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TESTING DATA TIME SERIES CONSUMPTION, FDI, GDP INDONESIA WITH SERIAL CORRELATION AND COINTEGRATION

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ABSTRACT

Purposive - The study was conducted by the authors to see how the correlation and cointegration in the long term between the variables of consumption, direct inventasi and GDP in Indonesia to test models of time series data.
Method / Analysis - Data analysis method used by the authors in this research using correlation analysis and cointegration model.
Data - Data that is used by the author in this study is the variable data consumption, Direct investation and Indonesian GDP, from the year 1967 to 2014. Data obtained by the authors of the World Bank website, the data before it is analyzed in advance at the though the author.
Finding - From the research that has been done can be concluded that the variable consumption, direct investment and GDP are correlated and cointegrated in the long term is strengthened by the presence $\hat{\omega}_w^{1/2}$ to the SE regression, which is a measure of the amount of residual autocorrelation in the long term variants, and tests Phillips-Ouliaris accept the null hypothesis of no cointegration (unit root in the residuals) at approximately 1% significance level.
Novelty - Model mix between correlation and cointegration in the long term against the consumption variable, direct inventasi GDP in Indonesia and this has never been done. Earlier research studies with discussion about the causality or cointegration only.

KEYWORDS: Cointegration; stationarity; nonstationarity; Augmented Dickey-Fuller test; unit root; Lags.

INTRODUCTION

In a country Indonesia is no exception, there are some indicators of economic conditions that could affect the economy negaar include national income, per capita income, inflation, unemployment, and poverty. However, generally speaking, in this matter will address national income indicator (Gross Domestic Product). In Indonesia national income could mean an analysis of an earned income in the country as a whole. This understanding is much related to the national income is not only gross domestic product, but also to the Gross National Product, Net National Product, Net National Income, Personal Income, Disposable Income and Gross Regional Domestic Product. Many economists and decision-makers are very concerned at the output of goods and services in the country in total, but also the allocation of this output among the various alternatives. In general for the equation of a national income divide GDP into several posts including: 1. Consumption (C), 2. Investment (I), 3. Government Spending (G), 4. Net exports (NX).

The encouragement of consumption or by the private sector that is strong enough and the investment performance improved, the Indonesian economy is considered able to maintain their resilience and even scored a higher growth in 2010 upwards. This was revealed from the recent report of the Asian Development Bank (ADB) recently. In a major annual economic report ADB, Asian Development Outlook (ADO 2013) containing predictions of economic trends in the Asian region in particular, projected that Indonesia would grow by 6.4% in 2013, and drove to a level of 6.6% in 2014, the figure is The highest growth rate in the last 15 years. These projections assume private consumption will rise in 2013, driven by rising employment, the average minimum wage and civil servants' salaries. Spending ahead of legislative and presidential elections in 2014 is also expected to start contributing to the increase of consumption in the second half of 2013.

Presence existence investment, both private and public, tend to show a healthy expansion. This projection is supported by an increase in credit rating by an independent agency, declining interest rates, the increased allocation for infrastructure, and a record of strong economic growth. "Backed by the high consumption, increased investment and trade between countries is increasingly improved, the growth momentum in Southeast Asia will continue to strengthen. Indonesia is now well on track for long-term growth, "according to Jon D. Lindborg, ADB's Country Director for Indonesia.

Still in that capacity Jon D, Lindborg menatakan "However, this should not make us complacent. Still required a constant effort to improve the investment climate, as well as reducing regulatory uncertainty and bureaucratic ". ADO 2013 notes that Indonesia grew by 6.2% in 2012, as a result of the level of domestic consumption and investment continued to strengthen. Figures private consumption grew by 5.3%, which is the highest figure in the last four years and contributed to nearly half of the total growth in gross domestic product (GDP) in terms of expenditure. This was driven by the increasing number of jobs, rising wages, and low levels of inflation. Meanwhile the Government's efforts to encourage public sector investment can be seen from the increasing capital expenditure in this sector.

With the increase in the investment rate of 9.8% in 2012, it is in because of the encouragement, with the improvement of the investment climate in Indonesia in particular, the highest investment value sepnjang history of Indonesia can push record numbers of strong economic growth in recent years, as well as the credit enhancement. Results of this analysis makes the investment to GDP ratio increased to 33.2% in a period of at least the last 20 years. But the Government's efforts to encourage public sector investment can be seen from the increasing capital expenditure in this sector. In addition, exports are expected to increase again in 2013, which was boosted by stronger growth in the People's Republic of China (PRC) and other countries. This figure is projected to continue to rise in 2014, due to the improvement in growth opportunities in other industrial countries.

Do not forget when we look at the poverty rate decreased by 0.7 points to 11.7% in the 12 months up to September 2012. It is considered as the improvement caused by rising wages for workers in agriculture and construction, as well as the higher the income of farmers , Quality of work continues to experience growth: Last year, there were 2.7 million new jobs in the formal sector, while the decline in employment in the informal sector as much as 1.5 million.

On the other hand, the average inflation rate is predicted to be at a reasonable level, namely 5.2% in 2013 and 4.7% in 2014. This projection is based on the assumption there will be no rise in fuel prices in the next two years. The inflation rate will be higher if the government wants to reduce the burden of subsidies by raising fuel prices. One of the major challenges for development in Indonesia is how to ensure that economic growth is felt by all parties. ADO 2013 notes that despite the economic growth during the last six years has been alleviating 6.4 million people out of poverty, there are still 29 million Indonesian people who live below the poverty line set by the Government. In the event of a decrease in income levels only slightly, then there will be 30 million Indonesian people who are poor.

To face these challenges, there needs to be a policy that focused on efforts to reduce the gap, including an ongoing effort to improve public infrastructure, especially transport and electricity. Weak infrastructure in rural and eastern Indonesia has hindered the growth of economic activity and new jobs. As disclosed in ADO 2013, the Indonesian government has made important changes to reduce barriers to the development of infrastructure.

LITERATURE REVIEW AND RESEARCH METHOD

Literature Review

In a study conducted by Still and Still (2007), Chen et al. (2007) and Tang (2009) showed relationship causality between energy consumption and gross domestic product (GDP) in Malaysia. reveals that there is a unidirectional causality of electricity consumption to GDP in Malaysia, while the last stud indicates that there is a two-way causality between electricity consumption and income in Malaysia.

In (Still and Still, 2007; Yoo, 2006; Ho, 2007; Chandran, 2010; Bekhet and Yusof, 2009, Hondroyiannis, et al (2002), as well as Halicioglu (2007) most of the research has focused on the causal relationship between electricity

consumption (energy consumption) and economic growth that are used in energy consumption (in general), real GDP and price developments. use residential energy, income, price and urbanization. From the best of our knowledge, only examine the causal relationship between FDI and consumption electricity. By testing the causal relationship between electricity consumption and the other independent variables. Based on the above reasons, this research tries to re-examine the causal relationship between electricity consumption and real GDP. Also, the relationship between electricity consumption, total expenditure, GDP and FDI, will investigated in Tang (2009).

The relationship between electricity consumption and economic growth has been researched by Jumbe (2004), Narayan and Smyth (2005), as well as Mozumder and Marathe (2007) discusses the empirical findings that many found to be consistent across the country and included the methodology used. By using causality between electricity consumption, agricultural income and non-farm incomes. Some empirically using error correction models (ECM) and Granger causality analysis for 1970 to 1999. The period in Malawi Granger causality analysis shows that agriculture and agriculture cause income to electricity consumption of non and at the same time electricity consumption caused total revenue. ECM analysis results indicate the direction of causality of agricultural and non-agricultural income for electricity consumption. using the same methodology to the countries of Australia and discovered that affects the growth of electricity consumption and employment in the short term. using Granger causality analysis to analyze the direction of causality between GDP and electricity consumption. Last empirically discovered that the GDP affects electricity consumption and there is no causality is found from electricity consumption to GDP.

The study, done by Asafu (2000), Still and Still (2007) study the causality between energy consumption, income and prices for a number of developing countries of Asia such as India, Indonesia, the Philippines and Thailand. He uses Granger causality analysis of the data for the period 1971 to 1995. The results showed that the direction of causality is different for different countries in Asia. They found unidirectional causality from energy consumption to income in India and Indonesia, while the two-way causality between energy consumption and income are found in the Philippines and Thailand. Similarly, with the use of models to study the causality between energy consumption and GDP in Asian countries by using vector error correction model (VECM) and VAR analysis. They use the data for the 1955 annual period of 1999. They drew the conclusion that there is no causal link between energy consumption and GDP in Malaysia, Singapore and the Philippines. They also found that there is a two-way causality between energy consumption and GDP in Pakistan, unidirectional causality from energy consumption to GDP in India and unidirectional causality from GDP to energy consumption in Indonesia. In contrast to the study done by Ciarreta, et al. (2010) which uses panel data from 1970 to 2007 to analyze the causal relationship between electricity consumption, real GDP and energy prices. They reveal the long-term equilibrium relationship between the variables. The causal relationship runs from electricity consumption to GDP revealed. Also, they found the two-way relationship between energy prices and GDP. Similarly Apergis et al. (2011) also uses panel data from 1990 to 2006 for 88 countries. They found the two-way relationship between electricity consumption and growth in the short term and long term.

Research undertaken by Chen et al. (2007), Still and Still (2007), and Chandran (2010) used various types of energy consumption (electricity) to test the causal relationship to the GDP in the countries of Asia. They use data for the period 1971 to 2001 concluded that there is a unidirectional causality from GDP to electricity consumption in the short term in Malaysia. In addition, they found different results compared to. They also found unidirectional causality of electricity consumption to GDP in Indonesia. The results of research done in the Philippines was opposed by Still and Still (2007). The big difference in the results of research done by Lean et al. (2010), Lang (2010) in Taiwan. They found unidirectional causality from GDP to electricity consumption. Causal relationship between electricity consumption and other variables in Malaysia found to conflict with. In the study they found the two-way causality between aggregate output and electricity consumption period 1971-2006 with two-way causality test between the total consumption of electricity, industrial electricity consumption and real GDP in Taiwan.

When Yoo (2006), Tang (2009) conducted a study using different types of methodologies (Granger causality) to examine the causal relationship between electricity consumption and growth in Asian countries for the period 1971 to 2002. He found a two-way causality between variables. These results are consistent with those using the same methodology for the period 1970 to 2005. Subsequently, he found unidirectional causality from growth in electricity

consumption in Indonesia and Thailand, which is consistent with Still and Still (2007) results. But Ho (2007) and Shiu and Lam (2004) examined the causal relationship between electricity consumption and GDP in China. He uses the ECM analysis for the period 1966 to 2002 and found unidirectional causality of electricity consumption to GDP. using the same method in China and also obtained the same results. While Tang (2009) using a model of ECM and Granger causality analysis to examine the causality between electricity consumption, income, population and FDI. Tang (2009) using data for the period 1970 to 2005. He found a two-way causality between electricity consumption, revenue and FDI in the short term. On the other hand, Chandran (2010) using ARDL analysis to measure the relationship of causality in the same variable that he found the same results.

Research Method

Time and Data Research

This research was conducted by the authors of the start time in January-February 2016. The research data were used by the authors consists of variable consumption, direct investment and GDP of Indonesia during the period 1967-2014. Research data uploaded by the authors of the World Bank website, but before analyzing the data first processed by the author.

Data Analysis Techniques Research

In this study the authors used data analysis correlation and cointegration. The authors use the analysis techniques for correlation data as to determine the value that indicates the strength and direction of a linear relationship between the variables that are being researched or two random variables (random variable), what is the relationship between variables that are being undertaken research direction or relationship a. Positive (coefficient 0 s / d 1), b. Negative (coefficient 0 s / d -1) c. Nil (coefficient 0). While cointegration analysis techniques used by the author as the author would like to see and to know whether two or more economic variables are being researched have a long-term equilibrium relationship.

RESULTS AND DISCUSSION

Testing For Correlation

In some software mathematical or statistical is provide several methods of testing for the presence of partial correlation, it is done to check for residue existing in the model correlation in shape. One of these test Durbin Watson (DW) statistics as part of a standard regression output. The Durbin-Watson statistic is a test for first-order mathematical or statistical correlation serial. To give several methods of testing for the presence of partial correlation, it is done to check for residue existing in the model correlation in shape. One of these test Durbin Watson (DW) statistics as part of a standard regression output. The Durbin-Watson statistic is a test for first-order serial correlation. More formally, the DW statistic measures the linear association between adjacent residuals from a regression model. The Durbin-Watson is a test of the hypothesis $\rho = 0$ in the specification:

$$u_t = \rho u_{t-1} + \epsilon_t \qquad (1)$$

If there is no correlation biserial, statistics will be around 2 DW DW statistics will fall below 2 if no positive serial correlation (in the worst case, it will be close to zero). If there is a negative correlation, the statistics will be located somewhere between 2 and 4. In Johnston and DiNardo (1997, Chapter 6.6.1) positive serial correlation is the form most commonly observed dependence. As a rule of thumb, with 50 or more observation and a few independent variables, DW statistic below about 1.5 is a strong indication of the positive first order serial correlation. As an of the application of serial correlation testing procedures, consider the following results from estimating a simple consumption function by ordinary least squares using data in the workfile "CSMPT, DRINVST, GDP":

Table 1 : Result regression Consumption, Direct Invetsment, and GDP

Dependent Variable: CSMPT

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.82E+09	1.48E+09	1.909161	0.0629

DRINVST	1.612134	0.733424	2.198091	0.0334
GDP	0.652783	0.024101	27.08515	0.0000
CSMPT(-1)	0.046812	0.037217	1.257793	0.2153

R-squared	0.998614	Mean dependent var	1.49E+11
Adjusted R-squared	0.998518	S.D. dependent var	1.71E+11
S.E. of regression	6.58E+09	Akaike info criterion	48.13340
Sum squared resid	1.86E+21	Schwarz criterion	48.29086
Log likelihood	-1127.135	Hannan-Quinn criter.	48.19265
F-statistic	10330.25	Durbin-Watson stat	1.320080
Prob(F-statistic)	0.000000		

Sources : Proceed by author

From the results [Table 1] The above results show that the coefficient is statistically significant and very tight fit. If the error term serial correlation, OLS estimates of standard errors are not valid and the estimated coefficients will be biased and inconsistent because of the lagged dependent variable on the right side. The Durbin-Watson statistic is not appropriate as a test for serial correlation in this case, because there are lagged dependent variable on the right side of the equation. Here we can see the test results korrelogram in [Table 2] for the variable that is in use:

Table 2 : Result correlogram Consumption, Direct Invetsment, and GDP

Date: 01/18/16 Time: 02:07

Autocorrelation	Partial Correlation		AC	PAC	Q-Stat	Prob*
. |** |	. |** |	1	0.339	0.339	5.7669	0.016
. |** |	. |*. |	2	0.273	0.179	9.5878	0.008
. |** |	. |** |	3	0.326	0.221	15.156	0.002
. | . |	**| . |	4	-0.059	-0.299	15.341	0.004
. | . |	. | . |	5	0.036	0.035	15.413	0.009
. |*. |	. |*. |	6	0.151	0.171	16.686	0.011
.*| . |	.*| . |	7	-0.139	-0.170	17.794	0.013
. | . |	. | . |	8	0.060	0.067	18.010	0.021
. |*. |	. |*. |	9	0.153	0.144	19.424	0.022
.*| . |	**| . |	10	-0.195	-0.250	21.789	0.016
. | . |	.*| . |	11	-0.030	-0.076	21.847	0.026
.*| . |	.*| . |	12	-0.135	-0.115	23.052	0.027

*Probabilities may not be valid for this equation specification.

Sources : Proceed by author

Correlogram have spikes on trailed by three and eight solid lag. Q-statistically significant on all flags, show significant serial correlation in the residuals. At probabilistic value [Table 2] can we look for a model that is created. But for the LM test can be used to reject hiotesis that there is no correlation, as in [Table 3] below :

Table 3 : Result LM Test Consumption, Direct Invetsment, and GDP

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	4.406982	Prob. F(4,39)	0.0049
Obs*R-squared	14.63081	Prob. Chi-Square(4)	0.0055

Sources : Proceed by author

At [Table 3] Test accept the hypothesis on the serial correlation to order four. Q-statistics and the LM test three variables showed that the residual serial correlation and equations must be re-determined before using it to test hypotheses and forecasting. Seen from the significant probability of F statistics.

Testing for Cointegration

In the setting of a single equation, some software mathematical and statistical many who advocate for using test Engle and Granger (1987), Phillips and Ouliaris (1990) residual-based test, or Hansen instability tests (Hansen 1992 b), and Park $H(p, q)$ added test variables (Parks 1992). Engle-Granger and Phillips-Ouliaris residue tests based cointegration only the unit root tests applied to the residuals obtained from the estimation SOLS. Based on the assumption that the series are not cointegrated, all of the linear combinations of (y_t, X_t'), including residuals from SOLS, is a unit root nonstationary. Therefore, test the null hypothesis of no cointegration against the alternative of cointegration in accordance with the unit root test of the null of nonstationarity against stationary alternatives. Two tests differ in method of accounting for serial correlation in the rest of the series; Engle-Granger test using a parametric, plus Dickey-Fuller (ADF) approach, while Phillips-Ouliaris test using nonparametric methodology Phillips-Perron (PP). The Engle-Granger test estimates a p -lag augmented regression of the form :

$$\Delta \varkappa_{1t} = (\rho - 1)\varkappa_{1t-1} + \sum_{j=1}^{p} \delta_j \Delta \varkappa_{1t-j} + v_t \qquad (2)$$

The number of lagged differences p should increase to infinity with the (zero-lag) sample size T but at a rate slower than $T^{1/3}$. We consider the two standard ADF test statistics, one based on the t-statistic for testing the null hypothesis of nonstationarity $(\rho = 1)$ and the other based directly on the normalized autocorrelation coefficient $\hat{\rho} - 1$:

$$\hat{\tau} = \frac{\hat{\rho} - 1}{se(\hat{\rho})}$$
$$\varkappa = \frac{T(\hat{\rho} - 1)}{\left(1 - \sum_j \delta_j\right)} \qquad (3)$$

where $se(\hat{\rho})$ is the usual OLS estimator of the standard error of the estimated $\hat{\rho}$

$$se(\hat{\rho}) = s_v \left(\sum_t \varkappa_{1t-1}^2\right)^{-1/2} \qquad (4)$$

In Stock (1986), Hayashi (2000). Unlike the Engle-Granger test, test Phillips-Ouliaris obtain estimates by running regressions augmented Dickey-Fuller.

$$\Delta \varkappa_{1t} = (\rho - 1)\varkappa_{1t-1} + w_t \qquad (5)$$

and use the results to calculate the estimate of the long-term variance ω_{uv} and variance rigorous long-term λ_{1uv} one side of the residual. By default, the software will perform mathematical or statistical-df or correct the variance estimates of both the long term, but correction can be turned off. (Correction df used in tests Phillips-Ouliaris slightly different from those in FMOLS and CCR estimates since the former applies to both the variance estimator of the long-term, while the latter only applies to long-term conditional variance estimation). If there is a bias corrected autocorrelation coefficient is then given by:

$$(\hat{\rho}^* - 1) = (\hat{\rho} - 1) - T\lambda_{1uv}\left(\sum_t u_{1t-1}^2\right)^{-1} \quad (6)$$

Here we can see the test results Engle-Granger in [Table 4] which in divided into three different parts. The first section displays the test specifications and settings, along with test values and corresponding p-values:

Table 4 : Result Engle-Granger Consumption, Direct Invetsment, and GDP

Date: 01/18/16 Time: 02:19
Series: CSMPT DRINVST GDP
Automatic lags specification based on Schwarz criterion (maxlag=9)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
CSMPT	-4.173806	0.0289	-25.97748	0.0211
DRINVST	-1.480362	0.9016	-14.95567	0.2449
GDP	-4.278025	0.0227	-27.05768	0.0156

*MacKinnon (1996) p-values.

Sources : Proceed by author

It can be seen from the results of the probability values derived from the equation MacKinnon response simulation results are made. In a setting in which to use the results MacKinnon may not be appropriate, for example when cointegration equation contains user-defined deterministic regressors or when there are more than 12 stochastic trends in the asymptotic distribution, mathematical or statistical software will display a warning message at the bottom of the results normally. See description of the test, we first make sure that the test statistic calculated using C and TREND as deterministic regressors, and note that the option to include a single difference lags in the ADF regression is determined by using an automatic lag selection criteria and maximum lag Schwarz 9. While the test it self, Engle-Granger tau-statistics (t-statistics) and normal autocorrelation coefficient (which we refer to as the z-statistic) either reject the null hypothesis of no (unit root in the residuals) cointegration at the 5% level. Tau-statistical rejected at a significance level of 1%. On balance, the evidence clearly shows that CSMPT and GDP are cointegrated. The middle section of the output displays the results of which are used in constructing test statistics that may be of interest [Table 5]:

Table 5 : Result Rho statistic Consumption, Direct Invetsment, and GDP

Intermediate Results:

	CSMPT	DRINVST	GDP
Rho - 1	-0.552712	-0.528460	-0.575695
Rho S.E.	0.132424	0.356981	0.134570
Residual variance	3.36E+19	8.06E+17	7.38E+19
Long-run residual variance	3.36E+19	4.24E+17	7.38E+19
Number of lags	0	8	0
Number of observations	47	39	47

Number of stochastic trends**	3	3	3

**Number of stochastic trends in asymptotic distribution

Sources : Proceed by author

Most of the results are shown quite clearly in [Table 5], although some decent little discussion. First, the "Rho SE" and "residual variance" is (perhaps) df corrected coefficient and standard error squared standard error of regression. Furthermore, the "Long-run residual variance" is a long-term estimate of the residual variance based parametric model estimation. The estimation results obtained by looking at the residual variance and dividing it by the square of one minus the amount of lag coefficient difference. This long-term residual variance and the variance is used to get the denominator of the z-statistics. Finally, "The number of stochastic trend" entry reported $k = m_2 + 1$ value is used to obtain p-values. In the leading case k, only the number of cointegration variables (including dependent) in the system, but generally have to take into account the value of the deterministic trend in the system that are excluded from the cointegration equation. With time series data that there is a change in use Options dialog to show a single button to control the variance estimation of long-term ω_w and one long-term variant hand tight λ_{1w}. The test results provided by Z-statistic [Table 6]

Table 6 : Result Z-statistic Consumption, Direct Invetsment, and GDP

Date: 01/18/16 Time: 02:20
Series: CSMPT DRINVST GDP
Long-run variance estimate (Bartlett kernel, Newey-West fixed bandwidth)
No d.f. adjustment for variances

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
CSMPT	-4.283354	0.0224	-27.23472	0.0149
DRINVST	-3.911655	0.0517	-28.19021	0.0113
GDP	-4.404228	0.0168	-28.67113	0.0099

*MacKinnon (1996) p-values.

Sources : Proceed by author

At the top of the output [Table 6] outputs noted that, the results of long-term variance estimates and the long-term side variances using Bartlett kernel bandwidth and the number of observations. More importantly, the statistical testing showed that, as with the Engle-Granger tests, tests Phillips-Ouliaris accept the null hypothesis of no cointegration (unit root in the residuals) at approximately 1% significance level. Among the results is given by [Table 7]:

Table 7 : Result Rhos statistic Consumption, Direct Invetsment, and GDP

Intermediate Results:

	CSMPT	DRINVST	GDP
Rho - 1	-0.552712	-0.548694	-0.575695
Bias corrected Rho - 1 (Rho* - 1)	-0.579462	-0.599792	-0.610024
Rho* S.E.	0.135282	0.153335	0.138509
Residual variance	3.29E+19	1.31E+18	7.22E+19
Long-run residual variance	3.51E+19	1.45E+18	7.82E+19
Long-run residual autocovariance	1.09E+18	6.69E+16	2.98E+18
Bandwidth	NA	NA	NA
Number of observations	47	47	47
Number of stochastic trends**	3	3	3

**Number of stochastic trends in asymptotic distribution

Sources : Proceed by author

In the output results [Table 7] look there are some new results. The "Bias corrected Rho - 1" reports the estimated value and "Rose". The "Long-run residual variance" and "Long-run residual autokovarian" are approximate ω_{ar} and λ_{1ar} respectively. It should be noted $\hat{\omega}_{ar}^{1/2}$ that the ratio to S.E. regression, which is a measure of the amount of residual autocorrelation in the long term variants, is the scale factor used in adjusting the raw t-statistic for forming tau.

CONCLUSION

From the research that has been done using a variety of models and cointegration correlation to economic variables consumption, direct investment and GDP Indonesia, it can be concluded that among the variable consumption, investment and GDP correlate directly in the hose do that research data. While the results of cointegration test can be concluded that that the variable consumption, direct investment and GDP mutually cointegrated in the long term at the time do that research, these results are strengthened by the existence $\hat{\omega}_{ar}^{1/2}$ to SE regression, which is a measure of the number of autocorrelation residual in variants of long-term, is the scale factor used in adjusting the raw t-statistic for forming tau [Table 7] and tests Phillips-Ouliaris accept the null hypothesis of no cointegration (unit root in the residuals) to guess -kira significance level of 1% [Table 6], as well as accept the hypothesis is no serial correlation to order four. Q-statistics and the LM test three variables showed that the residual serial correlation [Table 3].

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