

## THE IMPACT OF MACROECONOMIC INDICATORS ON ECONOMIC GROWTH IN THE UNITED STATES AND INDONESIA: A COINTEGRATION TEST APPROACH

Antoni

*Economics Department, Bung Hatta University, Padang, Indonesia*

Corresponding Author: toni819975@gmail.com

**Abstract :** *The aim of this subject area is whether the impact of macroeconomic indicators on economic growth in the United States and Indonesia by using the cointegration approach. The variables used are Gross Domestic Product, Foreign Debt, Export and Foreign Direct Investment from 1998-2018. The analytical method used in this research is to apply the cointegration approach and the Vector Error Correction Model (VECM). The results show that, there is a strong long-term relationship between macroeconomic variables in the two countries. Therefore, a more active macro-economic policy is recommended in both countries, especially Indonesia. This also means that the government, especially the State of Indonesia, must make better management in the public sector that supports macroeconomic policies and other variables.*

**Keywords:** *cointegration, granger causality, growth, foreign direct investment, debt, export and impuls response.*

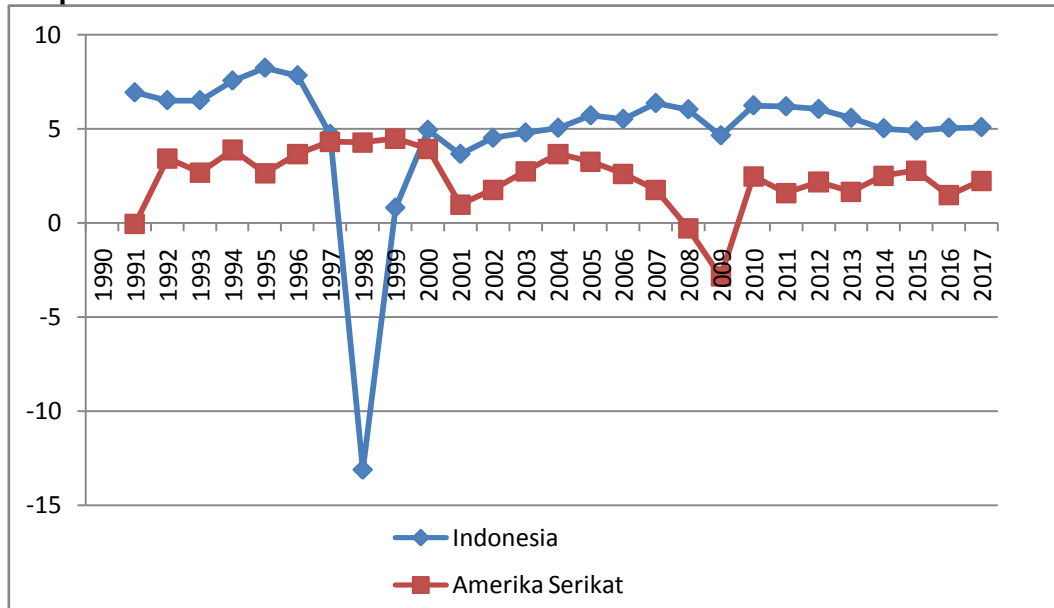
### A. INTRODUCTION

Economic growth for the two countries of the United States and Indonesia as illustrated in graph 1. Based on graph 1 we can see the value of GDP of Indonesia and the United States of America tends to increase. Both of these countries had experienced an economic crisis that affected the country's economy. In 1997 the Asian economic crisis had a huge impact on the Indonesian economy so that in the following year 1998 Indonesia experienced a monetary economic crisis so that the resulting GDP decreased by US \$ 428,759.4 million. In 2008 there was a global economic crisis that had a major impact on the economies of developed countries so that in 2008 the United States experienced an economic crisis that resulted in GDP produced in 2008 and 2009 fell during the crisis of US \$ 15,011,490.5 million and after the crisis fell again due to economic recovery of US \$ 14,594,842.2 million. Meanwhile, when the global economic crisis that occurred in 2008 did not really affect Indonesia's GDP, where Indonesia's GDP in 2008 increased by US \$ 679,403 million.

Indonesia and the United States GDP growth have fluctuated (fluctuated). Indonesia's lowest GDP growth occurred in 1998 with -13.1 percent. While the growth of United States GDP occurred in 2009 with -2.8 percent. But the economy during 1997 Indonesia had experienced a crisis namely the financial crisis and the global crisis in 2007-2008.

Economic growth in growing states such as Indonesia is relatively higher than economic growth in developed nations like the United States. In general, economic growth in developed countries is low because economic conditions are stable and almost all resources have been used optimally so that there is no significant increase in GDP. Another cause of low economic growth in developed countries is due to the high cost of human resources, as a result many companies in developed countries undertake outsourcing or diversion of work abroad, in developing countries where labor costs are low.

Graph 1. Real GDP Growth in Indonesia and the United States



Sources : World Bank, 2017

The Asian financial crisis will affect economic indicators such as foreign debt, exports and foreign direct investment which have an impact on the growth of government debt. Developing countries initially focused on foreign debt for development-related needs, such as investing in sophisticated capital equipment and increasing their capital or using it to build infrastructure that was deemed necessary to increase income and lead to economic growth (Ali et al., 2016). But Ayadi and Ayadi's research (2008) shows that foreign debt has a positive on GDP. This is because debt is an alternative funding source to increase economic development.

Based on the data, Indonesia's exports have fluctuated. The sharpest increase occurred in 2011 in the amount of US \$ 211,066.6 million dollars. The highest export value occurred in 2011 in the amount of US \$ 211,066.6 million dollars. While the sharpest decline occurred in 2009 of US \$ 125,322.1 million dollars.

Another case according to Korkmaz's (2015) view, said that most countries look for foreign debt when there is very little internal incentive to save. Therefore developing countries are looking for all possible ways to create savings to increase private investment, which then results in economic growth. Based on these problems, it is necessary to conduct a study of the impact of macroeconomic variables on economic growth in Indonesia and the United States using the cointegration test approach.

## B. LITERATURE REVIEW

Economic growth is influenced by the inflation rate as a study conducted by Fatmawati (2015), analyzing the effect of international trade and foreign debt on Indonesia's Gross Domestic Product (Period 1990 - 2010). Using the Error Correction Model (ECM), results that exports have a positive and significant influence on Indonesia's short-term and long-term GDP. Foreign debt in the short term has a negative and insignificant influence on Indonesia's GDP in the 1990-2010 period but in the long run has a positive and significant effect on GDP. However, research Antoni, Et al (2018), examined the relationship between trade liberalization and the composition of economic growth in Indonesia, Singapore and Thailand in the long run in 1995-2017 using the pooling method of data analysis by applying the GLS model of fixed effects. The results showed that there was an influence of economic openness on trade, domestic investment and foreign investment. This means that the structure of the composition of export and trade liberalization policies contributes to long-term economic growth.

Research Rifaqat., & Usman (2012) examined the relationship of foreign debt and economic growth in Pakistan in 1970-2020 in the long term and short term by considering GNP

as a function of annual education expenditure (proxy for human capital), capital, labor and external debt country. They found that foreign debt had a negative impact on economic growth. Emerenini and Nnanna (2015), using the Solow type neoclassical growth model. The results showed a nonlinear effect of debt on economic growth in Nigeria.

Jilenga (2016), examines the impact of foreign debt and foreign direct investment (FDI) on economic growth in Tanzania in 1971-2011 using the ARDL model. The results of the study show that debt will drive economic growth in Tanzania in the long run. However, foreign direct investment shows a negative impact on economic growth. In the short term, it is found that there is no causal relationship debt and economic growth.

The research of I Made Yudisthira and I Gede Sujana Budhiasa, (2012). Two Stage Least Square (TSLS) Method. The consumption and investment variables have a positive and significant effect on GDP, while the inflation variable has a positive but not significant effect on GDP. Bonokeling Research (2016), also explains that foreign debt partially has a positive and significant effect on GDP in the long term and short term.

The research of Zulkefly, A.K., et al (2006), examined the long-term relationship between total expenditure, income (tax and non-tax) and economic growth of ASEAN-5 countries, namely Malaysia, Indonesia, Thailand, Singapore and the Philippines. The result of variance decomposition shows that the strong influence on expenditure for state income namely Malaysia, Indonesia and the Philippines, which supports the income-expenditure hypothesis. Meanwhile, for Thailand and Singapore budget decisions are driven by the income side which supports the 'expenditure-income hypothesis'. In addition, public expenditure does not play a role in stimulating economic growth in Malaysia, Thailand, Singapore and the Philippines, except for Indonesia.

Researchers who study foreign direct investment (FDI) can also have a negative influence on economic growth in Indonesia and Tanzania (Malik and Kurnia, 2017; Jilenga, et al, 2016). However, several studies on the relationship of foreign debt and economic growth are different for each country. There are several countries producing research that foreign debt has a positive and significant effect on Indonesia's economic growth (Malik and Kurnia, 2017). However, several Indonesia case studies found that foreign debt also had a negative and significant effect on Indonesia's economic growth in the period 1996 - 2013 (Saputra and Kesumajaya, 2016).

Giirsoy's research (2012) empirically examines the impact of foreign direct investment (FDI) on Georgia's economic growth using the Engle-Granger cointegration method and the Granger causality test of the 1997-2010 period. His findings produce foreign direct investment which causes GDP in the country of Georgia. However, it is very important to understand the direction of causality between these two variables, to establish policies that will encourage private investors, especially in developing countries. In their findings the direction of causality going from FDI to GDP was confirmed in the case of Georgia.

Different research results revealed by Alfaro et al. (2008), concluded that FDI increases economic growth only in certain economic conditions, such as the threshold level of human capital. Acaravci and Ozturk (2012), examine the FDI-economic growth relationship. The findings can be generated that FDI can help developing countries through providing capital by creating new job opportunities, through technology, through the flow of managerial knowledge and marketing skills. Ozturk and Kalyoncu (2007) also say that there is a positive relationship between FDI inflows and growth provided that the recipient country has reached a minimum level of development in education, technology and or infrastructure.

Islam (2014) also examines the effect of FDI on the Bangladeshi economy using data from 1996 - 2010. He believes that FDI in Bangladesh plays an important role in achieving expected economic growth. The results show that FDI has a positive correlation with GDP, exports and private investment.

### C. METHODOLOGY

The research data examined consisted of data on gross domestic product, foreign debt, exports and foreign direct investment. Research data from 1998 to 2018 sourced from the World Bank. The study applies the cointegration-error correction model (ECM) approach. Tests for cointegration and causality between two or more variables are also applied in this analysis. This test requires the existence of a unit root test among the variables used by the Dicky and Fuller (1981) methods. The Akaike information criterion (AIC) determines the optimal lag specifications. For example  $GDP_t$  represents a series of economic growth, the null unit root hypothesis is tested using the ADF t-test. Test statistics,  $t_\sigma$ , are the usual t statistics for testing  $H_0: \sigma_1 = 0$  in the following equation:

$$\Delta \log GDP_t = \delta_0 + \delta_1 B \log GDP_t + \sum_{i=1}^k \theta_i B^i \Delta \log GDP_t + e_t \quad (1)$$

where,  $\Delta$  is the first difference,  $B$  is the lag operator,  $k$  shows the optimal lag based on AIC. The  $t_\sigma$  distribution does not follow the student-t distribution, but its empirical distribution is tabulated by McKinnon (1991). The rejection of the null hypothesis implies that the GDP proxy economic growth data is integrated at  $I(0)$ , and therefore stationary. To allow for the possibility of deterministic time trends, equation (1) is added to the time trend component to test the existence of a root unit. so the form of the equation is:

$$\Delta \log GDP_t = \delta_0 + \delta_1 T + \delta_2 B \log GDP_t + \sum_{i=1}^k \theta_i B^i \Delta \log GDP_t + e_t \quad (2)$$

Augmented Dicky-Fuller statistics (ADF) to examine the unit root hypothesis,  $H_0: \sigma_2 = 0$ , is also based on the work of McKinnon (1991). If the null hypothesis in equation (2) is not ruled out, the order of integration of  $GDP_t$  logs can be one or higher. So, we must go on to examine the root unit for the log in the shape of the first conflict. Test statistics,  $t_\sigma$ , are the usual t statistics for testing  $H_0: \sigma_1 = 0$  from the next equation:

$$\Delta^2 \log GDP_t = \delta_0 + \delta_1 B \log GDP_t + \sum_{i=1}^k \theta_i B^i \Delta^2 \log GDP_t + e_t \quad (3)$$

The rejection of the null hypothesis implies that the log series is in the integration degree 1,  $I(1)$ . Next, we can proceed with cointegration testing for between variables. The second step of causality testing will be to use a vector error correction model (VECM). According to Engle and Granger (1987), if two variables are integrated from degree  $I(1)$  and cointegrated, the uni-directional or bi-directional Granger causality must exist at least in variable  $I(0)$ . This temporal causality can be captured through a vector error correction model (VECM) derived from a long-term cointegration vector (Granger, 1988). In the cointegration analysis Johansen multivariate procedures were used (Johansen and Juselius, 1990). Based on the VAR model, data is used to find the appropriate lag structure. The p-sequence VAR model can be written as follows:

$$\Delta GDP_t = \pi B^i GDP_t + \sum_{i=1}^{p-1} \theta_i B^i \Delta GDP_t + e_t \quad (4)$$

The long-term relationship in the data set of the coefficient matrix  $\pi$  gives the number of cointegration vectors. This idea is based along the matrix estimate  $\pi$  and then tests whether the limit expressed by a rank reduction can be turned down. Rating  $\pi$  is being, equal to the number of cointegration vectors, tested with maximum eigenvalue ( $\lambda_{max}$ ) and trace statistics. The null hypothesis testing of at least the cointegration vector of the alternative hypothesis is based on the likelihood ratio of the trace test (5) and the max eigenvalue value (6) as follows:

$$Q_r = -N \sum_{i=r+1}^3 \log(1 - \lambda_i) \quad (5)$$

$$\lambda_{max} = -N \log(1 - \lambda_i) \quad (6)$$

where  $r = 0, 2, 3$  and  $\lambda_i$  are the  $i$ -th largest eigenvalue. The critical value of this statistic is obtained from Osterwald-Lennon (1992). AIC is also used to determine the lag ( $p$ ) optimal equation (4). If the rank  $\pi$  is equal to zero or  $p$  ( $r = 0$  or), cointegration does not survive. So, cointegration only occurs at condition  $0 < r < p$ . The third step involves utilizing VECM modeling and testing for causality. Engle and Granger (1987) show that cointegration, there is always a representation of error correction. This implies that alterations in the dependent variable are a affair of the degree of disequilibria in cointegration relationships or error correction terms (ECT), as well as alterations in the explanatory variables. Therefore, through modeling ECT and VECM establish additional ways to check causality. The use of VECM is not simply to get a valid regression, but also to explain the result of macroeconomic variables on economic development in the short term for each nation. Afterwards that, use impulse response analysis of active interactions.

#### D. EMPIRICAL RESULTS

##### Diagnostic testing

Table 1 summarizes the results of diagnostic tests. Decision test for normality, heteroscedasticity, and serial correlation shows that the data is categorized as normal and there is no heteroscedasticity and serial correlation problems at level 5 percent and there is a structure break.

**Table 1. Diagnostic Testing Result**

United States	Test	Statistic test	Conclusion
Normality	Jarque-Bera	5.25	normally distribution
Heteroscedasticity	Breusch-Pagan-Godfrey	0.15	Homoscedasticity
Serial Correlation	Breusch-Godfrey	13.74	No Serial Correlation
Stability test	Cusum <sub>(SQ)</sub>		Structural Break
<b>Indonesia</b>			
Normality	Jarque-Bera	14.39	normally distribution
Heteroscedasticity	Breusch-Pagan-Godfrey	10.57	Homoscedasticity
Serial Correlation	Breusch-Godfrey	7.33	No Serial Correlation
Stability test	Cusum <sub>(SQ)</sub>		Structural Break

Note: \* significant at the 1 percent significance level, \*\* significant at 5 percent significance level, \*\*\* significant at the 10 percent significance level.

##### Stationeritas Test

Testing stationerity Data was carried out using the Augmented Dickey-Fuller (ADF) approach to all time sequence variables in this study. For both countries the ADF unit root test results show that all the variables studied were not significant at the level level. But in the first point, the four variables for the two countries are stationary at the significance level of 1%, 5% and 10%. The unit root test results in the data series with and without the time trend component are identified in table 1.

**Table 2. Unit Roots Test, Augmented Dickey Fuller and Phillips Perron (PP)**

Country	Variable	ADF		PP	
		Level	Ist Difference	Level	Ist Difference
United States	GDP	3.2033	0.0758***	3.2093	0.0785***
	FDEBT	-0.0222	-3.2119**	-0.4938	-3.2119**
	EXP	-0.4372	-4.2226*	-0.4506	-4.1293*
	FDI	-1.5289	-5.5683*	-1.3194	-5.5631*
Indonesia	GDP	-0.4957	-3.6366**	-0.4913	-3.6366**
	FDEBT	1.6151	-3.2121*	2.2936	-3.1601**

	EXP	-0.1205	-4.8347*	-0.0323	-4.8377*
	FDI	-1.9372	-5.5576*	-1.8634	8.7921*

NOTE: \*, \*\*, \*\*\* indicate 1, 5 and 10 percent level of significances respectively.

According to Engle-Granger (1987), the cointegration test will be valid if a series of data sets is stationary and has the same level of integration. Cointegration tests, reported in table 3. With Johansen's procedure and optimal slowness based on Akaike criteria, we found 2 cointegration vectors for the United States and Indonesia. The results show a long-term relationship between macroeconomic variables and economic growth in these two countries. It also shows that macroeconomic policies will be effective in supporting economic growth. This finding implies that a vector which is a set of cointegrated data series, it implies a statistical cause-and-effect relationship in at least one direction.

**Table 3. Empirical Johansen Cointegration Test**  
 United States, GDP FDEBT, EXP, FDI (Var Lag=2)

Null Hypothesis	$\lambda$ - max	$\lambda$ - max (5%)	Trace	Trace (5%)
Ho : r = 0	48.0841*	27.5843	77.8868*	47.8561
Ho : r ≤ 1	18.8607	21.1316	29.8027**	29.7971
Ho : r ≤ 2	8.1174	14.2646	10.9420	15.4947
Ho : r ≤ 3	2.8246	3.8415	2.8246	3.8415
Indonesia GDP FDEBT, EXP, FDI, INF (Var Lag= 2)				
Null Hypothesis	$\lambda$ - max	$\lambda$ - max (5%)	Trace	Trace (5%)
Ho : r = 0	27.5686	27.5843	57.3078*	47.8561
Ho : r ≤ 1	15.8183	21.1316	29.7393	29.7971
Ho : r ≤ 2	9.9569	14.2646	13.9209	15.4947
Ho : r ≤ 3	3.9640**	3.8415	3.9640**	3.8415

Note: \* indicates 5 percent level of significances.

Source: author's estimation

Table 4 shows for countries the United States, there is a one-way causality between debt and economic growth, suggesting an increase in debt will induce a positive effect on increasing economic development. The results provide data around the directional causality from debt to economic growth. This finding is also for the variable foreign direct investment in economic development. This means that there is a substantial relationship between foreign direct investment and economic development. This as well implies that the higher foreign direct investment will cause an impact on economic development. Also, the direct relationship between exports and foreign debt.

Another Indonesian state, that the implication of different results found in Indonesia. In that location is only direct causality, namely debt to economic growth, economic growth in exports, foreign direct investment in economic growth, foreign direct investment to debts and foreign direct investment for exports. This gets the meaning, that debt, exports, foreign direct investment increased will have an impact on economic development.

**Table 4. Summary of Empirical Granger Causality Test: Vector Error Correction Model**

Null Hypotheses	United States	Indonesia
LFDEBT does not Granger Cause LGDP	<b>Rejected</b>	<b>Rejected</b>
LGDP does not Granger Cause LFDEBT	Accepted	Accepted
LEXP does not Granger Cause LGDP	<b>Rejected</b>	Accepted

LGDP does not Granger Cause LEXP	<b>Rejected</b>	<b>Rejected</b>
LFDI does not Granger Cause LGDP	<b>Rejected</b>	<b>Rejected</b>
LGDP does not Granger Cause LFDI	<i>Accepted</i>	<i>Accepted</i>
LEXP does not Granger Cause LFDEBT	<b>Rejected</b>	<b>Rejected</b>
LFDEBT does not Granger Cause LEXP	Accepted	<b>Rejected</b>
LFDI does not Granger Cause LFDEBT	<b>Rejected</b>	<b>Rejected</b>
LFDEBT does not Granger Cause LFDI	<b>Rejected</b>	Accepted
LFDI does not Granger Cause LEXP	<b>Rejected</b>	<b>Rejected</b>
LEXP does not Granger Cause LFDI	<b>Rejected</b>	Accepted

Note: \* indicates 5 percent level of significances of F statistic.

Table 5 shows the results of impulse response. Focusing on causality tests in the United States, the impact of LGDP on LFDEBT, LFDI and LEXP have elasticities of 0.08, -0.001 and -0.12, respectively. Response Foreign direct investment in economic growth is only low compared to exports and debt is exclusively at the elasticity of 0.03. While the export response to debt was but 0.15. However, debt to foreign direct investment shows great results with an elasticity of 4,091. The example in Indonesia shows that the elasticity of LFDI on LGDP is only 8.51. The export response to economic growth only gives elasticity of 0.00, while the foreign direct investment response gives elasticity of 0.02. The findings also illustrate that the debt response to foreign direct investment also demonstrates a great elasticity of 8.72. This exhibits the big impact of increasing economic growth in foreign direct investment and debt.

**Table5. Cumulative Impulse Responses after five years.**

Country	<i>Response of LGDP</i>				<i>Response of LEXP</i>			
	LGDP	LEXP	LFDEBT	LFDI	LGDP	LEXP	LDEBT	LFDI
United States	2.54	-0.12	0.08	-0.001	1.53	1.63	1.23	0.03
Indonesia	1.33	-1.15	-7.26	8.51	0.00	1.70	-0.07	0.02

Source: Author's estimation

Continued

Country	<i>Response of LFDEBT</i>				<i>Response of LFDI</i>			
	LGDP	LEXP	LFDEBT	LFDI	LGDP	LEXP	LDEBT	LFDI
Amerika Serikat	-1.78	0.15	1.98	-0.006	34.07	-1.48	4.901	1.19
Indonesia	0.00	0.03	2.06	0.001	0.00	2.54	8.72	1.21

Source: Author's estimation

## E. CONCLUSION

Based on the results of the study it can be concluded that there is a long-term relationship between macroeconomic variables with economic growth in both countries. A strong causal effect One-way relationship between macroeconomic variables and economic growth in the United States and Indonesia. While a unidirectional causal relationship between countries implies better macroeconomic and bureaucratic variable policies must be broken. In the United States, challenging this expansionary policy will not have a budget shortfall, but merely receives a moderate influence on economic development in the long run. Thus, the size of the government sector is relatively low compared to the individual sector. This also implies that the regime must produce better management in the public sector that supports macroeconomic policies and other vary. Higher economic demand will also touch on higher demand for public goods and services, which are more effectively provided by the regime. In Indonesia Increasing the quantity of foreign money and direct investment will also bring significant growth to economic growth

compared to an increase in exports. Therefore, Indonesia, to improve economic growth, management of macroeconomic variables needed for government bureaucracy must be safer.

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