

Interdependency Analysis of Foreign Direct Investment (Fdi) With Macroeconomics Variables in Indonesia

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Abstract: *The main purpose of this study is to analysis the interdependencies between FDI nd some macroeconomics variable, such as PDB, Trade, Exchange Rate, and Interest Rate. VAR model is used to show a comprehensive view of this interdependencies The empirical results show that through VAR model, interdependence between the variables FDI, PDB, Trade, Industrial Output Value, Exchange Rate and Interest Rate has been investigated in long-term relation through cointegratingvector and short-term impact of the VAR model. The dynamic correlation of the variables already has been gotten by decomposition variance analysis and impulse response. Some major implications appear from the research results. If the Indonesian government wishes to push its FDI and economic growth, this can be done by means of output and exchange rate shocks. In the short as well as long run, both shocks is essential for the economic stabilization.*

Keywords: *FDI, economic growth, macro variables and VAR models*

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I. Introduction

In the era of globalization, the world of economy and increasingly fierce competition are not only in trade, but also in transnational corporations (transnational corporation - TNC) today, such as the implementation of European Unity (EU), North American Free Trade Agreement (NAFTA), ASEAN Free Trade Area (AFTA), that has been a little evidences of increasingly heavy movement in capital flows and inflows of foreign direct investment (FDI), which in turn have an impact on the openness of the economy in many countries, particularly developing countries. The openness can be interpreted as economic openness, policies of capital and information openness. Thus, no wonder some researchers like Pfaffermatr (1994), Gopinath (1999) and Liu (2001) examined the relationship between FDI with export and PDB growth. They concluded that foreign direct investment (FDI) not only directly stimulated economic growth but also indirectly reciprocal interaction between FDI and economic growth, through the interaction of FDI with human resources (human capital) so as to provide a very strong positive impact to economic growth in developing countries.

United Nations Conference on Trade and Development, UNCTAD (2001) found that the growth of worldwide FDI has increased significantly since 1990, 1997 and 2000, which, respectively, USD 209 million, USD 437 million and USD 1,118 million. While the data were based on UNCTAD (2007), from 1980 to 2006, FDI inflows in developing countries increased by more than 30 times, from USD 8.4 billion in 1980 to USD 412 billion in 2006.

An increase in FDI to Indonesia is caused by Indonesia as a developing country, which definitely has a desire to increase economic growth. To achieve the desired economic growth, it is required amount of investment that should be financed from national saving. But in developing countries such as Indonesia, the national savings are insufficient to finance investment, so that Indonesia does not have sufficient funds to finance economic development due to limited capital accumulation, national savings and low productivity and high consumption, so it needs other sources of funding, namely foreign direct investment or foreign investment

Investment data released by UNCTAD (2012) showed that, from the share aspect or portion of accumulated investment, Indonesia ranked 25th of 238 countries in 2011. The portion of foreign investment in Indonesia was recorded at 0.84% of total foreign investment in all over the world, although it was still below Singapore (2.54%). But in ASEAN, Indonesia has received a portion of the investment exceeds other neighboring countries such as Thailand, Malaysia, and the Philippines.

Furthermore, BKPM (2012), the value of foreign investment that came into Indonesia stood at USD 24.5 billion, or about IDR 240 trillion. That number has increased over the previous year to reach USD 19.4 billion (growing at about 26%). Investment rate also increased quite high in 2011 compared to 2010 to reach USD 16.2 billion (growing at about 20%).

On the other hand, there are two things that affect the activities of FDI in a host country, in relation to why a country so active in attracting investors to invest in a country, namely (1) environmental or policy

framework and (2) economic determinant. Economic considerations, on the one hand, make considerations in FDI activity. The economic variables were related to market access, resources, and efficiency factors. Both of these variables are in fact underlies why nations race to attract these opportunities.

FDI appeal is one of the most strategic for developing countries to improve capital formation which can result in economic growth rate higher. Furthermore, the interdependence between FDI and other macro variables needs to be studied optimally. There are two main problems that are often studied and analyzed in a study related to the inflow of foreign direct investment (FDI), namely, (1) Whether there are interdependencies between FDI with macroeconomic variables in Indonesian long term periode? (2). How does the pattern of responsiveness between FDI with macroeconomic variables in Indonesian long-term period?

II. Theoretical Approach

The definition of FDI is complicated, the literature that are based on various analytical studies provides an understanding of OECD (2009) and (IMF, 2005). According to definition of benchmark of OECD and Balance payment of IMF, FDI is a reflection or desire of resident of a country that has run its investment in the economy of their own country to invest directly in the economies of other countries in the form of their enterprise development. The immediate desire implies presence long-term relationship among direct investment in the country selected by the company management of their own. (OECD, 2009 and IMF, 2005).

Furthermore, the World Investment Report defines FDI as an investment involving long-term relationship and reflects desire to run long-term investment and control performed by the population in the economy of a country as foreign investors direct to resident in an economy of other countries as an affiliate entrepreneurs or foreign affiliates (UNCTAD, 2009:243)

In Act No. 25 of 2007 on Investment which is a product of the latest legal consummation of the Act No. 1 of 1967 concerning Foreign Investment and ActNo 6 of 1968 concerning Domestic Investment, FDI activity is defined as: "*Foreign investment is the investment activity to do business in the territory of the Republic of Indonesia by foreign investors, whether using foreign capital and is a joint venture with a domestic investor.*" From that sense at least there are basic elements that can be taken are: (1) investment activities must be done directly (2) *Private Investment* and generally carried by companies, where the investment risk is borne by the investor themselves.

Of the various definitions mentioned above, it can be concluded that FDI is as a long term investment made directly by the foreign investor in a business of domestic citizens field or as a type of investment activity across the country, where the control of the company's operations in the host country is fully held by the home-based country.

Based on UNCTAD (2006), FDI was based on the motive of investments made by the TNC regarding profit expectations or global profits of business activities of TNC. There are four important motives underlying FDI activities by TNC, particularly in developing countries based on the sequence, (a) *Market-seeking* (b) *Efficiency-seeking* (c) *Resource-seeking* (d) *Created-asset seeking*.

Various theories have been developed since the 1960s to explain FDI. The theories provide information about factors that could explain the determinants of FDI flows involving micro-economic approach (e.g., organizational aspects) and the macro-economic approach (e.g., resource allocation) (Dunning and Lundan, 2008).

In the microeconomic approach, the theories of FDI focused specifically on company characteristics that affect the decision making for the companies to invest, for example, the theory of market imperfections. While the macroeconomic approach to foreign direct investment theory seeks to analyze the characteristics of a country that became FDI flows within and across these countries, such as internalization theory of the product cycle. While Faeth (2009) stated that dimension of micro covered intrinsic factor of the company itself, such as owners benefit (profit), cost savings and scale of economies, whereas macro dimension like barriers to entry, availability of resources, political stability, risk state and market size (Faeth, 2009).

There are five theories that are in the international economic literature describing FDI, namely (1) The MacDougall-Kemp model and Macro Financial and Exchange Theories; (2) Theory Organization Industry; (3) LifeCycle Hypothesis Product, (4) Internalization Theory and (5) Eclectic Production International Paradigm Model (OLI Model). (Hongtian, 2011).

FDI theories believe the inclusion of FDI into the host country will be followed by what is known as the "spillover effect" as, transfer of technology, improvement innovations and the formation of human capital, know-how, improved management skills, entrepreneurial skills, and helps encourage domestic investment in various forms, such as partnerships, provision of material needs of industry, marketing of products, the business risk is relatively small and more profitable.

Externalities from FDI activity is acceptable through three important channels namely: demonstration effect, competition, and labor turnover.

The FDI theories show that the role of FDI in economics of home country can be approximated within the framework of theoretical economic development. The research about the impact FDI on growth economy should consider not only direct causality between FDI and total output, but also its impact on conditions and determinants economic growth that indirectly affect growth economy. Of this aspect, studies on the role played by FDI to economic growth can be discussed from different perspectives, and can produce conclusion which will certainly be different, can complement or even contradictory.

In the neo-classical models, the impact of the FDI on output growth is bounded by presence result of diminishing return in physical capital. Therefore, the FDI can only impact on the level of per capita output and not on growth rate. Thus the influence on the FDI has influence on economic growth through spillovers effect. In this context, the impact of the FDI on the economy of home country can analyzed through its effects on factors that drive economic growth, such as capital formation, employment, human capital or human capital, exports, and technology. As a result, the FDI has been integrated into the theory economic growth as an FDI gains-from-approach (Graham and Krugman, 1995).

In principle, the relationship between FDI and trade in the context of the Heckscher-Ohlin model, goods and services moves in substitution with other driving factors. The mobility of goods due to the differences in prices factor among countries. The movement will eliminate the difference price in both goods and market factors, thereby eliminating trade basis. Then, trade barriers will increase the driving factors and vice versa, so that exports and the foreign direct investment (FDI) will lookan alternative ways to involve themselves in foreign markets. However, this result will depend on certain assumptions made (Schmitz and Helmlberger, 1970 in Oscar Bajo - Muno z-María Montero, 2001). Dunning (1998) said that the relationship between the FDI and trade among countries is mutually complement each other. This suggests a form of complementary relationship between the FDI and cross-country trade activities. This view is also supported by other researchers such as Lipsey, Blomstrom and Kulchycky (1988) in Pain and Wakelin (1998) resulting in the complementary relationship between exports and FDI.

In general Balassa (1977), most of the results of the studies of Salehi (1989), Bahmani (1990), and Dodaro (1993) and Amoateng (1993) showed a significant positive relationship between economic growth and international trade activity (exports growth) in Pfaffermayr (1994). Pfaffermayr (1994) gave the conclusion of the studies' results that the outflow of FDI and exports were affected by the same variables such as capital, labor, skills and research and development activities (R & D).

Mean while, the association between exchange rate real and FDI is also topics in recent researches at this time. Osinubi, Tokunbo (2009) stated that movement of the exchange rate and the rise of uncertainty of the exchange rate appeared to be an important factor to be considered in the investor's decision to invest abroad. Much of the literature on exchange rate movements and FDI concentrated on two issues, namely the exchange rate and exchange rate of volatility.

To determine the relationship between interest rates and investment can use the concept of the marginal efficiency of investment or with MEI curve which explains that the investment will be made by the investor if the rate of return on capital is greater than or equal to the interest rate. If the interest rate is greater than the rate of return on the capital, the investment will not be made by the investors.

III. Methods

This section will describe the research analysis tool that is used to determine the long-term interdependence in Foreign Investment Direct (FDI), macroeconomic variables (TRADE, Industrial Output Value, exchange rates, and interest rates) as well as economic growth.

The analytical tool used to answer the research problem is vector Auto Regression (VAR) model to analyze the long-term in interdependence among Foreign Investment Direct (FDI), macroeconomic variables (TRADE, Industrial Output Value, exchange rates, and interest rates) and economic growth in Indonesia. Study will observe six endogenous variables, namely the Foreign Investment Direct (FDI), economic growth (PDB), indicators of openness (TRADE), Industrial Output Value (NOI), exchange rate (EXR), and interest rate (IR) in Indonesia, the interdependence among the six variables specified in the system of equations as follows:

$$FDI_t = \alpha_1 + \sum_{j=1}^k 1jFDI_{t-j} + \sum_{j=1}^k 1jPDBK_{t-j} + \sum_{j=1}^k 1jTRADE_{t-j} + \sum_{j=1}^k 1jNOI_{t-1} + \sum_{j=1}^k 1jEXR_{t-1} + \sum_{j=1}^k 1jIR_{t-1} + \varepsilon_1 \dots\dots\dots(1)$$

$$PDB_t = \alpha_2 + \sum_{j=1}^k 2jPDB_{t-j} + \sum_{j=1}^k 2jTRADE_{t-j} + \sum_{j=1}^k 2jNOI_{t-j} + \sum_{j=1}^k 2jEXR_{t-j} + \sum_{j=1}^k 2jIR_{t-j} + \sum_{j=1}^k 2jFDI_{t-j} + \varepsilon_2 \dots\dots\dots(2)$$

$$TRADE_t = \alpha_3 + \sum_{j=1}^k 3jTRADE_{t-j} + \sum_{j=1}^k 3jNOI_{t-j} + \sum_{j=1}^k 3jEXR_{t-j} + \sum_{j=1}^k 3jIR_{t-j} + \sum_{j=1}^k 3jFDI_{t-j} + \sum_{j=1}^k 3jPDBK_{t-j} + \varepsilon \dots\dots\dots(3)$$

$$NOI_t = \alpha_4 + \sum_{j=1}^k 4_j NOI_{t-j} + \sum_{j=1}^k 4_j EXR_{t-j} + \sum_{j=1}^k 4_j IR_{t-j} + \sum_{j=1}^k 4_j FDI_{t-j} + \sum_{j=1}^k 4_j PDBK_{t-j} + \sum_{j=1}^k 4_j TRADE_{t-j} + \epsilon_4 \dots \dots \dots (4)$$

$$EXR_t = \alpha_5 + \sum_{j=1}^k 5_j EXR_{t-j} + \sum_{j=1}^k 5_j IR_{t-j} + \sum_{j=1}^k 5_j FDI_{t-j} + \sum_{j=1}^k 5_j PDBK_{t-j} + \sum_{j=1}^k 5_j TRADE_{t-j} + \sum_{j=1}^k 5_j NOI_{t-j} + \epsilon_5 \dots \dots \dots (5)$$

$$IR_t = \alpha_6 + \sum_{j=1}^k 6_j IR_{t-j} + \sum_{j=1}^k 6_j FDI_{t-j} + \sum_{j=1}^k 6_j PDBK_{t-j} + \sum_{j=1}^k 6_j TRADE_{t-j} + \sum_{j=1}^k 6_j NOI_{t-j} + \sum_{j=1}^k 6_j EXR_{t-j} + \epsilon_6 \dots \dots \dots (6)$$

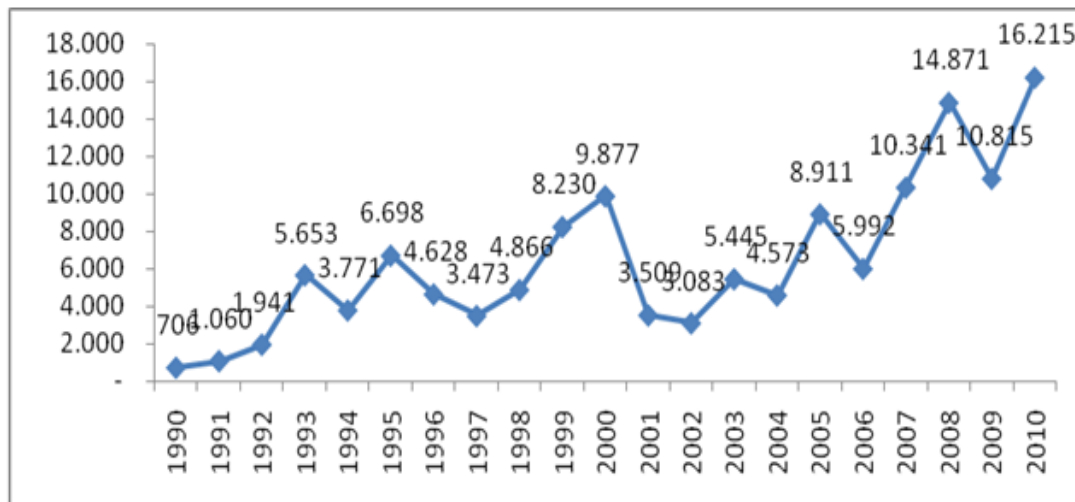
Where FDI = Foreign Direct Investment, PDB= PDB (market size and performance), TRADE = Openness Indicator, NOI = Industrial Output Value ; EXR = Exchange Rate and IR = Interest Rate

In this study the testing stages include (1) Unit Root Tests; (2) Optimal Lag Test and (3) Cointegration Test . The impacts of a variable innovations' shock on the other variables are traced through the impulse response function and Variance Decomposition.

IV. Results And Findings

As shown in chart 1.1, economic and financial crises that have been occurred since mid-1997 in some Asian countries, particularly in South Korea, Thailand, and Indonesia has resulted in the economic contraction. The economic crisis began with the flight of capital that impact on a sharp decline in the exchange value of those countries. The very sharp depreciation resulted in worsening the condition of the balance of the business world. This condition was exacerbated by delays in banking intermediation so that further complicate the space for the business world.

Figure 1 .1 Realization of FDI in Indonesia. 1990 - 2010 (In Million U.S. \$)



Sources: Statistics BKPM

The pressure on economic activity increasingly severe, as a tight monetary policy in order to stabilize prices and exchange rates. The pressure of the economic crisis caused FDI inflows to Indonesia decreased less encouraging, which decreased by 1,155 million U.S. \$, from USD 4,626 to USD 3,473 million or the growth fell by 24.96%.

In 2000, foreign direct investment could rise back up to reach USD 9.8 billion and return fell to below USD 4 billion in the period 2001-2002. The decline of foreign investment in 2001 was caused by the high investment risk due to the persistence of disturbances, uncertainty law enforcement, and labor disputes. In addition, the factors of limited financing due to the recovery of investment banking intermediation function and the presence of new regulations related to the implementation of regional autonomy has also limited investment activity. The negative sentiment was associated with a delay in the disbursement of the loan the International Monetary Fund (IMF), the relatively high interest rates in the home country, and the slow restructuring of foreign debt. As a result, companies tended to focus more on the internal, so the realization of new investments and expansion of production capacity at the existing investment was to be very low.

In 2002, the direct foreign investment still decreased by USD 426 million or slowing its growth until it reached 12,14%. In general indication of the deterioration of investment activity can be seen from the decrease

in the amount of foreign investment approval value of investments approved in the framework of Foreign Direct Investment (FDI) that declined by 35.3%, from USD 15.1 billion (1,333 projects) to USD 9.7 billion (1,135 projects) in 2002. Besides, there were also indications of foreign investors shift from industry to trade and repair services as well as other areas that the returns were faster and *sunk costs* (initial investment cost that is inevitably lost) lower (Bank Indonesia. 2002).

Meanwhile, the foreign direct investment in 2003 increased to 76.61%. The increased investment activity in 2003 was driven by two main factors, namely the availability of financial resources and improved investment sentiment by business people. Approximately 80% of the international capital flows that go into developing countries during 2003 was in the form of FDI. In Asia, the FDI got into countries that have good economic prospects such as China, Vietnam and Thailand. In the meantime, Indonesia has not been able to capitalize on the increasing trend of FDI flows. Along with still attractive yields offered by the domestic capital market, the type of foreign capital flow into Indonesia more in the form of portfolio investments for the purchase of stocks and bonds.

In the last 4 years, it showed that the realizable value of FDI has always been above the USD 10 billion, even realizable value in 2008 was to reach USD 14.8 billion and decreased to USD 10.8 billion in 2009 but rose again to USD 16,2 billion in 2010, (See chart 1 .1).

The stationarity test can be performed with the unit root tests developed by Dickey Fuller. Alternative test is the Augmented Dickey Fuller (ADF), which seeks to minimize autocorrelation. The data stationarity test results for all variables studied are as follows:

Table 1 Results of Tests with Unit Roots Level

Variables	Augmented Dickey-Fuller values	Critical Values Mac Kinnon at 1% Significance Level	Prob	Conclusion
FDI	-8.561516	-3.596616	0.0000	Stationary in 1 st difference
PDB	-34.21176	-3.610453	0.0001	Stationary in 2 nd difference
TRADE	-4.798300	-3.592462	0.0003	Stationary in level
NOI	-5.211785	-3.615588	0.0001	Stationary in 1 st difference
EXR	-6.755631	-3.596616	0.0000	Stationary in 1 st difference
IR	-3.593522	-3.592462	0.0100	Stationary in level

Source: Attachment Unit Root test.

Because of all the variables analyzed were stationary, then the next step could be testing the determination of the optimal lag length. Optimal lag length for VAR was tested by the log-likelihood ratio resulting in an optimal lag length with 2 sufficient lags to test the cointegration and ECM model. The cointegration test in variable that use VAR models allows to evaluate relationship equilibrium in the long run. The cointegration test results that was conducted showed that the calculated value and the maximum Eigenvalue Trace Statistic was greater than the critical value, then there was cointegration on a number of variables, there were 6 cointegration equations at 5% level. And the values of the Trace statistic and maximum is eigenvalue were greater than the Critical value, which meant the existence of a long-term relationship between the variables proved.

Based on Vector Auto Regression analysis results, it was known that previous variables also contributed to the recent variable. By using basic lag 1, it showed that there was positive and negative contribution of each variable to the variable itself and other variables, so the variables in this study contributed to each other. The VAR analysis in this study included the variable Foreign Direct Investment (FDI), indicators of market size and performance in a proxy of the Gross Domestic Product (PDB), indicators of market openness proxy of import-export trade (TRADE), output industry value (NOI), exchange rate (EXR) and interest rate (IR). The following is the table of the VAR contribution conclusions:

Table 2 Results of VAR analysis

Variables	The largest contributor 1	The largest contributor 2
FDI	NOI _{t-1} -4.4478	EXR _{t-1} -1.8516
PDB	PDB _{t-1} 1.1983	IR _{t-1} -0.0700
TRADE	NOI _{t-1} 4.9098	PDB _{t-1} 0.9153
NOI	NOI _{t-1} 1.5270	IR ₋₁ -0.1089

EXR	EXR _{t-1} 0.6657	^{t-1} - 0.2240
IR	NOI _{t-1} 0.8361	PDB _{t-1} - 0.2659

The results of the VAR contribution analysis showed the 1st and 2nd largest contribution to a variable, which were then analyzed based on the results of prediction of FDI, interest rate (IR), Exchange Rate (EXR), TRADE, NOI and PDB in Indonesia for 2000.1 to 2010.4 Indonesia is:

- (a) FDI Variable, The greatest contribution and positive impact on FDI is the value of industrial output (NOI-1) and NOI-2 respectively 4.4478 and 4.1249 and PDB (-2) of 1.569. Followed by FDI itself lag 1 and 2, respectively 0.2046 and 0.0502. While other variables such as EXR and IR contributed negatively.
- (b) Output Growth (PDB), The greatest contribution and positive impact on PDB is PDB itself at 1.1983 and TRADE at 0.0325; exchange rate (EXR) 0.039, while the other variables contribute negatively.
- (c) TRADE Variable, The greatest positive contribution to the trade variable is NOI (-1) at 4.9098; exchange rate (EXR) at lag 1 and 2 respectively 0.6308 and 0.8907, then followed by PDB (-1) at 0.9153 and FDI (1) and FDI (-2), respectively, 0.1383 and 0.1272.
- (d) Industrial Output Value Variable (NOI), Positive contribution to NOI variables are variables of FDI (-1), FDI (-2), PDB (-2), NOI (-1), EXR (-2) and IR (-2), while others give a negative contribution. The biggest positive contribution is variable NOI (-1) that equals to 1.5270.
- (e) EXR Variable, Positive contribution to the exchange rate is FDI (-1), Trade (-1), NOI (1) and NOI (-2) and EXR (-1). While other variables contribute negatively.
- (f) Interest rate, Positive contribution to the 6-month Libor interest rate is the PDB (-2), NOI (-1), EXR (-1) and IR (-1), while other variables contribute negatively.

In the innovation accounting, variables tested are variance decomposition and response impulse. This is done to analyze the relationship or correlation between each variable. The analysis of response impulse gives practical vision to interpret how the behavior of time series in response to various shocks in the VAR equation system. Because all variables are endogenous in the VAR models, any shock in one equation is transmitted to the entire system, so that the analysis of response impulse provides an opportunity to analyze how the response of one variable to another variable in one system involve a set of variables as well. The function of impulse response of all variable for all types of shocks is evaluated by using the method of decomposition of Cholesky impulse, in this case its order is FDI, PDB, TRADE, NOI, EXR and IR.

Table 3 Summary of Results of Impulse Response Function of FDI

No.	Variables	Short-term	Medium-term	Long-term
1	FDI	+	-	-
2	PDB	+	+	+
3	TRADE	+	+	+
4	NOI	+	-	-
5	EXR	+	-	-
6	IR	+	+	+

Variance decomposition aims to measure the prediction of error variance of a variable, i.e., how much difference before and after the shocks, both derived from the variable itself or other variables. The variance decomposition analysis is divided into three periods, namely the short-term period at quarter to one, the medium-term period in the first quarter of the twentieth and long-term period quarter to sixty.

The results of data processing with Eviews 6. For Variance decomposition of FDI are shown in Table 4

Table 4 Variance Decomposition of FDI

Period	SE	Variance Decomposition of LOG (FDI):					
		LOG (FDI)	LOG (PDB)	LOG (TRADE)	LOG (NOI)	LOG (EXR)	LOG (IR)
1	0.463604	100.0000	0.000000	0.000000	0.000000	0.000000	0.000000
2	0.522127	85.49660	4.826514	0.127769	6.631550	2.792930	0.124633
20	0.816350	50.49943	30.81334	7.631035	6.238032	4.251740	0.566426
21	0.822136	50.28437	31.11571	7.655121	6.150714	4.220168	0.573917
60	0.849353	49.37008	32.44817	7.719479	5.765836	4.082648	0.613781

Based on the results shown in Table 4, it shows FDI in the short term (period 1), the estimated error variance was 100% explained by FDI itself, while the other variables, namely PDB, Trade, NOI, EXR and IR

did not respond at all, where the response of these variables emerged in the second period to the fourth period. In the medium term (the 20th period), the estimated error variance was 50.29% that was explained by the FDI itself. Another greatest variable affecting policy was PDB, that is, 30.81% and trade 7.63%. Meanwhile, the smallest variable affecting FDI was IR, 0.56%. In the long term (period 60), the prediction of error variance was 49.37%, which was explained by the FDI itself. Another greatest variable affecting FDI as policy variables other than FDI itself was PDB, 32.44% and Trade amounted to 7.72% while the smallest variable affecting FDI was IR, 0.61%.

V. Conclusion

Through series of analyzes, studies provide empirical evidence about the existence of interdependence between FDI and PDB, Trade, Exchange Rate (EXR) and Interest Rate (IR). Through the model of VAR, the interdependencies among variables of FDI, PDB, Trade, Industrial Output Value, Exchange Rate and the interest rate has been investigated in relation long-term cointegrating vector and Short-term impact of the VAR model. The dynamic variable correlation has already gotten by using decomposition variance analysis and impulses response.

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