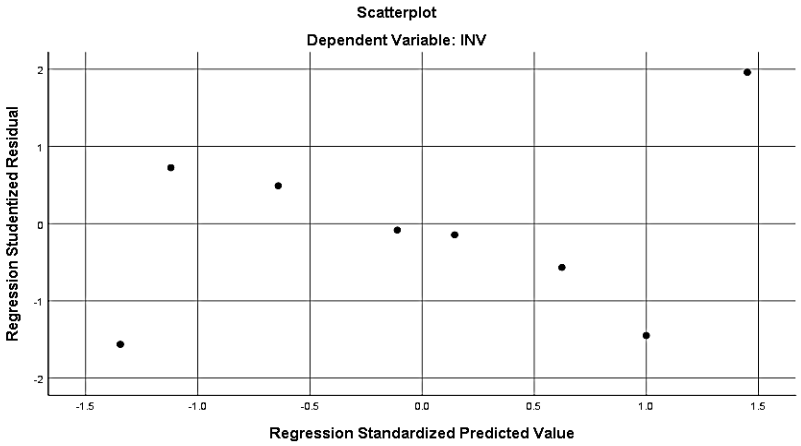

Figure 1. Graph Regression Standardized Residuals

Figure 1 shows that there are no symptoms of Heteroscedasticity because the plot spreads evenly above and below the 0 axes without forming a specific pattern. Test F in regression serves as a simultaneous test, which is to determine if all independent variables simultaneously have a meaningful influence on the dependent variables. Here is a table of F-test calculation results.

Table 5. F-Test result Calculation

Source	DF	Adj SS	Adj MS	F-Value	P-Value
Regression	3	0.066916	0.022305	14.03	0.014
Error	4	0.006361	0.001590		
Total	7	0.073277			

The F-test was concluded to influence if the P-Value value was less than the critical research or alpha limit. In the table above, the Regression P-Value was 0.014, which was < 0.05, and it was concluded that simultaneous independent variables had a significant effect on the dependent variables. A partial T-test was used to determine whether independent variables in a regression model had an individual influence on the dependent variables by observing other variables' existence within the model. Partial T values can be seen in Table 6 below. There was a preferential influence if the P-Value was less than the real level of 0.05.

Table 6. T-Test result Calculation

Term	Coef	SE Coef	T-Value	P-Value	Conclusion
LogX1	0.0410	0.0992	0.41	0.701	Not significant
LogX2	-0.0273	0.0906	-0.30	0.778	Not significant
LogX3	1.284	0.261	4.92	0.008	significant

In the X1 and X2 variable or inflation and interest rate levels, the P-Value of each variable is 0.701 and 0.778 where the value is greater than the real level of 0.05 (P-Value > Real-level 0.05). Hence, the H0 is rejected and Ha accepted which means that there is no significant relationship between inflation and interest rate on the investment of fishery in Bandung City. The Log X3 or GDRP variables indicate a P-Value of 0.008, is less than the real level 0.05 (P-Value <-level 0.05). Thus, it can be concluded that H0 was accepted and Ha was rejected. In other words, a significant relationship between GDRP and investment in the fisheries sector in Bandung City.

The coefficient of determination of compound (R2) describes the proportion or portion of the total percentage of variations in the dependent variables defined by independent variables at the same time. R^2 represents the conformity size, which is the degree to which the sample regression lines match data. A measure is getting higher R2 than the regression line approaches 1 or 100%, indicating estimates are getting closer to reality (Gujarati, 2004).

Table 7. Model processing results

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
	.956[a]	0.913	0.848	0.039

a. Predictors: (Constant), GDRP, Inf, SB

b. Dependent Variable: INV

Based on the table 7 above, R Square (R^2) shows a value of 0.913 which means it shows a high correlation degree or close to number 1. In other words, the test result of the compound coefficient of determination explains that 91.3% of the proportion of the fishery investment from 2010-2017 can be explained by the inflation variable, interest rate, and gross Regional domestic product. While 8.7% is described by other variables outside the model. In the meantime, Test R was used to see the relationship strength relationship between dependent variables and independent variables. The R-value obtained is 0.956 then it can be concluded that the relationship between dependent variables and the independent variable is strong.

Model interpretation

From the calculation of multiple linear regression that has been done, a picture of how the influence and relationship of the variables studied was obtained. The multiple regression equation is as follows:

$$INVt = f\ (INFt, SBt, GDRPt)$$

Transformed into an empirical logarithmic multiple models

$$Log\ INVt = b0 + b1\ INFt + b2\ SBt + b3\ LogGDRPt + et$$

Where:

INVt : Value of the Fisheries Sector Investment in the year t in million Rupiah.

INFt : Inflation in the year-t in percent.

SBt : Interest rates year-t in percent.

GDRPt : Gross Regional Domestic Product in year-t in million Rupiah.

Et : Error variable

b1, b2, b3 : Regression coefficient of each variable.

b0 : Intercept coefficient

From the results of the calculations that have been made, the following regression equation can be made:

$$LogINV = -7.97 + 0.0062\ INF - 0.00385\ SB + 1.346\ LogGDRP$$

Where:

Log INV : Investment rate of the fisheries sector in percent.

INF : Inflation in percent.

SB : Interest rates in percent.

LogGDRP : The level of Gross Regional Domestic Product in percent.

Based on the regression equation above, if other variables are assumed to be constant, then the investment level will change by itself at a constant value of -7.97. The hypothesis has an insignificant positive effect between inflation and investment in the fisheries sector in Bandung city.

The P-Value variable X1 indicated this shows a value of 0.584, which was higher than the real level of 0.05. Between inflation and investment in the fisheries sector had a positive relationship with 0.0062. Assuming that the other variables were fixed, it can be concluded that an increase of 0.0062% in inflation (INF) increases investment in the fisheries sector by 1%. This result was supported by the theory explained by Rizal (2018), which states that mild inflation usually actually had a positive influence on the inflation can encourage the economy to develop better, namely by increasing income and making people passionate about working, saving, and investing.

Based on the hypothesis explained earlier, the interest rate on investment in the fisheries sector in Bandung City was demonstrated to have a non-significant negative relationship. The result has shown that P-Value of the variable interest rate (X2) was 0.566, which was higher than the real level of 0.05. Based on the regression equation above, the interest rate coefficient is -0.00385, which means that the interest rate and investment in the fisheries sector have a negative relationship. Assuming the other variables were fixed, it can be stated that each interest rate decreases by 0.00385%, increasing investment by 1%.

Gross Regional Domestic Product (GRDP), which was presented regularly, can determine the production amount from a particular area. Based on the hypothesis that had been tested before, between the GRDP and investment in the fisheries sector in the city of Bandung had a significant positive relationship. The P-Value of variable X3 or GRDP is less than the real level of 0.05, which is 0.007 (P-Value X3; 0.007 < fundamental level; 0.05). The regression equation above explains that between the GRDP and investment in the fisheries sector in Bandung had a positive effect, with a regression coefficient of 1.346. Assuming other variables are of fixed value, then it can be stated that each increase in investment by 1%, the GRDP of Bandung city, will increase by 1.346%.

CONCLUSION

Based on research that has been done on the Analysis of Macroeconomic Factors on Investment in the Fisheries Sector in the City of Bandung, it can be concluded that the macroeconomic factors tested in this study were inflation, interest rates, and Gross Regional Domestic Product (GRDP). Inflation and GRDP have a positive influence on investment in the fisheries sector in Bandung city. At the same time, interest rates negatively influence investment in the fisheries sector in Bandung city.

Structural restrictions of the modern economic growth of Bandung city are the weakness of political and economic institutes that constrain the competitiveness of the Bandung city economy and adversely impact the business climate. We assume that if Bandung society does not improve the business environment, it can't provide a stable flow of investment and sustained economic growth in the long run.

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