*I J A B E R*, Vol. 14, No. 11, (2016): 8195-8209

# A STUDY OF NON-STATIONERITY MACROECONOMIC INDICATOR (GROWTH) EVIDANCE FROM INDONESIA

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***Abstract: Purpose*** *- This research was conducted by the authors aimed to determine the form of the data rate of growth in Indonesia by using the unit root test model (augmented Dickey fuller).*

***Method/ Analysis*** *- unit root test was conducted to test a set of data growth rate of Indonesia. The annual growth rate of the Indonesian state value data starting in 1968-2014, test data analysis model that will be used is lagging the model 1, 10 and 20, as well as using the differences in the model to be applied at the level, level, 1 st, 2 nd and confidence intervals for level, trend and intercept, and None.*

***Data*** *- Variable rate of growth in Indonesia is obtained writers through the web site statistics central agencies and the Indonesian government through the Opera Web sites such as Bank Indonesia, Blomberg and others. Data were analyzed by the author using the latest version of the statistical software. The study found three techniques that are not consistent, that is, they do not lead to the same result.*

***Finding*** *- however, recommend the use of methods Dickey-Fuller Because Capable of detecting non-stationary easier for the form of time series data. From the research that has been done can be concluded that the level of data growth in Indonesia is stationary at lag 1 and lag 10, for the whole of this model is applied. When delays are used 20, and the same model, it appears that the rate of data growth in Indonesia Become a stationary state.*

***Novelty*** *- Using data growth rates in Indonesia, data will not be the same level of stationary, if the number of lags that of the ADF test increased in number.*

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

***JEL Classification:*** *C01, C22, E24, E27.*

## 1. INTRODUCTION

Several empirical studies in the field of economics, which uses data based on time series has been much developed and published. When viewed from some of these studies, showing how the standards for a data that is time series, which in replication as a process of realization of a stochastic process. To build a model in times of data eries could use some tools or statistical inference as a tool to build

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and test the equations that will be able to characterize the relationship between economic variables are in use. According to the opinion (Wei, 2006) there are two special categories of many major characteristics in an economic data series that are either stationary or non-stationary nature series or also about volatility over time. Two special categories of time series data can or can lead to many applications in both areas, especially relating to statistics and economics.

A data in said nonstationarity if there are analytical tools that are general to be widely applied to the time series data. With a sense that the use of multiple variables sure will not have a clear trend, for these variables back to the value that is constant or linear trend. The argument is generally considered a justification and see that an economic process will be produced by the nonstationary process from the time series data, and the data in the sense that it must follow a stochastic trend. In a study done by (Pfaff, 2006) one of the main objectives of the empirical studies in economics to test hypotheses and estimate relationships derived from economic theory, among other variables such as aggregate.

In the mechanism of statistical methods newest and earlier many of which use data analysis tool used to build and test a model of simultaneous equations small scale and large scale, such as the example structural VAR, VAR, Ordinary Least Squares (OLS) and others, where some of the methods that many based on the assumption that economic variables are used in the equation must be stationary model. Currently the core of a problem is how a process of statistical inference related to the analysis of time series data to a stationary process and is no longer valid if the time series data that are formed because of the lack of stationary. If a time series is nonstationary, it is unlikely that the analysis of these data certainly use OLS models to estimate that there is a linear relationship in the long term in the data or variables used in the study. Or in other words, in the language of statistics if the data remains on proceed to the OLS equation form, it can cause spurious regression. Spurious regression is a state in which the data will be analyzed before is not stationary, but apparently there are a significant relationship between the data in the statistical equations, or in other words between the variables in the study did not have a relationship with each other. In the previous period a lot of the meet the difficulties of data that is nonstationarity problem is, in because of the absence of a good understanding in the model built into the OLS regression equation earlier. With the emergence of cointegration method, makes the stationary test methods to be forgotten, but not so for some particular cases should remain stationary method and should remain on the run in an analysis of data that are time series. So that will be built and developed several models containing stochastic variables that are stationary, which can be built such that the result if we interpret the results are statistically and economically can be accounted.

As with the study done by (Wei, 2006) discuss the cointegration models. As was said at the beginning of this modeling is one of econometric concepts that can be used to see how an economic or a few variables in the case of a state of long-term equilibrium between economic time series data that is in use. We must pay attention to the analysis of data in the time series, because any analysis of the data will have functions and usefulness, because if the data are nonstationary time series, then the equation OLS estimate assumption is certainly violated. Before the analysis procedure carried on regular, preferably for testing the hypothesis should see how the relationship between variables is not stationary. See the distinction data is stationary and not stationary then several methods, one of which called the method of truth in large samples, can lead to mistakes that can be misleading, so it will be able to give a false conclusion or regression in a small sample. A study done by (Banerejee et al., 1993) regarding the estimation framework of a single equation with variable integrated or nonstationary tend to be able to create a problem like the following: will the emergence of data distribution is non-standard of the estimated coefficients gender erated by a process that does not become stationary, in the sense that further explanatory variables generated by the process that created the equation will show autocorrelation. With the presence of more than one cointegrated vector and the tendency for a slightly weak exogeneity.

In this study will be undertaken is to estimate a model of the process data is stationary and not stationary and explain the application that will be used for a different data sets using three main methods of testing analysis of existing data model in the unit root test (ADF test) to see the stationary over the data. Results from this study will be able to answer phenomena in stationary and nonstationary, data analysis by using a variable rate of economic growth in Indonesia as time series data analysis. In this study, the above techniques for testing stationery to be explored by using statistical software assisted, where this software can be tested by using the three forms of the model data sets.

## 2. THEORETICAL OVERVIEW

### Stationarity and nonstationarity

A time series of data which will be observed, can be regarded as the embodiment of a random variable that can be explained by some stochastic process. The concept of "stationary" relates to the properties of stochastic data. In this study, the concept of "stationary and nonstationary" adopted by the author; which means that the data is assumed to be stationary if the means, variances and covariances of the series independent of time, rather than all the data has been distributed. A process stationarity and nonstationarity within a period of time can occur, when there is no means constant $\mu$, there is no constant variance t, or both of these properties are met. It can come from various sources but the most important is a unit root.

***Unit root:*** Of the many simplest model, is a model that may contain a unit root AR (1).

Standard equations of the first order autoregressive process, AR (1), as below:

$$Yt = \varphi Y_{t-1} + t \quad (1)$$

where the letter t show serial error term white noise corrected with average zero and constant variance constant.

In the study (Yule, 1989) If φ = 1, equation 1 will be random, it will form a nonstationary process. When this happens, we face the problem of what is known as a root unit. This means that we are faced with a situation of nonstationarity in the series. However, if φ <1, then the series Yt is stationary. Stationarity of these series is important because it can survive in the correlation nonstationary time series even if the sample is very large and can cause what is called spurious regression. The presence of unit root problem can be solved when stationary on the data can be achieved by conducting the process of differencing on a collection of data that we have (see Wei, 2006).

**The augmented Dickey-Fuller (ADF) test**

In this section, it is stated that, if φ = 1, contained in equation 1 become a model random walk without irregularities, known as nonstationary process. The basic idea behind the ADF unit root test for nonstationarity is the regression only on the Yt (one period) left value Yt-1 and find out if φ is estimated statistically equal to 1 or not. Equation 1 can be manipulated by subtracting Yt-1 from both sides to get the following equation:

$$Y_t - Y_{t-1} = (\varphi - 1)Y_{t-1} + t \quad (2)$$

Where can we write the equation :

$$4Y_t = \delta Y_{t-1} + t \quad (3)$$

is δ = (φ – 1), and Δ is the first difference operator.

In practice, instead of estimating equation 1, we will estimate equation 3 and the test for the null hypothesis of δ = 0 against the alternative δ = 0. If δ = 0, then φ = 1, which means that we have a unit root problem and the series under consideration is nonstationary. It should be noted that under the null hypothesis ä = 0, the value t of the estimated coefficients Yt-1 does not follow t-distribution even in a large sample (Erdogdu, 2007). This means that the value of t does not have a normal distribution asymptotically. The decision to reject or not reject the null hypothesis of δ = 0 based on the Dickey-Fuller (DF) important values of τ (tau) statistics. DF test is based on the assumption that the fault of the term t are not correlated.

However, in practice, the error term in the test series DF usually show evidence of correlation. To resolve this problem, Dickey Fuller and has developed a test known as Augmented Dickey-Fuller (ADF) test. In the ADF test, which lags behind the first differences that are included in the regression equation to make the t error term white noise and, therefore, the regression equation is presented in the following form:

$$\Delta Y_t = \delta Y_{t-1} + \alpha_i \overset{m}{\underset{i=1}{X}} \Delta Y_{t-i} + t. \tag{4}$$

To be more specific, the intercept may be included, as well as a time trend t, after which the model becomes

$$\Delta Y_t + \beta_1 + \beta_2 t + \delta Y_{t-1} + \alpha_i \overset{m}{\underset{i=1}{X}} Y_{t-i} + t. \tag{5}$$

The testing procedure for the ADF unit root test is applied to the following model

$$\Delta y_t = \alpha + \beta t + \gamma y_{t-1} + \overset{\rho}{\underset{j=1}{X}} \Delta y_{t-j} + it \tag{6}$$

where $\alpha$ is a constant, $\beta$ the coefficient on a time trend series, $\gamma$ the coefficient of $y_{t-1}$, $\rho$ is the lag order of the autoregressive process, $\Delta y_t = y_t - y_{t-1}$ are first differences of $y_t$, $y_{t-1}$ are lagged values of order one of $y_t$, $\Delta y_{t-j}$ are changes in lagged values, and it is the white noise.

So ADF test can be tested on at least three possible models:

(i) This is defined by using the constraint á = 0, â = 0 and ã = 0 in equation 6. This leads to the equation

$$\Delta y_t = \Delta y_{t-1} + t. \tag{7}$$

Study (see in Pfaff, 2006) with equation 5 if not stationary series because its variance grows with time.

(ii) In is obtained by imposing the constraint $\beta = 0$ and $\gamma = 0$ in equation 6, which yields to the equation

$$\Delta yt = \alpha + \Delta y_{t-1} + t. \tag{8}$$

(iii) In equation if trend with a drift. For $\beta = 0$, equation 6 becomes the following deter- ministic trend with a drift model

$$\Delta y_t = \alpha + \beta t + \Delta y_{t-1} + t. \tag{9}$$

In (Pfaff, 2006) Value sign of the drift parameter ($\alpha$) causes the series to wander upward if positive and downward if negative, whereas the size of the absolute value affects the steepness of the series.

With in the ADF model is $\gamma$. For $\gamma = 0$, the yt sequence contains the unit root and hence is integrated of order d = 1.

The test procedure for unit roots is similar to statistical tests for hypothesis, that is: (i ) Set the null and alternative hypothesis as

$$H_0 : \gamma = 0 \tag{10}$$

$$H_1 : \gamma < 0 \tag{11}$$

Determine the test statistic using

$$F_\tau = \frac{\hat{\gamma}}{SE(\hat{\gamma})} \tag{12}$$

Is SE($\hat{\gamma}$) is the standard error of ã.

(iii) Compare the calculated test statistic in 12 with the critical value from Dickey-Fuller table to reject or not to reject the null hypothesis.

(iv) The ADF test is a lower-tailed test, so if Fσ is less than the critical value, then the null hypothesis of unit root is rejected and the conclusion is that the variable of the series does not contain a unit root and is nonstationary.

Testing DF and ADF are similar since they have the same asymptotic distribution. Although there are numerous unit root tests, such as the Phillips-Perron test and the Schmidt-Phillips test, the most notable and commonly used is the ADF test, which will be used in this study.

**Why Testing for Nonstationarity and Stationarity is Important**

In testing a form of time series data, the data is not stationary and stationary is very important to know in a study. Why is that, because of where the underlying variables of the study are based on time series. It is supposed to be for the time analysis of the data series has many applications, especially in various fields eg economy, where data time series including one type of data that many learned, because it is closely connected with the study of a relationship between the economic variables with economic variables other mutually or very affect. If the financial industry study time series data, such as learning about how to link a variable in which financial profit with other financial variables that affect said such dividend will be paid, or as a variable in household consumption and GDP of a country. An econometric analysis is very important, because the econometric analysis can create a form that is most appropriate equation, using variables that will be analyzed in the economy. A determination of the trends in the data and determining the level of significance that is in use. Many studies concerning the financial and economic as well as the study of the behavior of the time series data, or papers relating to the non-stationary in a data reference can be made in a time series data analysis.

As done by the authors is currently analyzing time series data for the variable rate of economic growth in Indonesia, began the decade 1968-2014, focusing on a non-stationary process. Some researchers such as Granger and Newbold (1974) is one of many researchers who provide opinions in the field of research, especially those dealing with time series data. They give the idea that the data contained or that will be used to macroeconomic regarded as a rule that there must be a process of stochastic trend. A data marked with a process unit root for example, they suggested that the use of variables in the equation econometric models can lead to a spurious regression. With in doing a test for data non-stationarity is very important, because the author considers that the results of a regression that maximum will be made if through the process. Or with a simple sentence can be said that the data in the form of time series will tend to continue to so-called non-stationary when the unit root test is not done and will tend to be stationary when marked with in doing it the unit root test.

In this study the authors only using Dickey-fuller in stationary and whether a notice of data, although many other models to see stationery a process of economic and financial data. In an article initiated by Dickey and Fuller (1979, 1981), there is the existence of a formal test assay development to achieve a stationary nature of the data will have. Significance level of testing carried out to see whether the test for the existence of a unit root presence, the Dickey-fuller look at the value of which is derived to make the right decision in making a regression equation later. This can be considered as a test in accordance with all the tests to be run later in using the unit root analysis tool stationary.

In this study the authors used a variable rate of growth in Indonesia as variables to be tested for stationary data. Especially by applying only one method used to test the data for stationary, but using lags the model and the level of test models in Dickey-fuller different.

## 3. DATA AND RESEARCH METHOD

### 3.1. Time Research and Data Collection

This study was conducted by the authors in December 2015 to January 2016. The data used in this research is of variable value of the growth rate of the national economy of the Indonesia nation during the time period from last year ended 1968 to 2014. The data in the can by the author's web site statistics central body as well as the web sites of other government institutions. Data once in the can by the first author in the last though analyzed by means of statistical aided latest version.

### 3.2. Research Method

#### *3.2.1. Unit Root*

Further in Granger and Newbold (1974) says that the data will be analyzed when stationary test has not been implemented there can be a spurious regression. Spurious regression is one of the crucial problems that usually caused many standard errors of non-stationary variables, that could cause the data that we produce biased results. There are several ways that can be used to ensure that no spurious regression correlation. In this study, the unit root test of Augmented Dickey-Fuller (ADF), Phillip-Perron (PP) and Kwiatkowski, Phillips, Schmidt and Shin (KPSS). But here the author only apply augmented Dickey fuller test (ADF). The equation is simple a stationary the data as follows:

$$\mathbf{Y_t = \rho\, Y_{t-1} + U_t}$$

If the coefficient of Yt-1 (ρ) is a = 1 in the sense that the hypothesis is accepted, then the variable contains a unit root and non-stationary. To change the trend of non-stationary becomes stationary test first order (first difference)

$$\mathbf{\Delta Y_t = (\rho\text{-}1)\ (Y_t - Y_{t-1})}$$

P coefficient would be 0, and the hypothesis will be rejected so the model becomes stationary. The hypothesis used in the test is augmented Dickey fuller:

**H0 : q = 0** (There are roots unit, the variable Y is not stationary)

**H1 : q ≠ 0** (No there are roots unit, the variable Y is stationary)

Test root test is obtained by comparing the t-test with a t-table in the table Dickey-Fuller.

## 4. RESULT AND DISCUSSION

By using statistical and econometric methods, we will be able to check later whether the data rate of economic growth in Indonesia is stationary or not stationary. However, in this study the author uses augmented Dickey fuller test or complete a short test of the ADF. The test is widely used in time series data is stationary or not stationary. Indeed there are other stationary data test such as the Phillips-Perron test. In this study the authors divide into three parts in the form of unit root test results using the model lagged 1, are 10 and 20, and divide again into the respective model in the form of intercept, trend and intercept also None. In each model to another in the form of levels, 1 st and 2 nd difference. From these results we can see the model behind the implementation and use of different models earlier.

*Lags 1 with interceipt, trend and interceipt and none*

**Table 1**
**Result test ADF with lags 1 with interceipt model**

| *Null Hypothesis: GROWTH has a unit root* | | *With interceipt level* | | *With interceipt 1 st diff* | | *With interceipt 2 nd diff* | |
|---|---|---|---|---|---|---|---|
| *Lag Length: 0 (Automatic-based on AIC, maxlag=1)* | | *t-Statistic* | *Prob.** | *t-Statistic* | *Prob.** | *t-Statistic* | *Prob.** |
| Augmented Dickey-Fuller test statistic | | -4.792038 | 0.0003 | -7.411968 | 0.0000 | -9.757662 | 0.0000 |
| Test | 1% level | -3.581152 | | -3.588509 | | -3.592462 | |
| critical | 5% level | -2.926622 | | -2.929734 | | -2.931404 | |
| values: | 10% level | -2.601424 | | -2.603064 | | -2.603944 | |

*Source:* Proceed by author

**Table 2**
**Result test ADF with lags 1 with trend and interceipt model**

| *Null Hypothesis: GROWTH has a unit root* | | *Trend & interceipt level* | | *Trend & interceipt 1 st diff* | | *Trend & interceipt 2 nd diff* | |
|---|---|---|---|---|---|---|---|
| *Lag Length: 0 (Automatic - based on AIC, maxlag=1)* | | *t-Statistic* | *Prob.** | *t-Statistic* | *Prob.** | *t-Statistic* | *Prob.** |
| Augmented Dickey-Fuller test statistic | | -5.031872 | 0.0009 | -7.328882 | 0.0000 | -9.641248 | 0.0000 |
| Test | 1% level | -4.170583 | | -4.180911 | | -4.186481 | |
| critical | 5% level | -3.510740 | | -3.515523 | | -3.518090 | |
| values: | 10% level | -3.185512 | | -3.188259 | | -3.189732 | |

*Source:* Proceed by author

**Table 3**
**Result test ADF with lags 1 with none model**

| *Null Hypothesis: GROWTH has a unit root* | | *None level* | | *None 1 st diff* | | *None 2 nd diff* | |
|---|---|---|---|---|---|---|---|
| *Lag Length: 0 (Automatic-based on AIC, maxlag=1)* | | *t-Statistic* | *Prob.** | *t-Statistic* | *Prob.** | *t-Statistic* | *Prob.** |
| Augmented Dickey-Fuller test statistic | | -1.639087 | 0.0949 | -7.492795 | 0.0000 | -9.878398 | 0.0000 |
| Test | 1% level | -2.617364 | | -2.618579 | | -2.619851 | |
| critical | 5% level | -1.948313 | | -1.948495 | | -1.948686 | |
| values: | 10% level | -1.612229 | | -1.612135 | | -1.612036 | |

*Source:* Proceed by author

Of output produced above shows how the variable rate of economic growth in Indonesia in [Table 1, Table 2, and Table 3], her t statistical value respectively -4.79, -7.41 -9.75, -5.03, -7.32, -9.64, - 1.63, -7.49 and -9.87 some already greater than the value of t on the table McKinon confidence level of 1%, 5%, or 10%, except for non-models on the level probabilistic value level is not significant. The average value of the probability of 0.0000 has been smaller than the value of criticism 0.05 (0.0001 <0.05). Thus, the data has been stationary at the level of level, differentiation of the first stage (1st difference), differentiation of the second phase (2nd differensi) and the null hypothesis can be rejected, except for non-level models in [Table 3].

*Lags 10 with interceipt, trend and interceipt and none*

**Table 4**
**Result test ADF with lags 1 with interceipt model**

| *Null Hypothesis: GROWTH has a unit root* | | *With interceipt level* | | *With interceipt 1 st diff* | | *With interceipt 2 nd diff* | |
|---|---|---|---|---|---|---|---|
| *Lag Length: 0 (Automatic-based on AIC, maxlag=10)* | | *t-Statistic* | *Prob.** | *t-Statistic* | *Prob.** | *t-Statistic* | *Prob.** |
| Augmented Dickey-Fuller test statistic | | -4.792038 | 0.0003 | -7.411968 | 0.0000 | -6.041251 | 0.0000 |
| Test | 1% level | -3.581152 | | -3.588509 | | -3.605593 | |
| critical | 5% level | -2.926622 | | -2.929734 | | -2.936942 | |
| values: | 10% level | -2.601424 | | -2.603064 | | -2.606857 | |

*Source:* Proceed by author

**Table 5**
**Result test ADF with lags 1 with trend and interceipt model**

| *Null Hypothesis: GROWTH has a unit root* | | *Trend & interceipt level* | | *Trend & interceipt 1 st diff* | | *Trend & interceipt 2 nd diff* | |
|---|---|---|---|---|---|---|---|
| *Lag Length: 0 (Automatic-based on AIC, maxlag=10)* | | *t-Statistic* | *Prob.** | *t-Statistic* | *Prob.** | *t-Statistic* | *Prob.** |
| Augmented Dickey-Fuller test statistic | | -5.031872 | 0.0009 | -7.328882 | 0.0000 | -5.951847 | 0.0001 |
| Test | 1% level | -4.170583 | | -4.180911 | | -4.205004 | |
| critical | 5% level | -3.510740 | | -3.515523 | | -3.526609 | |
| values: | 10% level | -3.185512 | | -3.188259 | | -3.194611 | |

*Source:* Proceed by author

**Table 6**
**Result test ADF with lags 1 with none model**

| *Null Hypothesis: GROWTH has a unit root* | | *None level* | | *None 1 st diff* | | *None 2 nd diff* | |
|---|---|---|---|---|---|---|---|
| *Lag Length: 0 (Automatic-based on AIC, maxlag=10)* | | *t-Statistic* | *Prob.** | *t-Statistic* | *Prob.** | *t-Statistic* | *Prob.** |
| Augmented Dickey-Fuller test statistic | | -1.287829 | 0.1795 | -7.492795 | 0.0000 | -6.129982 | 0.0000 |
| Test | 1% level | -2.618579 | | -2.618579 | | -2.624057 | |
| critical | 5% level | -1.948495 | | -1.948495 | | -1.949319 | |
| values: | 10% level | -1.612135 | | -1.612135 | | -1.611711 | |

*Source:* Proceed by author

If we see similar results for the variable data value economic growth in Indonesia in [Table 4, Table 5 and Table 6] on the use lags 10 above, the value of t-statistic of -4.79, -7.41 -6.04, -5.03, -7.32, - 5.95, -1.28, -7.49 and -6.12 some already greater than the value of t on the table McKinnon confidence level of 1%, 5%, or 10%, except for non-models on the level probabilistic value level is not significant. The average value of the probability of 0.0000 has been smaller than the value of criticism 0.05 (0.0001 <0.05). Thus, the data has been stationary at the level of level, differentiation of the first stage (1st difference), differentiation of the second phase (2nd differensi) and the null hypothesis can be rejected, except for non-level models in [Table 3] is almost the same as the model use lags 1.

*Lags 20 with interceipt, trend and interceipt and none*

**Table 7**
**Result test ADF with lags 1 with interceipt model**

| *Null Hypothesis: GROWTH has a unit root* | | *With interceipt level* | | *With interceipt 1 st diff* | | *With interceipt 2 nd diff* | |
|---|---|---|---|---|---|---|---|
| *Lag Length: 0 (Automatic-based on AIC, maxlag=20)* | | *t-Statistic* | *Prob.** | *t-Statistic* | *Prob.** | *t-Statistic* | *Prob.** |
| Augmented Dickey-Fuller test statistic | | -1.314570 | 0.6072 | -2.411138 | 0.1485 | -0.042456 | 0.9453 |
| Test | 1% level | -3.711457 | | -3.711457 | | -3.737853 | |
| critical | 5% level | -2.981038 | | -2.981038 | | -2.991878 | |
| values: | 10% level | -2.629906 | | -2.629906 | | -2.635542 | |

*Source:* Proceed by author

**Table 8**
**Result test ADF with lags 1 with trend and interceipt model**

| *Null Hypothesis: GROWTH has a unit root* | | *Trend & interceipt level* | | *Trend & interceipt 1 st diff* | | *Trend & interceipt 2 nd diff* | |
|---|---|---|---|---|---|---|---|
| *Lag Length: 0 (Automatic-based on AIC, maxlag=20)* | | *t-Statistic* | *Prob.** | *t-Statistic* | *Prob.** | *t-Statistic* | *Prob.** |
| Augmented Dickey-Fuller test statistic | | -1.643886 | 0.7468 | -0.479245 | 0.9777 | 2.213731 | 1.0000 |
| Test | 1% level | -4.356068 | | -4.374307 | | -4.394309 | |
| critical | 5% level | -3.595026 | | -3.603202 | | -3.612199 | |
| values: | 10% level | -3.233456 | | -3.238054 | | -3.243079 | |

*Source:* Proceed by author

**Table 9**
**Result test ADF with lags 1 with none model**

| *Null Hypothesis: GROWTH has a unit root* | | *None level* | | *None 1 st diff* | | *None 2 nd diff* | |
|---|---|---|---|---|---|---|---|
| *Lag Length: 0 (Automatic-based on AIC, maxlag=20)* | | *t-Statistic* | *Prob.** | *t-Statistic* | *Prob.** | *t-Statistic* | *Prob.** |
| Augmented Dickey-Fuller test statistic | | -2.064274 | 0.0395 | -0.829269 | 0.3466 | -0.160087 | 0.6179 |
| Test | 1% level | -2.656915 | | -2.660720 | | -2.664853 | |
| critical | 5% level | -1.954414 | | -1.955020 | | -1.955681 | |
| values: | 10% level | -1.609329 | | -1.609070 | | -1.608793 | |

*Source:* Proceed by author

For the last table of this output results in [Table 7, Table 8 and Table 9] use lags 20 above shows that the statistical value of t for economic data Indonesian state growth rate t statistics for each -1.31, -2.41 -0.04, -1.64, -0.47 , 2:21, 0:03, 0:34 and -6.17 some have less than the value of t on the table McKinon confidence level of 1%, 5%, or 10%, except for non-models at a rate level probabilistic significant value. The average value of the probability of 0.0000 has been greater than the value of criticism 0.05 (0.0001 <0.05). Thus, the data is not stationary at the level of level, differentiation of the first stage (1st difference), differentiation of the second phase (2nd differensi) and the null hypothesis is rejected, except for non-level models in [Table 3] received.

## 5. CONCLUSIONS

From the research that has been done, the subject of non-stationary stationary data using a variable that is the rate of economic growth in Indonesia. It can be concluded that, in theory statineritas with a data rate of growth in Indonesia is stationary, with the use of lag 1, lag 10, but on the level of variable data usage dropping 20 Indonesian state growth rate becomes stationary. So it can be concluded from the study that in doing this, that the data rate of growth in Indonesia in the use level of inaction is greater, then the test data in less stationary.

Note that if the test results show the data that is in use is stationary, the econometric model test that will be applied is the VAR model. However, if the test results indicate that the data is not stationary, then in the form of lag that used to be required to change in order to make these data become stationary. If the data is already in the transformation of the stationary, the next test steps that can be implemented is cointegration. If the test results show that the data contained cointegration, the VAR model is a model which is in the form of Vector Error Correction Model (VECM). Data cointegration indicates the long-term variable is used interconnected or have a relationship.

### *References*

Asufu. A. D., (2000), The relationship between energy consumption, energy prices and economic growth: time series evidence from Asian developing countries. Energy economics, 22 ;pp. 615-625.

Banerejee A, et.all., (1993), Cointegration, error-correction, and ecometric analysis of nonstationary data. London: Oxford University Press.

Belloumi M., (2009), Energy consumption and GDP in Tunisia: Cointegration and causality analysis. Energy policy, 37; pp. 2745-2753.

Bentzen J., (1995), An empirical of gasoline in Denmark using cointegration approach. Energy Eco- nomics, 17: pp; 329-339.

Bhaskara R., (1994), Cointegration for applied economist. London:Springer + Business Media.

Cancer M., (1998), Tests for cointegration with infinite variance errors. Econometrics, 86; pp. 155-175.

Chan. H. L. Lee S. K., (1997), Modeling and forecasting and demand for China. Energy Economics, 19. pp. 149-168.

Cheng B. S., Lai T.W., (1997), An investigation of cointegration and causality between energy consumption and economic activity in Taiwan. Energy Economics, 19 : pp. 435-444.

Choi. I., (1994), Spurious regression and residual based tests for cointegration when regressors are cointegrated. Econometrics, 60: pp. 331-320.

Enders W., (2004), Applied econometrics time series. Wiley series in Probability and Statistics.

Engle R.F., (1982), Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation. Econometrica, 50 : pp. 987-1007.

Engle R.F., Granger C.W.J., (1987), Cointegration and error correction: Representation, estimation and testing. Econometrica, 55 : pp. 251-276.

Erdogdu E., (2007), Electricity demand analysis using cointegration ARIMA modeling: A case study of Turkey. Energy Policy, 35: pp. 1129-1146.

Fouquest R, Pearson A, Hawdon P.D. Robinson C. and Stevens P., (1997), The future of UK final user energy demand. Energy Policy, 25: pp. 231-240.

Gregory A.W., Hasen J.M., (1996), Testing for structural breaks in cointegrated relationships. Econometrics, 71 : pp. 321-341.

Hamilton J.D., (1994), Time Series Analysis. New Jersey : Princeton University Press.

Harris R., (1995), Using cointegration analysis in econometric modelling. London:Oxford university press.

Holden D. and Perman R., (1994), Unit roots and cointegration for the economist. London:Oxford university press.

Jarque C.M., Bera A.K., (1980), Efficient tests for normality, homoskedasticity and serial independence of regression residuals. Economics letters, 6 ; pp. 255-259.

Johansen R., Juselius K., (1998), Testing structural hypothesis in multivariate cointegration of the P P P and the U I P for UK. Econometrics, 53: pp. 211-244.

Johansen S., (1988), Statistical analysis of cointegration vectors. Economic Dynamic control, 12: pp. 231-254.

Kanas A., (1997), Is economic exposure asymmetric between long-run depreciations and apprecia- tion? Testing using cointegration analysis. Multinational Functional Management, 7: pp. 27-42.

Khalifa H. and Sakka M, (2004), Energy use and output in Canada: a multivariate cointegration analysis. Energy Economics, 25: pp. 225-238.

Kulshreshtha M. and Parikh J.K., (1999), Modeling demand coal India: vector autoregressive models with cointegration variables. Energy Economics, 26: pp. 149-168.

Lee H., (1993), Seasonal cointegration:" The Japanese consumption function. Econometrics, 55: pp. 275-298.

Ljung G.M. and Box G.E.P., (1978), On a measure of lack of fit in time series models. Biometrika, 65: pp. 297-303.

Mashi R., et all., (1996), Energy consumption and real income temporal causality, results for a multi-country study based on cointegration and error correction techniques. Energy Economics, 1; pp. 165-183.

Maslyuk S., Smyth R., (2009), Cointegration between oil spot and future prices of the same and different grades in the presence of structural change. Economics and Business, 65: pp. 1-63.

Maslyuk S., Smyth R., (2010), Female labor force participation and total fertility rates in the OECD: New evidence from panel coitegration and Granger causality testing Economics and Business, 65: pp. 48-64.

Pauly P., (March 2003), Hypothesis test. Lecture notes for econometrics 815, taught at the University of Pretoria in.

Pfaff B., (2006), Analysis of integrated and cointegrated time series with R. London:Springer + Business Media.

Phillips P.C.B., Oualiaris S., (1998), Testing for cointegration using principal component methods. Economics Dynamic and Control, 12: pp. 205-230.

Ramsey J.B., (1978), Tests for specification errors in classical linear least squares regression analysis. Royal statistical society, 31 ; pp. 350-371.

Samimi R., (1995), Road transport energy demand in Austaralia: a cointegration approach. Energy Economics, : 17 : pp. 349-339.

United Nations World Economic Indicators http://quanis1.easydata.co.za/TableViewer/tableView.aspx. Wei W.S., (2006), Time series analysis: univariate and multivariate. Boston: Pearson.

Yang H., (2000), A note on casual relationship between energy and GNP in Taiwan. Energy Eco- nomics, 22: pp. 309-317.

Yule G.U. (1989), Why do we sometimes get nonsense-corrections between time series?"a study in sampling and the nature of time series. Royal Statistical Society, 1 : pp. 1-63.