# Analysis Weak Form Efficiency in Indonesia Stock Exchange Period 2011-2016

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Abstract: Stock market efficiency is a very important study, because an inefficient market allows the market authorities to consistently obtain an abnormal return indicated by stock returns showing predictable behavior or not following a random walk pattern. The purpose of this study is to find out whether stock returns on the Indonesia Stock Exchange are random walk evidenced from non-parametric tests (runs test) and parametric tests (unit root test). This study uses 34 samples, namely the issuer in the LQ45 index, with the study period from January 2011 to December 2016. The data used in this study is the LQ45 index weekly stock closing price from January 2011 to December 2016 obtained from the publication report Indonesia stock exchange. This study using a significance level of 5%. The analytical method used is non-parametric test (run test and phillips perron test) and parametric test (unit root test and autocorrelation function test). The result of the research shows that stock return of Indonesia Stock Exchange are not random walk or inefficient in weak form.

## 1 INTRODUCTION

Disclosure of information is a reflection of an efficient capital market. Where the efficient market theory proposed by fama defines the efficiency of the capital market as a market where prices fully reflect all available information (Fama, 1970). The faster the new information is reflected in the price, the more efficient the capital market. Thus the presence of information has an important role in stock trading in capital markets conducted by investors. This information is needed in making decisions related to the selection of investment portfolios that provide the highest level of profit with a certain level of risk (Setiawati, 2013).

If the equity markets work efficiently, the price would indicate the intrinsic value of the shares and in exchange, limited savings will be allocated to productive investment sector in an optimal way in a way that will provide a stream of benefits for individual investors and the national economy as a whole (Copeland and Weston, 1988). Thus there is no opportunity to obtain information that allows market authorities to consistently gain an abnormal return, because market returns show unpredictable behavior (Khairunnisa, 2015). Conversely, if an inefficient capital market can complicate various parties (Rahman, 1991), ie issuers difficulty in measuring the maximum shareholder wealth. Whereas for investors, of course, many will suffer because inefficient market conditions make a lot of manipulation that can be done to increase stock prices. Lastly, with this can prompt investors to reduce their investment in the stock market because they would have had difficulty detecting the return, risk and liquidity of the company's stock is traded. Therefore it becomes very important to make efficient capital markets, efficient capital market can be created with a lot of competition among investment analysis for investment analysis leads to a situation where at any time, the stock price indicates that the actual value. The more the number of financial analysts and the competition between them will make the price of the securities fair and reflect all the relevant information in which the analyst will attempt where the analyst will attempt to obtain as comprehensive information as possible compared to other analysts with the closest possible analysis that will make the price of the securities fair or in other words, the stock prices reflect all



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available information and make adjustments to fully and rapidly to new information (Husnand, 2005).

The idea of testing the efficiency of the market as the information contained in efficient market hypothesis. Fama divides the efficient market hypothesis into three categories: first, the strong form market efficiency hypothesis is to answer the question of whether investors have private information that is not reflected in the price of securities. Second, the semi strong form efficiency market hypothesis is how quickly the price of a security reflects the published information. Third, the weak form efficiency market hypothesis is how strongly historical information can predict future returns. This hypothesis is known as Random Walk Hypothesis (RWH) states that the current price of securities fully reflects the information contained in the historical price. Therefore, the best predictor of future prices is the current price. It is not possible for investors to design profitable strategies based on the prices of securities in the past. The capital market will be more efficient in a weak form if the prediction rate is lower, so the current stock market price is independent of the stock market prices in the past. In other words, the efficient market forms weak if the stock price follows a random walk process. To test the efficiency of weak form, it is necessary to do random walk hypothesis (RWH) test considering the relation between current and past stock price (Fawson. et.al, 1996; Ananzeh, 2016; Arora, 2013; Okpara, 2010; Borges, 2010; Shaker, 2013)

From three forms of testing efficiency in the information market, the discussion in this study focused on the weak form market efficiency testing or return predictability test, because most of the research in the market efficiency hypothesis (EMH) focuses on the weak form level, because if the research results do not support weak form market efficiency, testing at the next level is useless (Gimba, 2010; Ikechukwu, 2015; Phan & Zhou, 2014). The Indonesian capital market is a capital market that was established since the Dutch occupation in Indonesia under the name Vereniging Voor de Effekteenhundel in 1912 in Batavia with the aim of raising funds to support the expansion of the Dutch Colonial plantation business. But it stopped when World War I and II happened and was reactivated in 1977 and a few years later the capital market experienced growth. Indonesian capital market over the last 5 years have improved performance. This is reflected in the JCI, which is shown in Figure 1.

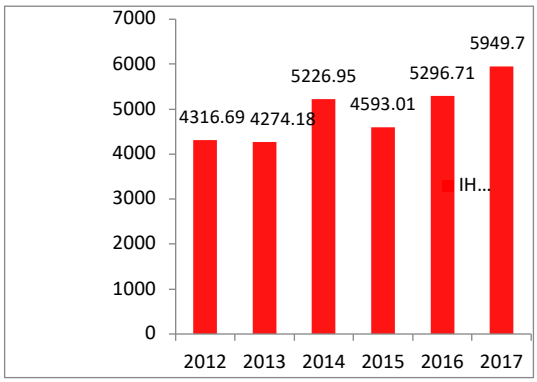


Figure 1: JCI Developments for the Last 5 Years

In theory emerging countries tend to be inefficient. Claessens et al believe that there are several motivations behind attempting to test efficiency in emerging countries (Claessens et al, 1993). First, domestic and foreign investors do not really like to invest in the stock market in emerging countries because there are inefficiencies. For example, the thin market in Africa is often considered the subject of insider manipulation and consequently makes foreign investors lose [Magnusson and Wydick, 2002). If the inefficiency of the market continues to the stage only individuals or certain companies are entitled to exclusive information or insider trading, certainly not encouraging domestic and foreign investors to approach the market. Second, the efficiency test is trying to give an assessment of the effectiveness of the role played by the market, as an example of a role in asset allocation.

## 2 METHODS

The type of research used in this study is explanatory research. In this study the researchers tested a theory that has been tested empirically by previous researchers. In this context, the variables tested related to the weekly stock price movement of the period January 1, 2011 to December 31, 2016. The data used in this study is the weekly data from the stock exchange LQ45 index from January 2011 until December 2016. The sampling technique was conducted by purposive sampling method are taken based on certain criteria, that are:

1. Number of issuers listed in the LQ 45 Index.
2. Issuers are not consistently listed in the LQ 45 Index during the year 2011-2016
3. Issuers incomplete publish weekly stock price LQ 45 Index during the year 2011-2016

Based on the criteria established, then obtained 34 sample data with the number of observations is 8160 obtained from 34 x 240 (multiplication of the number of samples with the study period ie weekly during the year 2011-2016). The main variable in this study is a weekly return of stocks from 34 companies listed in the LQ-45 for the period January 2011 to December 2016, by formula:

$$Z_t = \frac{P_t - P_{t-1}}{P_{t-1}} \times 100\% \quad (1)$$

Description:
$Z_t$ = return
$P_t$ = current close price
$P_{t-1}$= previous stock closing price

### 2.1 Data analysis method

Data analysis method used in this research non parametric test (runs test) and parametric test (unit root test and autocorrelation function test).

### 2.2.1 Non parametric test

1. Runs Test

Runs test is non parametrik test for serial dependence in the stock returns, which designed to examine whether or not an observed sequences is random (campbell et al,1997; Gujarati, 2003). With the following equation:

$$\mu = \frac{N(N+1) - \sum_{i=1}^{3} n_i^2}{N} \quad (2)$$

$$Z = \left( \frac{r \pm 0{,}5 - \mu}{\sigma_\mu} \right) \quad (3)$$

Description:
N = total number of observations
$n_i$ = the number of price changes (returns) in each category
*Z= standard normal Z-statistics*
r = number of actual *runs*;
μ = number expectations of *runs*,

Hypothesis testing criteria:
$H_0$: market is weak form efficiency
$H_1$: market is not weak form efficiency

If the Z-statistic is less than 1% and ρ value also less than 5% level of significance, then we reject the null hypothesis which mean market is not weak form efficiency.

2. Phillips perron (PP) test

PP test is a non parametric test from the unit root test conception. The PP test forces a non paremetric correction to the t-test statistic and corrects for any serial correlation and heterocedasticity in the error term (εt) of the regression test by directly modifying the tests statistic (Hasan, 2015).

$$\Delta Y_t = \alpha + \beta_t + \gamma Y_{t-1} + \varepsilon_t \quad (4)$$

Where, α = constants, β = coefficient of time trend, and Y is parameter and ε_t= error term.

Hypothesis testing criteria:
H0: stock returns are not stationary (random)
H1: stock returns are stationary (not random)

If the value of Phillips perron test statistic (tα) Statistics greater than 1%, 5% & 10% of critical value and ρ value greater than 5% then we accept the null hypothesis which mean stock returns are random (market is weak form efficiency).

### 2.2.2 Parametric test

1. Unit root test

Unit root test is used to see whether the data random or not. With the following equation:

$$\Delta Y_t = \alpha + \beta_t + \gamma Y_{t-1} + \delta_t \Delta Y_{t-1} + \delta_\rho \Delta Y_{t-\rho+} \varepsilon_t \quad (5)$$

Description:
α = constants
β = coefficient of time trend
$\delta$ = parameter
$\rho$ = lag order of the autoregressive process
ΔY = First Difference series of Y
ε = error term

Hypothesis testing criteria:
$H_0$: stock returns have a unit root (random)
$H_1$: stock returns have not a unit root (not random)

If the value of Augmented Dickey Fuller test statistic ($t_\alpha$) greater than 1%, 5% & 10% critical value and $\rho$ value greater than 5% then we accept the null hypothesis which mean stock returns are random (market is weak form efficiency).

1. Autocorrelation function test (ACF).

Auto autocorrelation function test is examine to identify the degree of autocorrelation in a time series. With the following equation:

$$\rho_k = \frac{\gamma_k}{\gamma_0} \quad (6)$$

Where $\rho_k$ is autocorrelation function, $\gamma_k$ is covariane on laq k and $\gamma_0$ is variance.

Hypothesis testing criteria:

$H_0$: no autocorrelation for stock returns of LQ45 index (market is weak form efficiency)
$H_1$: there is autocorrelation for stock returns of LQ45 index (market is inefficient in weak form)

If the autocorrelation function (AC) value heading to zero and ρ value is less than 5% level of significance, then the null hypothesis is rejected. Therefore the historical returns can be used to predict future returns and this element indicates that the weak form of market efficiency does not hold.

# 3 EMPERICAL RESULT

In data analysis method used in this research are testing the weak form efficiency on the Indonesia Stock Exchange, this study uses non-parametric test that is runs test & phillips perron test and parametric test that is unit root test and autocorrelation function test.

1. Runs test

Runs test is a non parametric test for serial dependence in stock return, designed to test whether the sequence observations are random or not.

Table 1: Results of runs test LQ45index

| | | |
|---|---|---|
| Result (average) | Number of Observation | 10469 |
| | Cases < Test Value | 153.2059 |
| | Cases >= Test Value | 154.7059 |
| | Number of Runs | 642 |
| | Z | -15.5346 |
| | *ρ* value | 0,00 |

Based on table 1 it shows that the output result show that Z-statistic less than 1% and ρ value also less than 5% level of significance, then we reject the null hypothesis which mean the market is not weak form efficiency.

2. Phillips perron (PP) test

PP test is a non parametric test from the unit root test conception.

Table 2: Results of phillips peron test LQ45index

| | Level 1st Difference | | Probability |
|---|---|---|---|
| Result (Average) | The ADF statistic | -19.915 | 0,00 |
| | Critical value at 1% | -3,451561 | |
| | Critical value at 5% | -2,870774 | |
| | Critical value at 10% | -2,571761 | |

Based on table 2 that the output result show the Phillips perron test statistic (tα) less than critical value at the 1%, 5% & 10% level of significance and ρ value also less than 5% level of significance, then we reject the null hypothesis which mean stock returns are stationary (market is not weak form efficiency).

3. Unit Root Test

This test is used to see whether the time series data being analyzed is stationary (not random) or not stationary (random). The results of unit root test show in table 2.

Table 3: Results of unit root test LQ45ind

| | Level 1st Difference | | Probability |
|---|---|---|---|
| Result (Average) | The ADF statistic | -19.77776 | 0,00 |
| | Critical value at 1% | -3,451561 | |
| | Critical value at 5% | -2,870774 | |
| | Critical value at 10% | -2,571761 | |

Based on table 3 that the output result show the ADF-statistic (tα) less than critical value at the 1%, 5% & 10% level of significance and ρ value also less than 5% level of significance, then we reject the null hypothesis, this gives the same conclusion to the previous test is the market is not weak form efficiency.

4. Autocorrelation function test (ACF)

Auto autocorrelation function test is parametric test examine to identify the degree of autocorrelation in a time series.

Table 4: Results of autocorrelation test LQ45index

| laq | AC | Q-Stat | Prob |
|---|---|---|---|
| 1 | 0.941 | 275.66 | 0.000 |
| 2 | 0.895 | 525.61 | 0.000 |
| 3 | 0.856 | 755.19 | 0.000 |
| 4 | 0.824 | 968.61 | 0.000 |
| 5 | 0.804 | 1172.4 | 0.000 |
| 6 | 0.786 | 1367.5 | 0.000 |
| 7 | 0.762 | 1551.8 | 0.000 |
| 8 | 0.743 | 1727.4 | 0.000 |
| 9 | 0.725 | 1895.3 | 0.000 |
| 10 | 0.710 | 2056.8 | 0.000 |

Based on table 4 it shows that AC value towards zero and ρ value less than 5%, then we reject the null hypothesis which is mean the market is not weak form efficiency or the historical returns can be used to predict future returns.

# 4 CONCLUSIONS

The result of this study shows that the testing of weak form efficiency market on Indonesia Stock Exchange (BEI) during the period of January 2011 to December 2016 by using non parametric test is runs test & phillips perron test and parametric test is unit root test and autocorrelation function test, jointly reject the null hypothesis or in other word Indonesia Stock Exchange is inefficient in weak form, this indicates that investors who use technical analysis can exceed the market returns because future return can be predicted by historical return.

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