

EXPORT AND INVESTMENT IN FISHERIES SECTOR IN MALUKU PROVINCE

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ABSTRACT

Export and investment are considered important parts of the macro variables that affect economic growth. The purpose of this study in long-term perspective is to analyze the dynamic behavior of export and investment and the movement direction of causality between exports and investment in the province of Maluku. Data used in this research is secondary data, the period of 1990-2009. Estimation methods used in this study is Granger Causality Test, Vector Autoregressive (VAR). Results show that based on Granger causality test there is one-way direction from investment variable to the export of fisheries at lag 1-4, and at lag 5 occurring in two-way relationship between two variables in the model. This proves that investment is a very good instrument to stimulate the expansion of fisheries exports sector towards economic openness. Dynamic behavior of the movement of exports and investment shows that there are reciprocal relationships between export and investment the results. It provides evidence that IRF shocks/innovations of the investment variables have a direct impact on exports and vice versa. This means that if export variable decreases, the investment variable also decreases. On the contrary, when export variable increases, the investment variable also increases. Yet, the Cholesky decomposition results show that shocks on fishery exports can be explained either by itself or investment. It indicates that variable of investment give better dynamic responses and more dominant compared to export variable.

Key words: Exports, Investment, Fisheries sector, VAR.

INTRODUCTION

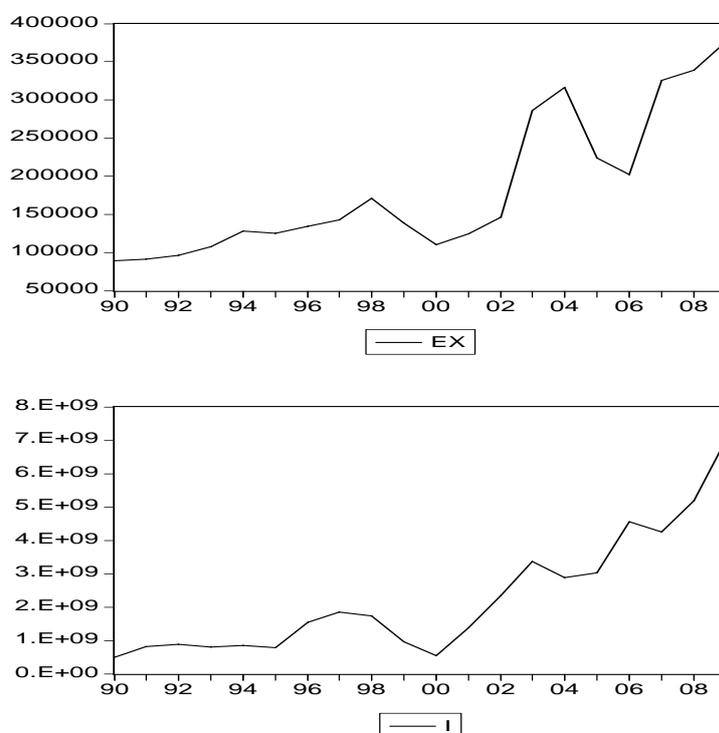
Maluku Province has a sea area of 92 percent while the remaining is the land area. Maluku sea territory has the nature of ocean, biologic and geographically distinct differentiating with other seas in the archipelago of Indonesia. That makes Maluku territorial water contains a relatively high economic potential as a source of marine biodiversity, mineral and marine tourism potential.

With such a sea area, it shows that Maluku is rich in natural resources especially being potential with its the sea. Such a condition can be seen from the standing stock of 1.9 million tons or year and Maximum Sustainable Yields (MSY) of 950,000 tons/year. Potential fishery based on the assessment of fish stocks in the region fishery (WPP) of Maluku Province in the year 2007,

by the Marine and Fisheries Research Agency (DKP) in collaboration with LIPI focused on: Banda Sea 277,890 tons/year, the Arafura Sea 771,500 tons/year, Ceram Sea 590,640 tons/year and the total catch reached 1.64003 million tons/year.

The potential of the fish capturing efforts is really a large pelagic fishes with 261,490 tons/year; small pelagic fish of 980,120 tons/year; other fish 295,500 tons/year; 47,600 tones of reef fish per year; 44,000 tones of shrimp per year; lobster 800 tons/year and all others reached 10,520 tons/year. The condition of fish export destinations are dominated to South Korea, Taiwan, Japan, and China. Fishery commodities for export are frozen fish, frozen fish mackerel, frozen fish fillets, frozen shrimps and frozen tuna.

Graph 1
Export and Investment in the Fisheries Sector
in Province of Maluku Year 1990-2009



Source: Department of Marine and Fisheries Maluku Prov. in 2009, the data processed

A marine sector development opportunity in the Province of Maluku is strongly supported by the potential availability of abundant marine resources. Therefore, local governments need to shift a paradigm for land development oriented (continental oriented) toward the sea development oriented (ocean oriented). Thus, regional development could synergize with the potential availability of the sea, as well as a carrying capacity for the achievement of development in Maluku Province.

According to Retraubun (2006), the efforts to manage marine sector in the Maluku has always received serious attention from the central government. This is indicated by the approval of the preparation of the Special Allocation Fund (DAK) for some of the islands, including Maluku, where an increase in the allocation of DAK in 2007 that is expected to be directed to infrastructure development leading fisheries and marine sector.

Export and investment in the fisheries sector in the Province of Maluku can be seen on the Graph 1. As shown in Graph 1, the growth of exports and investment in fisheries sector in the Province of Maluku period 1990-2009 shows that the data is volatile and has a trend can shows which tends have increased so far. The average export growth was 10.7% with the largest growth occurred in 2007, totaled to 60%. Yet, the growth of the largest investments in the year 2006 is totaled to 50% with an average growth rate of 23.9%.

When being scrutinized, it shows that investment is one of good instruments in stimulating economic activity. This effort can stimulus the growth of exports in relation to the development of the fisheries sector. With decentralization and regional autonomy in 1999, it provides opportunities for local authorities to manage their own natural resources. Especially for the Province of Maluku, with the regional autonomy

and economic openness, such an economic instrument can have positive impacts on the fisheries sector, especially in the export of fishery commodities because it can push the incoming of investments from both domestic and foreign ones.

In the theory of economic development, such a phenomenon is known that the level of export and investment have a positive reciprocal relationship. This means that it occurs because of the other side role, such as the higher export of an area, meaning the greater part of the revenue to be saved, so the investment can be created much greater. In this case, investment is a function of export.

On the other side, the greater investment of a country, the greater rate of export growth can be achieved. Again, in such instance, export is a function of investment. By having an assumption that the reciprocal relationship occurs, the investment projections must take into account the exports being variable. In projecting the number of exports, the viable investment should be used as a determining factor.

This study focuses on the problems: a.) whether there is a correlation between the export with an investment in the Province of Maluku? How is the pattern of the relationship, whether they are unidirectional or reciprocal? b.) How is the dynamic behavior of export and investment? c.) How is the dynamic impact response of each variable due to the innovation?

Based on such description, here the hypothesis which is statistically to be verified in this study is that the reciprocal relationship between export and investment in fisheries sector in the Province of Maluku is doubtful or unclear. It also attempts to find out the response of each variable such as whether there is an innovation.

THEORETICAL FRAMEWORK

International Trade

Export activity is the trading system by removing the goods from the customs territory of the country out of Indonesia with fulfill-

ing regulatory requirements. Exports represent the total goods and services sold by one country to another, e.g., the goods, insurance, and services in the year (Sasandara, 2005:32).

The most important functional component of the export in foreign trade is when there is a gain and the national income rises too, in which in turn, it increases the amount of output and economic growth. By having higher levels of output, it can be broken the vicious circle of poverty and economic development can be enhanced (Jhingan, 2000).

Export is an important factor in stimulating economic growth in a country. Furthermore, exports and imports can increase the consumption capacity of a country, world output, and provide access to resources which are scarce and international markets with the potential to export various products. All these when it is without these products, poor countries will not be able to develop their activities and its national economy as well. Exports can also assist all countries in implementing their development efforts through the promotion and strengthening of the economic sectors that contain a comparative advantage. It determines whether it induces the availability of certain factors of production in big numbers, or efficiency and advantages of labor productivity. (Lincoln, 2004:371).

In other consideration, investment is a component of aggregate demand which is as the second largest after consumption. Yet, it is relatively difficult to count such investment because they are more volatile or unstable compared with private consumption. Even, recession or boom in an economy can occur due to investment behavior. Moreover investment is very important for economic growth and improvements to productivity. Without investment there will be no further expansion.

Review of Empirical

Abou-Stait (2005) conducted a research on the paradigm of export-led growth (ELG) for Egypt. It used variables of the real gross

domestic product, real GDP without exports, net exports, real exports, real imports, and real gross capital formation. The methodology used is Granger causality and Vector Autoregressive (VAR). It provides a conclusion that the Egyptian exporting Granger causes its GDP growth in Egypt and there is no Granger causality between exports and capital formation. Such results were obtained from the impulse response functions (IRF) that shows that GDP responds positively to changes in exports.

Tuhepaly (2006) before the conflict in Maluku, fisheries sector from year to year has occupied the top position of the structure of commodity exports and non-oil manufacturing industries. In 1997, this sector could provide share and penetrate 80% numbers. This contribution has a large impact on increasing the GDP. In addition, diversified markets make this sector continuously increase in both export volume and revenue. Maluku was no longer relying on traditional markets, but was the expansion of market segmentation, as the main infrastructure in East Asia, especially Japan.

Sodik (2008) with the Indonesian case study examines the determination of investment by the panel data approach. The conclusion was that one of the variables of economic openness that has a very significant effect on investment climate. For another thing, Ardiarini (2008) conducted a study on the analysis of causality between economic growth and government investment in East Java, period 1975-2005, using the estimated VAR.

The results revealed that between economic growth and the growth of government investment have jointly determined the relationship, the policy implications of the reciprocal relationship between investment rates and income levels are making projections on an annual investment needs and economic growth. By holding the assumption that the reciprocal relationship occurs, the investment in making the projections must take into account the variables of economic growth.

RESEARCH METHOD

The data that used is time series data during the period of 1990-2009, which were obtained from the Department of Marine and Fisheries at Maluku Province. Research was conducted using the method of Vector Autoregressive (VAR). VAR is commonly used for projecting coherent variables time series system and analyzing the dynamic effects of disturbance factors inherent in the system variables. The advantages of the VAR analysis are: (a.) This method is simple, no need to differentiate between endogenous variables, where the exogenous variables, (b.) a simple estimate, which the OLS method can be applied to each equation separately; (c.) Results estimates (forecasts) obtained by using this method in many cases is better than the results obtained using a complex simultaneous equation model though. In addition, the VAR analysis is also a very useful analytical tool, both in understanding the reciprocal relationship (interrelationship) between economic variables and in the formation of structural economic model.

To understand the VAR analysis, it can be described a simple two-variable system (the simple vicariate system) as follow: (Enders, 1995:295)

$$y_t = b_{10} - b_{12}z_t + \gamma_{11}y_{t-1} + \gamma_{12}z_{t-1} + \varepsilon_{yt} \tag{1}$$

$$z_t = b_{20} - b_{21}y_t + \gamma_{21}y_{t-1} + \gamma_{22}z_{t-1} + \varepsilon_{zt} \tag{2}$$

Both of these variables (y and z), an individual is directly affected by other variables, and indirectly by the interval value (lag) of each variable in the system. System of equations can be formed into a matrix notation as the following.

$$\underbrace{\begin{bmatrix} 1 & b_{12} \\ b_{21} & 1 \end{bmatrix}}_B \underbrace{\begin{bmatrix} y_t \\ z_t \end{bmatrix}}_{X_t} = \underbrace{\begin{bmatrix} b_{10} \\ b_{20} \end{bmatrix}}_{\Gamma_0} + \underbrace{\begin{bmatrix} \gamma_{11} & \gamma_{12} \\ \gamma_{21} & \gamma_{22} \end{bmatrix}}_{\Gamma_1} \underbrace{\begin{bmatrix} y_{t-1} \\ z_{t-1} \end{bmatrix}}_{X_{t-1}} + \underbrace{\begin{bmatrix} \varepsilon_{yt} \\ \varepsilon_{zt} \end{bmatrix}}_{\varepsilon_t} \tag{3}$$

$$Bx_t = \Gamma_0 + \Gamma_1 x_{t-1} + \varepsilon_t \tag{4}$$

By multiplying the inverse of B (B^{-1}) in matrix notation above, the model will be obtained:

$$x_t = B^{-1}\Gamma_0 + B^{-1}\Gamma_1 x_{t-1} + B^{-1}\varepsilon_t = A_0 + A_1 x_{t-1} + e_t \tag{5}$$

or in the form of bivariate equations:

$$y_t = \alpha_{10} + \alpha_{11}y_{t-1} + \alpha_{12}z_{t-1} + e_{1t} \quad (6.a)$$

$$z_t = \alpha_{20} + \alpha_{21}z_{t-1} + \alpha_{22}y_{t-1} + e_{2t}, \quad (6.b)$$

where:

y_t = Export in the year t

z_t = Investment in the year t

y_{t-1} = Export in the year $t-1$

z_{t-1} = Investment in the year $t-1$

b_{10}, b_{20} = constants

e_{1t}, e_{2t} = error term

The two equations (e.g. 6) shows that the two economic variables are observed, namely, exports and investment, influence one another. For example, exports in year t (y_t) is influenced by the export of the previous period (y_{t-1}) and by investment in the previous period (z_{t-1}) in equation of 6.a. Similarly, investment in year t (z_t) is influenced by investments in the previous year (z_{t-1}) and exports the previous year (y_{t-1}) in equation of 6.b.

Coverage Stage VAR Analysis

Essentially, VAR analysis includes the following stages.

Unit Root Test

This unit root test is used to see whether the data observed are stationary. This is only as a complement of VAR analysis, as the end goal of VAR analysis. This it is to assess the reciprocal relationship between the observed variables, but not to test for data. However, if the observed data is stationary, this will increase the accurate from VAR analysis. Since the mean and variance are constants and the covariance between Δy_t and Δy_{t-s} depends solely on s , the $\{\Delta y_t\}$ sequence which is stationary. Mathematically, time series is stationary if it satisfies the conditions: (Enders, 1995:177)

$$\text{Mean} = E(\Delta y_t) = E(\alpha_0 + \varepsilon_t) = \alpha_0 \quad (7)$$

$$\text{Variance} = \text{Var}(\Delta y_t) \equiv E(\Delta y_t - \alpha_0)^2 = E(\varepsilon_t)^2 = \sigma^2 \quad (8)$$

$$\text{Covariance} = \text{Cov}(\Delta y_t, \Delta y_{t-s}) \equiv E[(\Delta y_t - \alpha_0)(\Delta y_{t-s} - \alpha_0)] = E(\varepsilon_t \varepsilon_{t-s}) = 0 \quad (9)$$

Time series data is said non stationary when the data stationary conditions are not met. Unit root test is to test the degree of

integration as a test is used to determine stationary time series data. This is done because the data to be stationary is a must in the dynamic model. The consequences of non stationary data can lead to the emergence of these spurious regressions in a model. (Insukindro, 1993; Thomas, 1997). Unit root test using Augmented Dickey Fuller test (ADF) with a formulation as follows: (Enders, 1995:222)

$$\Delta y_t = \gamma_{t-1} + \sum_{i=2}^p \beta_i \Delta y_{t-i+1} + \varepsilon_t \quad (10)$$

$$\Delta y_t = \alpha_0 + \gamma_{t-1} + \sum_{i=2}^p \beta_i \Delta y_{t-i+1} + \varepsilon_t \quad (11)$$

$$\Delta y_t = \alpha_0 + \gamma_{t-1} + \alpha_2 t + \sum_{i=2}^p \beta_i \Delta y_{t-i+1} + \varepsilon_t, \quad (12)$$

where:

y = observed variables

Δy_t = $y_t - y_{t-1}$

t = time trend

If the results of the ADF test statistics have an absolute value greater than the MacKinnon critical value, the observed data will show the stationary. When the absolute value of the ADF statistic is smaller than the critical value, it indicates that data are not stationary.

Hypothesis Testing

Hypothesis testing, consisted of:

a. Likelihood Ratio Test

Test determination of optimal lag is choosing the lag length in which it attempt to determine whether the lag is long enough to fully capture the dynamics that are modeled. In practice, it can restrict the size of lag that will be less than ideal as given in the dynamic model. Test used in determining the optimal lag is Log L, RL, FPE, AIC, SIC and HQ.

b. Granger Causality Test

This test is to see whether an independent variable improves forecast performance of the dependent variable. This uses Granger Causality test. In identifying one variable as the dependent variable (Y) and other variables as independent variables (X), It can

goes on to make an implicit assumption that changes in independent variables will cause changes in the dependent variable. This is the idea of the concept of causality in which information about X is expected to affect the future value of the state distribution of Y .

Granger causality test model which is used as follows:

Model (1)

$$EX_t = a_0 + a_1 EX_{t-1} + a_2 I_{t-1} + \varepsilon_t \quad (13.a)$$

Model (2)

$$I_t = b_0 + b_1 I_{t-1} + b_2 EX_{t-1} + \varepsilon_t \quad (13.b)$$

Based on the results of the regression equation (13.a) and (13.b), can be distinguished four cases of causality.

1. Unidirectional causality from EX_{t-1} to I_{t-1}
2. Unidirectional causality from I_{t-1} to EX_{t-1}
3. Feedback or bilateral causality, occurs if the coefficient of the past from export (EX_{t-1}) and investments (I_{t-1}) is not statistically equal to zero in the both of regression equation above ($b_2 \neq 0, a_2 \neq 0$).
4. Independence, occurs when the coefficient of the past from export (EX_{t-1}) and investments (I_{t-1}) is statistically equal to zero in the both of regression equation above ($b_2 = 0, a_2 = 0$).

Innovation Accounting

The purpose of this test is to test the dynamic structure of the system variables in the model which have been observed, as reflected by the variables of innovation. In other words, this test is a test of the variables of innovation. This test consists of:

a. Impulse Respons

To see the direction of the relationship and the influence of turbulence effects (shock) a variable standard deviation of innovations to the current value and the future value of endogenous variables included in the model which was observed by dynamic structural VAR.

b. Cholesky Decomposition

Cholesky decomposition or it is also known as variance decomposition which provides information about the variables that are relatively more important innovations in VAR. This test is basically another method to de-

scribe the dynamic system contained in the VAR. This test is used to compile estimates error variance of a variable that is how big the difference between the variance before and after the shock, both shock that comes from themselves as well as the shock of the other variables.

If the impulse response functions to track the effects of a shock occurred on the endogenous variables in the system, the variance decomposition separates the variants that exist in the endogenous variables into components of shock on the endogenous variables in the VAR. The procedure is done by measuring the percentage of shocks for each variable, for example in case of shock on the export of fishery, the changes can be explained by how many percentage of exports fishery itself and how many percentage more on its investments. Primarily according to Sims (1982), variance decomposition shows the strength of Granger causality relationships that may exist between the variables. In other words, if a variable explains a larger portion of the forecast error variance of another variable or vice versa, indicating the strong Granger causality relationship. If the forecast error of the n-period can be expressed in the equation: (Enders, 1995:311)

$$Y_{t+n} - E_t Y_{t+n} = \theta_{11}(0)\varepsilon_{yt+n} + \theta_{11}(1)\varepsilon_{yt+n-1} + \dots + \theta_{11}(n-1)\varepsilon_{yt+1} + \theta_{12}(0)\varepsilon_{zt+n} + \theta_{12}(1)\varepsilon_{zt+n-1} + \dots + \theta_{12}(n-1)\varepsilon_{zt+1} \quad (14)$$

Denote the variance of the n-step ahead forecast error variance of y_{t+n} as $\sigma_y(n)^2$

$$\sigma_y(n)^2 = \sigma_y^2[\theta_{11}(0)^2 + \theta_{11}(1)^2 + \dots + \theta_{11}(n-1)^2] + \sigma_z^2[\theta_{12}(0)^2 + \theta_{11}(1)^2 + \dots + \theta_{11}(n-1)^2] \quad (15)$$

The proportions of $\sigma_y(n)^2$ due to shock in the $\{\varepsilon_{yit}\}$ and $\{\varepsilon_{zit}\}$ sequence are

$$\frac{\sigma_y^2[\theta_{11}(0)^2 + \theta_{11}(1)^2 + \dots + \theta_{11}(n-1)^2]}{\sigma_y(n)^2} \quad (16.a)$$

and

$$\frac{\sigma_z^2[\theta_{12}(0)^2 + \theta_{11}(1)^2 + \dots + \theta_{11}(n-1)^2]}{\sigma_y(n)^2} \quad (16.b)$$

Forecast error variance decomposition describes the proportion of the movement is a sequence due to its "own" shocks versus shocks to the other variable.

Table 1
Stationary Test

Variable	ADF Stats. (level = I_0)			ADF Stats. (1 st difference = I_1)		
	None	Intercept	Trend & Intercept	None	Intercept	Trend & Intercept
Ex	0.75382	0.67707	3.07929	3.96021***	4.60143***	4.80570***
I	2.06677*	1.17586	0.75962	1.97927**	2.78550**	3.74018**

Source: the data processed

Description: *** significant 1%; ** significant 5%; * significant 10% (*McKinnon critical value*)

Table 2
Optimal Lag

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-521.9932	NA	7.54E+27	69.86576	69.96017	69.86476
1	-503.2237	30.03117	1.06E+27	67.89650	68.17972	67.89348
2	-496.1742	9.399397	7.39E+26	67.48989	67.96193	67.48486
3	-494.6566	1.618742	1.14E+27	67.82088	68.48173	67.81384
4	-484.7757	7.904772	6.46E+26	67.03675	67.88642	67.02770
5	-437.7179	25.09747*	3.22E+24*	61.29572*	62.33419*	61.28466*

Source: the data processed (* indicates lag order selected by the criterion; LR: sequential modified LR test statistic (each test at 5% level); FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion)

DATA ANALYSIS AND DISCUSSION

Stationary Test

Unit root test results on the variables used in this analysis are shown in Table 1. Stationary test result indicates that the variable is not stationary in level (I_0) because the absolute value of the ADF statistic is smaller than critical absolute value. The next step for stationary is first difference (I_1) in which the results can be seen in Table 1 column 5. The results showed that all variables are stationary. It was seen from the absolute value of the ADF statistics are greater than the absolute critical values, each at a significance level of 1 percent and 5 percent. Thus, the model used in VAR is different because stationary in the first is also different.

Determination of Optimal Lag

Results by using the method of determining the optimal lag Log L, LR, FPE, AIC, SC, and HQ is shown in Table 2. Optimal lag in this research is VAR with lag 5, it can be seen from the value of LR, FPE, AIC, SC and HQ are marked *, which means the order (lag) in the VAR equation has the smallest value.

Granger Causality

Results of Granger causality test is done by determining the number of lags based on the minimum value as the basis for determining the amount of lag to the causality between exports and investment are presented in Table 3. Based on Table 3, it shows that in models 1 and 2 (Eq. 6.a and 6.b) in the variables studied, the lag 1-4 going in one direction in which the relationship is statistically significant where investment variable affects export variables. Two-way relationship occurs at lag 5, where exports and investment are statistically significant influence to each other. This condition can be explained that the investment represents an important variable in the analysis of export expansion policies and instruments in promoting economic growth in the Maluku, particularly fisheries sector.

Estimation Using Vector Autoregression (VAR)

Results of VAR between exports and investment are presented in Table 4. It can be seen that each variable in the past is not significant both on themselves and on other

Table 3
Result of Granger Causality Test

Lags	Variable	F-statistic	Probability	Sig. Level
1	I does not Granger cause Ex	33.1115	3.0E-05	significant
	Ex does not Granger cause I	0.00074	0.97858	not significant
2	I does not Granger cause Ex	23.0194	5.3E-05	significant
	Ex does not Granger cause I	1.39423	0.28276	not significant
3	I does not Granger cause Ex	9.09091	0.00331	significant
	Ex does not Granger cause I	0.17483	0.91099	not significant
4	I does not Granger cause Ex	11.3069	0.00355	significant
	Ex does not Granger cause I	0.64684	0.64672	not significant
5	I does not Granger cause Ex	22.0742	0.00517	significant
	Ex does not Granger cause I	9.96969	0.02237	significant

Source: the data processed

Table 4
Vector Autoregression Result

Vector Autoregression Estimates		
Standard errors in () & t-statistics in []		
	EX	I
EX(-1)	0.111434 (0.33265) [0.33499]	-4015.622 (6189.64) [-0.64877]
EX(-2)	-1.098122 (0.31531) [-3.48262]	11062.54 (5867.10) [1.88552]
EX(-3)	0.253706 (0.55695) [0.45552]	-11272.29 (10363.3) [-1.08771]
EX(-4)	-2.720998 (0.58904) [-4.61935]	-22380.91 (10960.4) [-2.04198]
EX(-5)	0.453385 (0.90732) [0.49970]	-21033.08 (16882.6) [-1.24584]
I(-1)	7.12E-05 (1.1E-05) [6.70727]	0.816791(0.19751) [4.13541]
I(-2)	8.67E-05 (3.3E-05) [2.60770]	0.516824 (0.61859) [0.83549]
I(-3)	-0.000100 (3.9E-05) [-2.58486]	-0.033803 (0.72039) [-0.04692]
I(-4)	0.000178 (4.4E-05) [4.05387]	0.159774 (0.81623) [0.19575]
I(-5)	2.06E-05 (6.8E-05) [0.30463]	3.459825 (1.25900) [2.74808]
C	229879.8 (125623.) [1.82992]	1.94E+09 (2.3E+09) [0.82835]
<i>R-squared</i>	0.992635	0.993522
<i>Adj. R-squared</i>	0.974221	0.977328
<i>Sum sq. resids</i>	8.84E+08	3.06E+17
<i>S.E. equation</i>	14863.51	2.77E+08
<i>F-statistic</i>	53.90786	61.34956
<i>Log likelihood</i>	-155.4709	-302.9404
<i>Akaike AIC</i>	22.19612	41.85872
<i>Schwarz SC</i>	22.71535	42.37795
<i>Mean dependent</i>	210816.9	2.76E+09
<i>S.D. dependent</i>	92573.96	1.84E+09
<i>Determinant Residual Covariance</i>		1.07E+24
<i>Log Likelihood (d.f. adjusted)</i>		-457.5442
<i>Akaike Information Criteria</i>		63.93923
<i>Schwarz Criteria</i>		64.97771

Source: the data processed

variables. For example, from the export as dependent variable for the variable *EX* (-2) and *EX* (-4) significantly affects itself and the variable *I* (-1), *I* (-2), *I* (-3) and *I* (-4) significant effect on exports. Yet, the de-

pendent variable is investments, variable *EX* (-2), *EX* (-3), *EX* (-4) and *EX* (-5) significantly affects the investment and *I* (1) and *I* (-5) significantly affects itself.

If the export is the dependent variable,

investment is the most influential while if the investment is dependent then the most influential is export. Thus, the hypothesis that there is a bilateral causal relationship between two variables observed, namely variable of fishery exports and investment in fisheries which are proved to be true that there is a reciprocal relationship.

Impulse Response Function (IRF)

Impulse response is one of estimation tools in VAR that is the most important. IRF is the response of the dependent variable when getting shocks/innovation of the independent variables at 1% standard deviation. IRF calculation results are presented in Table 5.

From the results of tests conducted IRF, it can be seen that one standard deviation from fishery exports is totally at 23900.93. This brings immediate effect on fishery investment variable in the first period at 16498.22. After one period, the standard deviation of exports reaches at 47029.23 above average, and this has impact on increasing the standard deviation of the vari-

able investment at 67656.73 fisheries above average.

In the other side, one standard deviation of the variable investment is of 7.97E+08 causing a positive effect on the export variable of 5.50E+08. In the second period the standard deviation, the variable investment is at 8.78E+08 above the average standard deviation, causing an increase in exports to 6.45E+08 above averages.

Thus, if examined more deeply, the shocks that occur with the arrival of new information in D (EX) will affect both the D (EX) itself, or against the D (I) and as vice versa. The shocks that occurs with the arrival of new information in D (I) will have an impact both on D (I) itself and to D (EX). When displayed in graphical form, it will present that impulse response function tends to be an explosive move in response to the shock by bringing the large dynamic effects that can be described as in Graph 2.

Cholesky Decomposition

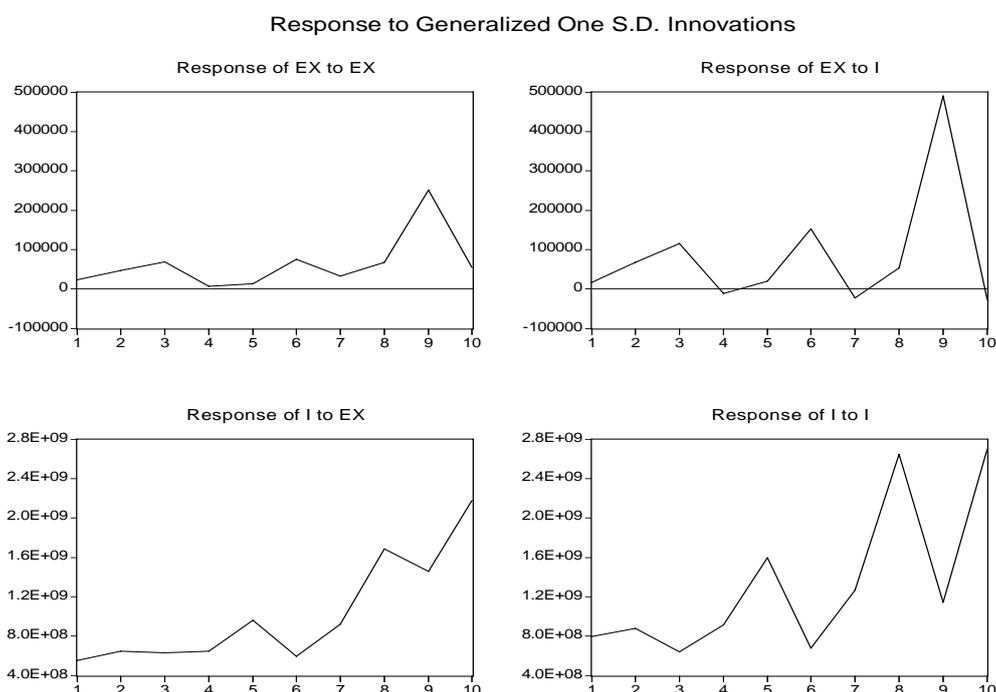
Cholesky Decomposition (variance decom

Table 5
Impulse Response Result

Period	EX	I
Response of EX:		
1	23900.93	16498.22
2	47029.23	67656.73
3	68179.45	114868.2
4	6711.703	-10846.01
5	13150.99	19370.96
6	75585.00	152609.9
7	32998.19	-23084.66
8	67851.93	53318.46
9	250786.8	489739.3
10	54610.95	-27029.15
Response of I:		
1	5.50E+08	7.97E+08
2	6.45E+08	8.78E+08
3	6.29E+08	6.42E+08
4	6.45E+08	9.15E+08
5	9.59E+08	1.60E+09
6	5.95E+08	6.79E+08
7	9.22E+08	1.27E+09
8	1.69E+09	2.65E+09
9	1.46E+09	1.14E+09
10	2.18E+09	2.70E+09

Source : the data processed

Graph 2
Impulse Response Function of Export and Investment



position) procedure is to measure the percentage of shocks for each variable, as shown in Table 7.

Cholesky decomposition, show the results that in the first period of the forecast, error variance of *EX* can be explained by *EX* itself at 100% while it can also be explained by *I* at 0%. In the second period of the forecast, error variance can be explained by *EX* itself at 54.1% while it can also be explained by *I* at 45.9%. Up to ten periods ahead, forecast of error variance can be explained by the *EX* at the last year decreasing by 26.5% and that can be explained by *I* at 73.4%. These results conclude that the fluctuations of the *EX* significantly are affected by the *EX* and *I* (*ceteris paribus*).

On the other hand, in the first period, forecast of error variance of *I* can be explained by *I* itself at 81.92% and it is affected by *EX* at 18.08%. In the second period, forecast of error variance of *I*, can be explained by *I* itself decreasing at 81.79%. This can be explained by *EX* increasing to 18.21%. Until the next ten year period, forecast of error variance can be explained by *I*

fluctuating during the last year at 44.5% and that can be explained by *EX* at 55.5%. These results conclude that the fluctuations of *I* are significantly affected by *I* and *EX* (*ceteris paribus*).

The findings indicated that exports of fishery variables can be explained by the investment variable with share of fishery exports nearing its won portion. In the event of shocks in the export of fishery, the changes can be explained by the percentages of exports of fishery itself and the percentages of the investment. The point of variance decomposition indicates the strength Granger causality relationship that may exist between the variables. In other words, if a variable explains a larger portion of the forecast of error variance of another variable or vice versa, it indicates the strong relationship Granger causality. Graph 3 describes the portion of forecast error variance.

Economic Analysis

As in Granger causality test, it can be concluded that there is a one-way causality from fishery investment to fishery export from

time lag 1 - lag 4, two-way causality occurs at lag 5, where exports and investment significantly affect each other. When investment the fisheries sector increases, it has an impact on improving the macro economic activities of real sector and business. Increased economic activity will bring the effect of increasing the volume of fisheries production, and it will also encourage increased exports of fishery. This has the effect of increased investment on exports after a period of two years.

Impulse response function shows dynamic behavior responses of variable dependent if there is a shock from independent variable. If there is a shock at investment hence the export variable will give responses in the first year, seen from the result analysis that positive movement from investment will affect positive also to improvement export and negative shock at the period 4th, 7th and 10th from variable of investment effecting negative movement to the fishery exporting.

If there is a shock at variable of export

fishery, it will affect responses of investment variable, at the period 6th that can be seen as negative responses of variable of investment because of the effect of existence of shock of export fishery. It refers that that dynamic behavior of variable export and variable of investment tend to have their own movement, namely if one of the variable e.g., export or investment is progressively improved by its quality and quantity, the other variable will also improve.

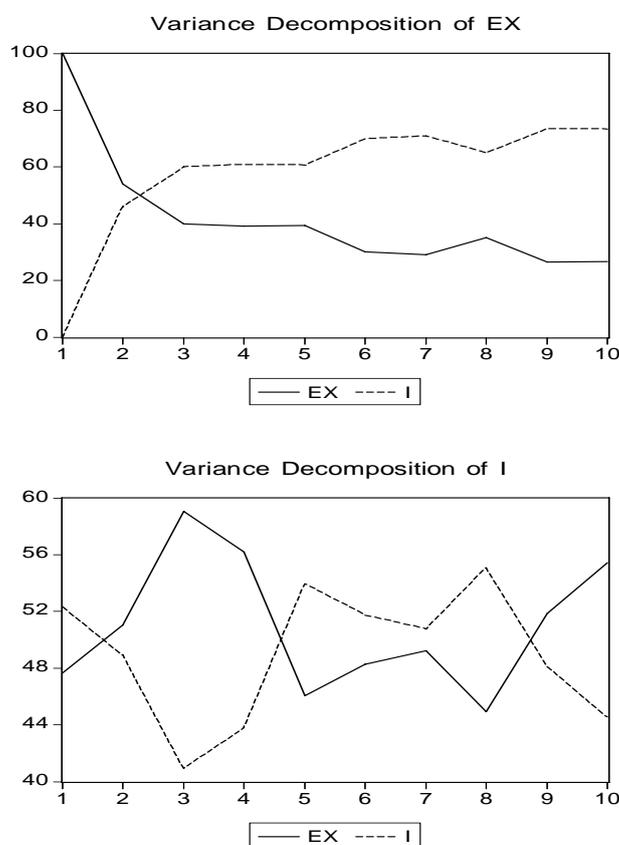
Yet, the results of variance decomposition show dynamic impact of responses each variable if there is a shock from its own variable and also from other variable. Shock from export variable in the early the period is given responses by itself. But, investment variable has no response. The variable of investment happens after the first period with percentage which increases and even its own value is larger compared with export. This means that shock to exporting of fishery can be explained by investment variable which is bigger than export. If shock from

Table 7
Cholesky Decomposition Result

<i>Period</i>	S.E.	EX	I
<i>Variance Decomposition of EX:</i>			
1	23900.93	100.0000	0.000000
2	71755.79	54.05051	45.94949
3	136306.3	39.99825	60.00175
4	138138.1	39.18057	60.81943
5	139490.0	39.31365	60.68635
6	210805.0	30.06956	69.93044
7	222587.8	29.16804	70.83196
8	232872.3	35.13825	64.86175
9	555536.8	26.55337	73.44663
10	565337.0	26.57387	73.42613
<i>Variance Decomposition of I:</i>			
1	7.97E+08	47.64797	52.35203
2	1.19E+09	51.03471	48.96529
3	1.37E+09	59.06446	40.93554
4	1.65E+09	56.17974	43.82026
5	2.31E+09	46.06314	53.93686
6	2.41E+09	48.25672	51.74328
7	2.72E+09	49.24653	50.75347
8	3.80E+09	44.91600	55.08400
9	4.08E+09	51.86709	48.13291
10	4.91E+09	55.44290	44.55710
<i>Cholesky Ordering: EX I</i>			

Source: the data processed

Graph 3
Cholesky Decomposition of Export dan Investment



variable of investment is providing direct responses by export of fishery with fluctuation, yet its own value provides difference compared with investment variable.

The results showed that the investment will increase the utilization of economic potential in which it can increase output exports. Thus, it can stimulate economic growth. Increased output exports in Maluku, particularly in the fisheries sector could stimulate the development of the economic climate. Thus, it can also push the investment. However, this relationship did not occur at the same time. This is in line with the research conducted by Wiwin (2008), Sodik (2005 and 2008) and Ardiarini (2008).

CONCLUSION, IMPLICATION, SUGGESTIONS, AND LIMITATIONS

The results provide some generalizations. One, there is a one-way causality from fishery to fishery export investment, two-way

causality occurs at lag 5, where exports and investment significantly affect each other. Secondly, the dynamic behavior from variable export and the investment variable has the same tendency of movement meaning that if one of variable of export or the investment increases, the other variable also increases as well. On the contrary, when one of the variables decreases, the other variable also decreases. Yet, the dynamic impact of responses of each variable indicates that investment variable has bigger and better responses towards the shock compared to export variable.

It is recommended that local governments should pay more attention to Maluku Province regional economy. In this case, the export of fisheries sector and the government policies should encourage investment (whether it is in the form of capital investment both domestic and foreign). This problem is due to the investment variable which

is quicker and better in giving stimulation and pushing the fishery as sub sector. By doing so, the local economy can grow much faster.

The estimation test adopted from Granger causality provides some conclusions. First of all, there is a one-way causality fishery from export to investment, two-way causality occurs at lag 5, where exports and investment significantly affect each other. Secondly, dynamic behavior from export variable and investment variable has the same tendency of movement. Thus, it means that if one of export variables or investment increases, the other variable also increase. On the contrary, when one of the variables decreases, the other ones also will decrease. Yet, the dynamic impact of the responses of each variable indicates that investment variable has a higher and better responses to the shock compared to export variable.

Based on such evidences, the implication and some suggestions of policy can be addressed as the following.

First, the investment in fishery sector has a higher and better responses than export (could be seen in the dynamics impact responses). Therefore, it implies that investment is more sensitive than export. If the government wants to raise the economic growth faster, investment is the best instrument to stimulate fishery. In other words, if the investment increases, export will increase too.

Second, the policy of commerce should be aimed more at the policy that could push the export growth. The policy can be in the form of giving incentive like facility credit, lowering the export taxes and deregulation of export bureaucracy.

Third, the government should improve the participation in negotiation agreement in tariff and subsidizing the export of fishery sector. Fourth, they should also improve flexibility of labor market through investment.

Fifth, the local governments should pay more attention to Maluku Province regional economy. In this case, they induce the ex-

port fisheries sector with government policies that encourages investment (whether in the form of capital investment both domestic and foreign) this matter because investment variable is quicker and better in giving stimulation and pushing in to the fishery sub sector so that local economy can grow faster.

However, this study embodies a limitation for example; it only involves two variables of macro economic so that the analysis may provide only export and investment analysis results. Thus, the next research can study more variables with different views. Model developed in this research can be price, total production, exchange rate, and labor.

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