

# VECTOR AUTO REGRESSION ANALYSIS BETWEEN EXPORT, ECONOMIC GROWTH, AND JOB OPPORTUNITY IN BANGKA BELITUNG ISLANDS PROVINCE

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## Abstract

**Purpose of the study:** The economic performance of Bangka Belitung Islands province has increased during the period of 2007-2016. This is marked by the increasing growth rate of Gross Regional Domestic Product (GRDP) measured at the constant price of 68 percent. These performance improvements should be accompanied by efforts to create job opportunities (for instance, by increasing exports) to boost the economic growth. The objective of the study was to examine and analyze the causality relationship between job opportunities, exports, and economic growth in the Bangka Belitung Islands province.

**Methodology:** This research used secondary data with Vector Auto Regression (VAR) analysis tool.

**Main Findings:** The test results indicated that job opportunities and exports are affected by job opportunity in the previous year (t-1). Furthermore, the results of the study show that in comparison to exports, job opportunity contributes more towards the economic growth.

**Implications:** This study implies that government may provide non-export oriented job opportunities in the province of Bangka Belitung Islands.

**Keywords:** *Export, Economic Growth, Job Opportunity, Vector Auto Regression.*

## INTRODUCTION

One indicator of the success of the development of a region or regions is determined by the economic growth of the area, in accordance with the statement of [Todaro and Smith \(2005\)](#) that economic growth is a process of increasing output over time and becomes an important indicator in measuring the success of development of a region or country. The economic growth is associated with an increase in production capacity, which is realized in the form of an increase in the income of a region. In line with [Afandi \(2014\)](#), who mentioned that economic growth is a total increase in the total output in the long run, the number of population growth is followed by changes in economic structure, regardless of the increase being smaller or greater. Some sources of the economic growth include exports and labor. High and low values of export and labor can be absorbed by job opportunities and becomes a factor of a region's rate of economic growth. Increased exports is a strategy that can be done by the government at both central and regional levels to accelerate economic growth, because a high export value is expected to increase production and then will be able to absorb labor, which ultimately impacts positive economic growth.

The average economic growth rate of Bangka Belitung Islands province was 5.09 percent during the period of 2011-2016. The rate of economic growth is strongly influenced by various factors, such as the contribution of leading sectors. The growth rate tends to increase when the role of the leading sector is towards the exports and the absorption of high workforce. In theory, it is said that exports can be a buffer in economic activity. The size of the contribution of exports in development should be driven by increased competitiveness of export products, market expansion for domestic production, expansion of the industrial production scale, and the increase will have an impact on the expansion of job opportunities.

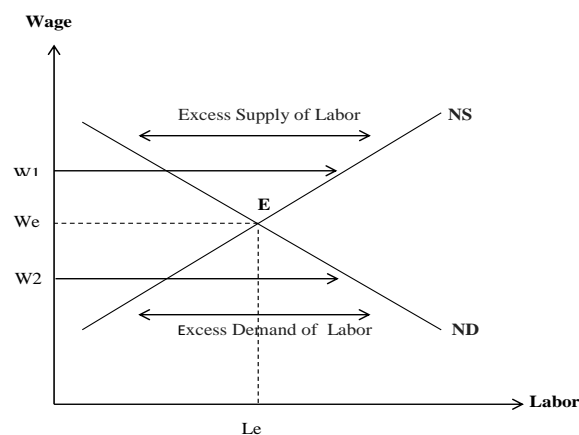
Export growth must be sustained by qualified human resources, quality, competence and specificity, and uniqueness to increase export competitiveness in international markets ([Coxhead and Li, 2008](#)). Other researchers [Ekayanake \(1999\)](#), [Aliman and Purnomo \(2001\)](#), [Ismail and Harjito \(2003\)](#), [Oiconita \(2006\)](#), and [Rachmadi and Ichihashi \(2011\)](#) indicate a link between exports and economic growth. However, the outcomes of the studies conducted by [Jung and Marshall \(1985\)](#) and [Ahmad and Harnhirun \(1995\)](#) do not show a strong relationship between the two. In addition, the breadth of the range and volume of exports to various countries allows an increase in the quantum of production that drives the high number of job opportunities to be absorbed and further affects the economic growth. The development of exports in the Bangka Belitung Islands province tends to fluctuate and even decreases from 2012 to 2016 by 26.7 percent. The decline in exports affects job opportunity and regional economic growth. The job opportunities decreased by 7.5 percent during the period of

2012-2016. Therefore, it is necessary to test the relationship between exports, economic growth, and job opportunity by using Vector Auto Regression.

## LITERATURE REVIEW

[Mankiw \(2003\)](#) argues that economic growth indicates the extent to which economic activity generates additional income for a given period. [Todaro and Smith \(2005\)](#) argues that at least three factors, namely, capital accumulation, population growth (which brings a growth in labor force), and technological advances, affect economic growth. While [Arsyad \(2010\)](#) mentioned that economic growth cannot be separated from the problems of population growth and job opportunity.

Keynes' opinion about job opportunity is the number of job opportunities available in the labor market in equilibrium. Equal job opportunities do not reflect actual job opportunities, because job in equilibrium is an interaction between the strength of demand and supply of labor. The neoclassical economic theory explains that the nature of labor supply in the economy is (1) The supply of labor increases if the wage rate increases. (2) Demand for labor decreases as wage rates increase ([Sukirno, 2011](#)). Based on the assumption that all parties have complete information about the labor market, the neoclassical theory assumes that the number of labor supply is always the same as the demand, as stated in the following figure.



**Figure 1:** Demand and Supply of Labor in the Economy

Source: Mankiw, 2000

The ND curve and NS curve show the demand and supply of labor in the economy. Point E is a balance point that shows the amount of placement or the number of people working (L) and wage level (W). If there is an imbalance between labor demand and supply, then there will be problems in the labor market. The balance achieved is seen by comparing a situation that applies to other wage levels, e.g., on W1 or W2. If the wage rate is W1, then the excess of work offer will be applied, which means that some of the workforce is unemployed. If the wage rate is W2, then the excess labor demand will be applied, which leads to an increase in wages, and eventually, there will be an excess supply of labor and reduced demand for labor.

Increased economic growth leads to an increase in job. In line with the studies of [Asmaria \(2013\)](#), [Wardana et al. \(2014\)](#), and [Hellen, Mintarti, and Fitriadi \(2017\)](#), which concluded that the economic growth variables on job have a positive and significant impact, the higher the economic growth, the higher will be the level of labor absorption.

[Salvatore \(1997\)](#) gave the view that the number of workers is helpful in the process of producing goods for export activities. Absolute benefit theory (absolute advantage) by Adam Smith explains the value of goods is measured by the amount of labor used to produce goods. The more the labor is used, the higher will be the value of goods (labor theory of value). While [Apridar \(2009\)](#) reveals that export is one of the supporting factors in stimulating the growth of a region and the undertaken export activities aim to increase the area's income. In other words, exports play an important role in the selection of economic development strategies and any changes in the number of exports will affect domestic products.

A review by [Monireh \(2014\)](#); [Sanika \(2015\)](#), [Maaruf and Wihastuti \(2008\)](#), [Yerimias \(2011\)](#), and [Fouad \(2005\)](#) points out that an increase in export capacity increases domestic product. This is because export activity is one component of aggregate expenditure and exports can affect the national income level to be achieved. If exports increase, aggregate expenditure grows higher and further stimulates the growth economy of a country.

[Bakari and Mabrouki \(2017\)](#) used Vector Auto Regression analysis and found that a strong evidence of two-way causality from both imports and exports to economic growth. These results provide evidence that exports and imports are therefore

seen as sources of economic growth in Panama. [Kalaitzi \(2013\)](#) examined the relationship between exports and economic growth in the United Arab Emirates during the period of 1980-2010. [Ajmi et al. \(2015\)](#) examined the causal relationship between exports and economic growth using the Granger linear and nonlinear causality test. This study uses South Africa's annual data on real exports and real gross domestic product from 1911-2011. The results of linear Granger causality do not show evidence of significant causality between exports and GDP. [Kim and Lin \(2009\)](#) examined the impact of exports on economic growth, which shows that not all exports contribute equally to economic growth. In particular, many developing countries rely on primary product exports, which are subject to excessive price fluctuations. [Abu Al Foul \(2004\)](#) tested the hypothesis of export growth in Jordan during the period of 1976-1997. [Awokuse \(2003\)](#) tested the hypothesis of export-driven growth using vector auto regression (VAR) analysis. [Crespo, Cuaresma and Worz \(2003\)](#) found that exports of manufactured products were less sensitive to cycle changes in the international market compared to exports of raw and semi-finished goods. The results of the studies conducted by previous researchers tested the cause and effect between exports and economic growth, which showed that economic growth helped explain changes in exports and exports accelerated the pace of economic growth in a region. [Turan and Karamanaj \(2014\)](#) tested the causal relationship between exports and economic growth in Albania using OLS and the results of the test showed that there was a causal relationship between the two variables.

In addition to testing the export variables on economic growth, some researchers also tested the import variables, using vector auto regression analysis, as did [Auro \(2014\)](#) in India, [Kojo \(2014\)](#) in Tunisia. The results of testing the study showed that there was a causal relationship between exports and economic growth and between imports and economic growth.

## METHODOLOGY

### Analysis Method

Research conducted is associated with the quantitative approach, which can serve to explain, predict, and control a symptom ([Sugiyono, 2007](#); [Gujarati, 2005](#)). This study uses secondary time series data with annual observation period from 2007 to 2016, obtained from BPS data. The variables used are export, economic growth, and job opportunity, as measured from GDP at constant prices. The approach used in this research is Vector Auto Regression developed by [Stock and Watson \(2001\)](#). The model analysis framework provides systematic information and is able to estimate the information in equations formed from the time series data; in addition, the estimation tools in the VAR model are interpretable and easy to use. In the VAR analysis, all variables are assumed as endogenous variables ([Widarjono, 2013](#)).

The data used in this study are summarized in Table 1.

**Table 1:** Economic Growth, Job Opportunity, and Export

Year	Economic Growth	Job Opportunity	Export
2006	9053553	431328	1068689300
2007	9464539	475006	1254435200
2008	9899926	494655	2035957500
2005	8707309	446174	955344100
2009	10270106	506284	1269859000
2010	10884947	585136	1787482258
2011	11587749	589634	2833010873
2012	12251022	583102	1761478700
2013	12905012	596786	1596414100
2014	13507148	604223	1653122000
2015	140583366	623949	1191059400
2016	14636811	539662	1290658000

Source: BPS, 2018

Stages of analysis in this study using unit root testing of export variables, economic growth, and job opportunity, then lag length criteria in determining the length of export lag, economic growth and job opportunity, the third stage is the Granger causality testing by forming the causality model as follows:

$$\text{Ext} = \sum a_i \text{Ext}_{-i} + \sum b_i \text{Pe}_{-j} + \sum c_i \text{Kk}_{-k} + \text{uit} \quad (1)$$

$$\text{Pet} = \sum d_i \text{Ext}_{-i} + \sum e_i \text{Pe}_{-j} + \sum f_i \text{KK}_{-k} + \text{uit} \quad (2)$$

$$\text{Kkt} = \sum g_i \text{Ext}_{-i} + \sum h_i \text{Pe}_{-j} + \sum j_i \text{KK}_{-k} + \text{uit} \quad (3)$$

Information:

- Ext = Export year t
- Ext-I = Exports of previous year i
- Pet = Economic Growth year t

- Pet-j = Economic Growth of the previous year j-j
- KKt = Year job opportunity t
- KKt-k = job opportunity in the previous year ke-k
- ai, bi, ci, di, ei, fi, gi, hi, ii = constants
- uti = Interruption factor

The next test used vector auto regressive (VAR) testing to obtain the projection model for predicting the future period of export, economic growth, and job opportunity in the province of Bangka Belitung. If the causality test results in equations (1), (2), and (3) show the interplay relationships, then the VAR model will be as follows:

$$PEt = a1 + PEt-n + a2EXt-n + a3KKt-n + et1 \tag{4}$$

$$EXt = a10 + PEt-n + a12EXt-n + a13 KKt-n + et2 \tag{5}$$

$$KKt = a20 + PEt-n + a22EXt-n + a23KKt-n + et3 \tag{6}$$

Information:

- PEt = Economic growth rate in year t
- EXt = Export value in year t
- KKt = Job opportunity in year t
- PEt-n = Economic growth rate in year t-n
- EXt-n = Export value in year t-n
- KKt-n = Job opportunity in year t-n
- a1, a10, a20 = Constants
- et1, et2, et3 = residual / error factors (error terms)

In general, the results of causality testing through the Granger Causality test can be seen in Table 2:

**Table 2:** Causality Test Results

Pairwise Granger Causality Tests  
 Date: 04/27/18 Time: 21:58  
 Sample: 1 12  
 Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
Job opportunity does not granger cause GRDP	10	1.22754	0.3684
GRDP does not granger cause job opportunity		4.79977	0.0686
Export does not granger cause GRDP	10	1.29200	0.3529
GRDP does not granger cause export		0.20624	0.8202
Export does not granger cause job opportunity	10	0.79437	0.5017
Job opportunity does not granger cause export		9.25513	0.0209

Source: Processed data, 2018

It can be noticed in Table 2 that among each of the variables used in the study, namely exports, economic growth, and employment opportunities, no causality relationship can be seen from the probability value greater than the value of  $\alpha = 0.05$ . Furthermore, the results of the Vector Auto Regression test can be seen in Table 3.

Based on information from Table 3, the equations of the VAR test can be formulated as follows:

$$PDRB = -0.804072 PDRB1_{t-1} + 65.56974 PDRB2_{t-2} - 531.5440 KK1_{t-1} - 545.0049 KK2_{t-2} + 0.022144 \text{ Export } 1_{t-1} - 0.020112 \text{ Export } 2_{t-2} - 90176926$$

$$\text{Job Opportunity} = -0.000813 PDRB1_{t-1} - 0.003344 PDRB2_{t-2} + 0.805512 KK1_{t-1} + 0.129080 KK2_{t-2} - 2.90 \text{ E} - 06 \text{ Export} + 1.51 \text{ E} - 05 \text{ Export } 2_{t-2} + 128134.1$$

$$\text{Export} = -1.549996 PDRB1_{t-1} + 780.3155 PDRB2_{t-2} + 22323.15 KK1_{t-1} - 1457.671 KK2_{t-2} - 0.683457 \text{ Export } 1_{t-1} - 0.058869 \text{ Export } 2_{t-2} - 87948443$$

After testing by Vector Auto Regression, the variables were then analyzed by an impulse response. The impulse response is one of analysis in VAR to know the response of endogenous variable in VAR system caused by shocks or change in interference variable. In addition to the impulse response, the VAR model also provides forecast analysis of decomposition of variance error, which is often called variance decomposition. This analysis provides a different method of describing the dynamic VAR system than the previous impulse response analysis. The analysis of variance decomposition describes the

**Table 3:** Results of the Vector Auto Regression test

Vector Auto regression Estimates

Date: 04/27/18 Time: 21:41

Sample (adjusted): 3 12

Included observations: 10 after adjustments

Standard errors in ( ) & t-statistics in [ ]

	GRDP	Job Opportunity	Export
GRDP(-1)	-0.804072 (0.45936) [-1.75043]	-0.000813 (0.00029) [-2.78710]	-1.549996 (1.61937) [-0.95716]
GRDP(-2)	65.56974 (53.2479) [ 1.23141]	-0.003344 (0.03383) [-0.09886]	-780.3155 (187.715) [-4.15691]
Job Opportunity (-1)	-531.5440 (652.342) [-0.81482]	0.805512 (0.41440) [ 1.94380]	22323.15 (2299.71) [ 9.70695]
Job Opportunity(-2)	-545.0049 (1293.86) [-0.42122]	0.129080 (0.82192) [ 0.15705]	-1457.671 (4561.26) [-0.31958]
Export (-1)	0.022144 (0.05953) [ 0.37195]	-2.90E-05 (3.8E-05) [-0.76736]	-0.683457 (0.20988) [-3.25648]
Export (-2)	-0.020112 (0.04355) [-0.46182]	1.51E-05 (2.8E-05) [ 0.54593]	-0.058869 (0.15353) [-0.38344]
C	-90176926 (1.7E+08) [-0.53727]	128134.1 (106621.) [ 1.20177]	-87948443 (5.9E+08) [-0.14864]
R-squared	0.684315	0.921300	0.973546
Adj. R-squared	0.052945	0.763901	0.920639
Sum sq. resids	4.73E+15	1.91E+09	5.87E+16
S.E. equation	39691866	25214.24	1.40E+08
F-statistic	1.083857	5.853257	18.40100
Log likelihood	-183.1361	-109.5212	-195.7358
Akaike AIC	38.02722	23.30423	40.54715
Schwarz SC	38.23903	23.51604	40.75896
Mean dependent	24599063	559843.7	1.67E+09
S.D. dependent	40786258	51891.77	4.97E+08
Determinant resid covariance (dof adj.)		1.55E+40	
Determinant resid covariance		4.17E+38	
Log likelihood		-487.2016	
Akaike information criterion		101.6403	
Schwarz criterion		102.2757	

Source: processed data, 2018

relative importance of each variable in the VAR system due to the shock. Variance decomposition is useful for predicting the percentage contribution of each variable due to changes in certain variables within the VAR system ([Widarjono, 2013](#)).

### Definitions of Operational Variable

- In this study, exports are the export value of the province of Bangka Belitung Islands from 2007 to 2016.
- In this study, economic growth is the relative change in real value of GRDP in the province of Bangka Belitung Islands from 2007 to 2016, at constant prices of 2010.
- In this study, job opportunities are the availability of jobs to be filled in by job seekers or the number of laborers working from 2007 to 2016 in the province of Bangka Belitung Islands.

### DISCUSSION

In order to find out stationarity, a test on the unit root variable of exports, economic growth, and employment opportunities was carried out. Data is stationary if it has a mean value and constant average varies during observations, or if data is not too varied and tends to approach the average value. The test results on the degree of first difference. It is known that the export variable, stationary economic growth at the level of first difference, and unit root test results show the value of the

export ADF test value of 0.047  $< \alpha = (0.05)$ , Prob ADF test value of economic growth is 0.0010  $< \alpha = (0.05)$  and the Prob ADF value test of employment is equal to the second difference of 0.02  $< \alpha = (0.05)$ , which means that the export and economic growth variables are stationary at the first degree difference while employment opportunities are stationary on the second degree difference and can be seen in the following table.

**Table 4:** Results of the ADF Test Export variable

Null Hypothesis: D (EKSPOR) has a unit root

Exogenous: Constant

Lag Length: 1 (Automatic - based on SIC, maxlag=2)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.292734	0.0477
Test critical values:		
1% level	-4.420595	
5% level	-3.259808	
10% level	-2.771129	

Source: processed data, 2018,\*[MacKinnon \(1996\)](#) one-sided p-values.

Based on the Augmented Dicky Fuller test results, the export variable in Table 4 has a probability value of 0.047  $< \alpha = 0.05$ . Thus, this variable is stationary at the first difference and does not contain unit roots. The same results are also shown in Table 5 for the variable economic growth is also stationary at the first difference with a probability value of 0.0010  $< \alpha = 0.05$ , which means that this variable also does not contain the root unit.

**Table 5:** ADF Test Results for Economic Growth variables

Null Hypothesis: D (PDRB) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=2)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.002557	0.0010
Test critical values:		
1% level	-4.297073	
5% level	-3.212696	
10% level	-2.747676	

\*MacKinnon (1996) one-sided p-values.

A slightly different result occurs in the third variable in this study, namely, the stationary job opportunity variable on the second difference. The probability value in the Augmented Dicky Fuller test of the export variable in Table 6 obtained a probability value of 0.0284  $< \alpha = 0.05$ . This means that this export variable also does not contain unit roots based on the probability values shown in Table 6.

**Table 6:** Results of the ADF Test Job Opportunities variable

Null Hypothesis: D (Job Opportunities,2) has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=2)

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-3.662646	0.0284
Test critical values:		
1% level	-4.420595	
5% level	-3.259808	
10% level	-2.771129	

\*MacKinnon (1996) one-sided p-values.

## CONCLUSION

The results of the research show that there is no causality relationship among export, job opportunity, and economic growth. Testing using Vector Auto Regression (VAR) analysis shows that job opportunity variables are influenced by job opportunity variables at the time (t-1) and export variables are affected by job opportunity at the time (t-1). The available job opportunities are not due to the value of exports, but are caused by other fields that are not export-oriented but driven by economic growth.

Testing VAR analysis based on the variance decomposition for export and employment opportunities shows that job opportunities make a far better contribution to economic growth compared to the export variable. These results reflect that existing employment opportunities are not export-oriented but more job opportunities are available at non-export-oriented business fields, and an increase in the number of workers was absorbed due to the economic growth.

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