# Analysis of the Influence of Macroeconomic Variables and CPO Global Price against the Volatility of the Palm Share Price Index (IHSS)

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*Abstract-* Share price index is constructed as a guide for investors to monitor the movement of the company shares as investment portfolio. Macroeconomic variables and the level of risks need to be identified to produce the best and most profitable portfolio. This research aims to build an index specific topalm plantation subsector calledPalm Price Share Index (IHSS). The index was arranged using Market Value Weighted Average method, with 12 palmcompanies in Indonesia as the sample, within the period between 2010-2015. The risk was calculated by measuring the volatility using ARCH/GARCH. Macroeconomic variables such as interest rates, inflation, Food IPI,exchange rate to USD, and Global CPO against IHSS volatility using multiple regression to make it easier to analyze the movement of part or all IHSS. The result of the research shows that palm stock is quite risky because of its high volatility, and all the five macroeconomic variables aresignificantly influential to the movement of IHSS.

*Index Terms*- Price share index, volatility, Market Value Weighted Average Index ,Linear regression, macroeconomic, CPO Global Price

## I. INTRODUCTION

Indonesia has great potential to take part in the capital market, but then the Financial Services Authority (OJK) in 2014 reported the level of community involvement was pretty small, only 0.27% of the whole Indonesia's middle-class society. This value is considered low if compared with neighboring countries, such as Malaysia and Singapore with 12% and 60% community involvement respectively (Bapepam-LK 2011). Statistical data on the development of trade stocksin 2015 issued by OJK as seen in Table 1 describes the Property and Real Estate sector was the most heavily traded by 19%, while the agriculture sector is only 7%. Then,palm stockwas dominating the price share index, with 5.6% of the total shares of the agricultural sector. Thisinformation suggests low interest in investing in the agricultural sector despite its high potential.

Palm plantation is a subsector in the agricultural business. Palm is one of the agricultural commodities relied upon by Indonesia. Indonesia is the country's largest Crude Palm Oil (CPO) producer in the world. In 2006 the production of CPO Indonesia reached 16.6 million tonnes, while Malaysia was only yielding 15.29 million tons. Since 2006, Indonesia managed to surpass Malaysia with respective share of 44.43% and 40.9% towards production of CPO in the world.

Efforts to attract community to invest can be through improved literacy related to available options in the capital markets. People's interest in investing in the capital markets cannot be separated from the expectations towards the earningswhich to be obtained and the risks inherent in the existing instruments. Share price index reflects the movement of stock prices. Frensidy (2006) mentions that intuitively, most stocks move in line with the movement of the index.

The study aims to formulate a guide for investors to invest in palm plantation industry, to assist them in taking decision to enter or exit from the sector. There are currently 9 sectoral indices issued by IDX (Indonesia Stock Exchange), namely Agriculture, Mining, Basic Industry, Various Industry, Consumption, Property & Real Estate, Infrastructure, Finance, and Trade.

Results of the study on market capitalization of 13 issuers of palm shares in Table 1 shows Herfindahl Index of 0.16 or less than 1, meaning that market capitalization in the palm industry is not concentrated. Several economic events bring a very great influence on the entire industry and the associated companies so that these factors are worth considering before analyzing the industry. Some previous studies suggest that macroeconomic variables such as GDP, inflation, interest rates on SBI, industrial production index, exchange rate of rupiah have an influence on the movement of share prices. Kewal (2012) in his research found that the only variables that influence Exchange rates against IHSG, while Lawrence (2012) reveals exchange rates, SBI, inflation, money supply, and CPO global prices jointly have an effect on IHSG.

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(2006) mentions that intuitively, most stocks are volatile, according to the movement of the index.

The study aims to formulate a guide for investors to invest in oil palm plantation industry and to ease them in taking the decision to enter or exit from the sector. There are currently 9 sectoral indices issued by IDX (Indonesia Stock Exchange), namely Agriculture, Mining, Basic Industry, Various Industries, Consumption, Property &Real Estate, Infrastructure, Finance, and Trade.

Moreover, volatility index is another thing to concern as it reflects the risk of investing in the palm stock market to produce the best portfolio. In the research of Kartika (2010), understanding volatility of the share price is beneficial in making portfolio, risk management and the establishment of prices, as investors generally pursue maximum return with minimum risk.

## II.   RESEARCH METHODS

The objects of the research were all palm companies listed and active in IDX within the 2010-2015 period, namely 12 issuers. The macroeconomic variables did have influence on palmshare price; they were Gross Domestic Product (GDP), Industrial Food Production Index (IPI), inflation, interest rates on SBI and the rupiah exchange rate against US dollar.

### Determining Palm Share Price Index

In the handbook of share price index in the Indonesia's Stock Exchange (2010), the basic formula to determine the value of the index is:

$$Index = \frac{Market\ value}{Basic\ value} \ x\ 100$$

Market value is the cumulative number of shares recorded (which is used for calculating the index) multiplied by the market price. Market value is also called market capitalization. The formula for calculating market value is given below:

$$Market\ Value = \sum_{i=1}^{n} pi\ qi$$

where:

Pi                     = closing price (the current price) for the $i$ issuer

Qi                     = number of shares used for calculating the index (number of shares recorded) for $i$ issuer

N                     = number of issuers listed on IDX (the number of issuers used for calculating the index)

### Determining ARCH/GARCH Model

After finding the best AR/MA/ARMA/ARIMA, the next phase was to combine the model with ARCH/GARCH model. It was carried out with trial and error, by making experiment with ARCH (1) to GARCH (p, q). The model giving the smallest value of AIC and SIC was decided as the best.

### Analysis on Influence of Macroeconomic Variables

Data analysis technique used to answer the research problem and to test the hypotheses was multiple regression. This study was substantially to test the impact of macro changes on the volatility of IHSS, so that the model to be used was in the form of the Natural Logarithm. The regression model can be formulated as follows:

Volatility of $IHSS_t = \beta_0 + \beta_1 IPI_t + \beta_2 Inf_t + \beta_3 SBI_t + \beta_4\ Kurs_t + \beta_5\ CPO_t + u$

Description:
IHSS                 = Palm Share Price Index
$\beta 1$                   = Regression Coefficient, $\beta_1 > 0$, $\beta_2 < 0$, $\beta_3 < 0$, $\beta_4 < 0$, $\beta_5 > 0$
IPI                   = Industrial Production Index
Inf                   = Inflation rate
SBI                   = Interest rate
Kurs                  = Inflation rate (Rp/ US$)
CPO                   = CPO price
u                           = error
t                           = Period of time

## III.   RESULTS AND DISCUSSION

### Data Analysis Results

IHSG graph displays a significant rise yearly from 2,533 level in January 2010 to be 5,516 in April 2015, as shown in Figure 1; unfortunately, the IHSS shows conversely. This indicates that shares in palm do not contribute significantly in enhancing investment climate in Indonesia.
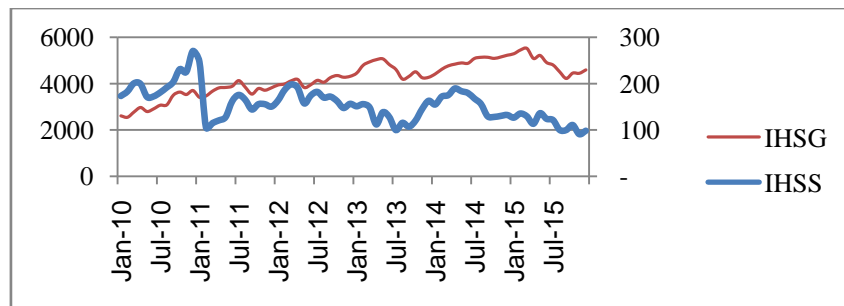


**Figure 1: Palm Share Price Index vs IHSG**

Based on observations during the draft, almost all the issuers of IHSS experienced decline in share price. The decline in the share prices allegedly occurred because of the weakening CPO global price in the period. The CPO price in December 2010 was recorded at the lowest rate by $ 41.12after previously reaching above $100 in March 2011. The fall of the price of commodities led to decreased sales revenue. This was indicated as the cause of fall in palm share price.

These different patterns might be interpreted that IHSS would further much precisely describe the condition of the issuers in plam industry and become additional information which benefits investors.

## Estimation of IHSS Volatility

A suitable model for forecasting IHSS is univariate ARIMA (1, 1, 2). The model has a significant value of coefficient parameter because the probability is smaller than 5% alpha. Based on the results of Modified Box-Pierce (Ljung-Box) test of Chi-Square statistics, p-value is greater than 5% alpha, and thus H0 is accepted and the model fits to forecast IHSS. The ARCH equation (1) is given below.

$$Var(ei) = 138.1059 + 0.854346\ RESID(-1)^2$$

The equation above effectively determines the value of volatility. The volatility index shows 0.86, meaning the volatility

is persistently high because of lower possibility to decline, so it keeps fluctuating. Therefore, with such indicators, the shares issued tend to be regulated by the speculator together with frenzy investors in influencing share prices. By understanding the volatility, investors will be able to profit through capital gains or dividends from the company. This certainly results in quite big risk because the law of economy says "high risk high return, low risk low return". Hence, investors will always face risks and uncertainties.

The result of this research shares something in common with Kartika (2010)'s findings, that both price indices, IHSG and KLCI, equally produce only ARCH effect. It means at both stock indices, the share price movements are only affected by the current share price volatility without being influenced by the movement of the previous share price.

## The Influence of Macroeconomic Variables

The results of classic assumption test performed on the regression equation explain that the equation is viable as a mathematical equation because it does not contain problems of multicolinearity, heteroscedasticity, and autocorrelation. The regression equation can then be analyzed by looking at the value and sign of the coefficient. Meanwhile to test the hypotheses,both T-test and F-test are eligible to use.

### Table 1. Result of Regression Analysis

| Variable | Coefficient | Std. Error | t-Statistic | Prob. | VIF | Description |
|---|---|---|---|---|---|---|
| SBI | -0.9697 | 0.2966 | -3.2694 | 0.0011 | 3.443 | Significant |
| CPO | 0.0027 | 0.0010 | 2.7571 | 0.0058 | 3.393 | Significant |
| INFLASI | 1.1219 | 0.1498 | 7.4881 | 0.0000 | 1.582 | Significant |
| IPI | 0.0571 | 0.0117 | 4.8829 | 0.0000 | 1.385 | Significant |
| KURSUSD | 0.0002 | 0.0000 | 53.7795 | 0.0000 | 6.798 | Significant |
| VOLATIL(-1) | 0.6456 | 0.0189 | 34.1944 | 0.0000 | 1.265 | Significant |
| C | -7.2317 | 2.3949 | -3.0196 | 0.0025 | | |
| R-squared | | | 0.3730 | | | |
| Adjusted R-squared | | | 0.2450 | | | |
| F-statistic | | | 2.9146 | | | |
| Prob(F-statistic) | | | 0.0061 | | | |
| Durbin-Watson stat | | | 1.7994 | | | |

From the estimations, the regression equation can be made into:

Volatil IHSS = -7.2317 - 0.9697 BIRATE + 0.0027 CPO +1.1219INFLASI + 0.0571 IPI + 0.0002 KURSUSD. The regression model can explain the factors which are significantly influential; R-squared of 0.3730 shows 37.30% of change in IHSS can be explained by variation of the five variables, while the rest 62.7% is explained by other factors.

$H_{1,1}$ : IPI, inflation, exchange rate, CPO global price, and SBI interest rate together exerta significant influence towards IHSS volatility.

$H_{2,1}$ :IPIhas a positive and significant influence on IHSS volatility.

$H_{3,1}$ : Inflation shows a positive and significant influence on IHSS volatility.

$H_{4,1}$ : SBI interest rate does not affect positively and significantly to IHSS volatility.

$H_{5,1}$ : Exchange rate brings a positive and significant influence on IHSS volatility.

$H_{6,1}$ : CPO global price affects positively and significantly to IHSS volatility.

**Hypothesis 1: $H_1$is accepted, IPI, inflation, exchange rate, CPO global price, and SBI interest rates together exert a significant influence towards IHSS volatility.**

From the significance probability of F count, the influence of free variables namely IPI, Inflation, USD Exchange Rate, SBI, and CPO GLobal Price against Volatility of IHSS is smaller than F 0.05 probability. In other words, the first hypothesis, namely

the free variables together provide a significant effect on the volatility of IHSS.

**Hypothesis 2: H1 is accepted, IPI food has a positive and significant influence on IHSS volatility.**

The influence of IPI food against the volatility of IHSS is influential and significant by 0.057. The significance of IPI variable on IHSS volatility is probably because of the relevance of data on the palm sector. According to the IPI Food data in industrial classification, the value added of the raw material from the palm sector in particular CPO for food industry is pretty much. This is due to numerous food ingredients which use CPO as raw material in the production process. This implies the influence of palm industry on food industry.

Besides, the industries that dominate IPI and boost the industry growth are chemical industry and chemical goods; radio, television and communication industry; machinery and equipment industry; and food and beverage industry. However, those could not determine movement in palm share price. Such finding is in line with the research of Chen, et al (1986) who found the industry production significantly influences the return of the stock market in America, while Buyuksalvarci (2010) figures out a significant effect of industry production on Turkey's stock market.

**Hypothesis 3: $H_1$ is accepted, Inflation shows a positive and significant influence on IHSS volatility.**

The value and sign of inflation coefficient are 1.129, which means any change to one percent on inflation will lead to the opposite change in IHSS volatility by 1.129 percent. As seen on the significance probability, the influence of inflation on IHSS volatility by 1.129 with probability value of 0.000 is smaller than 5% alpha; in other words, the null hypothesis rejects the third hypothesis, or inflation has no significant effect to IHSS.

Significance of inflation on the IHSS is possible because of the relevance of the data on the palm sector. Sari (2012) mentions the biggest contributor of inflation in 2010 was the food commodity which reached 3.5 percent. So are the conditions in the previous year, namely in 2008 and in 2009, as the food commodities remained the biggest contributor of increasing inflation. Palm oil as part of household commodities contributes greatly to the inflation rate. The possibility causes the inflation to have an effect on IHSS. At the same time, the increase in price that is mostly due to the rising food commodity prices would bring impact to palm share price.

The statement is supported by the research by Sitorus (2004) who found a significant effect of inflation on BUMI share price; Adinda (2007) identifies inflation affects significantly to return on shares of Non Agriculture sector, and; Thobarry (2009) observes inflation affects significantly to property stock price index.

**Hypothesis 4: H1 is accepted, SBI interest rate does not affect positively and significantly to IHSS volatility.**

Value and sign of the coefficient of SBI interest rate are -0.9697, which means any changes to one percent on SBI interest rate will cause the opposite change in IHSS by 0.9697 per cent. As observed from the significance probability level, the influence of SBI interest rate on IHSS is 0.0000, smaller than 5% alpha.

Hence, the fourth hypothesis, is accepted. The significant influence of SBI interest rate on IHSS volatility suggests that this variable can be an indicator to consider when making investment in palm shares. SBI interest rate might be useful to compare between return from share and return from other types of investment Instruments, such as savings or bank deposits. When the SBI interest rate is higher, investors will be more attracted in taking profits on deposits or bank deposits compared to shares as well. These results are consistent with research by Ardiansyah (2005) who found the SBI interest rate influences the performance of pharmaceutical stocks, while Buyuksalvarci (2010) identifies the interest rate affects Turkey's stock market return.

**Hypothesis 5: H1 is accepted, Exchange rate brings a positive and significant influence on IHSS volatility.**

The value and sign of exchange rate coefficient are 0.0002, which means any change to one per cent in the exchange rate will lead to change in IHSS volatility by 0.0002 per cent. From the significance probability, the influence of exchange rate on IHSS by 0.0000 is smaller than 5% alpha; in other words, the fifth hypothesis, is accepted.

The significant influence of exchange rate on IHSS volatility might denote investment condition in palm shares. When the exchange rate of Rupiah against US Dollar seems stronger, investors will sell their shares and buy more dollars. As a result, the share price will decline. Then, when the exchange rate of Rupiah against US. Dollar is weakening, it will invite foreign investors to buy shares. These results are in line with the research by Ibrahim and Aziz (2003) who reveals exchange rates bring a negative effect on Malaysia's stock market; Sitorus (2004) found the negative effect of exchange rate on stock return significantly to BUMI and MEDC, and; Buyuksalvarci (2010) investigated a significant negative effect of exchange rate to return on Turkey's stock market.

**Hypothesis 6: H1 is accepted, CPO global price affects positively and significantly to IHSS volatility.**

The value and sign of the coefficient of CPO global price are 0.0027, indicating that any changes to one percent in CPO global price will lead to change on the volatility of IHSS by 0.0027 per cent with the same sign. The significance probability has shown that CPO global price on IHSS volatility by 0.0000 is smaller than 5% alpha. Hence, we could say that CPO global price significantly impacts IHSS.

The significant effect of CPO global price on IHSS volatility might be helpful in analyzing the investment climate in palm share price. When the CPO global price surges up, investors will be willing to invest in palm share price. Also, when the CPO global price is declining, investors tend to reduce their shares in palm. CPO is eventually part of palm companies production. When the CPO global price arises, the earnings of CPO producers will be growing, and thus the emitten in palm share will react by increasing the price. This finding is in line with the statement of Prasetiono (2010) that the price hikes would carry advantage, as the decrease in oil production in Indonesia will be covered with the oil increasing CPO global price, and thus gas sector still remains the mainstay of the govenment for securing the state budget. The same research result is demonstrated by Jayadin

(2011) who found that the energy sector has a positive relationship with CPO global price, in contrast to other sectors such as banking, retail, and transportation that have a negative relationship with CPO global price.

## IV. MANAGERIAL IMPLICATIONS

1  Investments in the stock market are likely to have a high risk given the characteristics of the stock instruments is very volatile and difficult to predict. Palmshare price index (IHSS)and the volatilitysupplies additional information for conservative investors to suppress the minimum possible risks to bear. The more information available would further facilitate investors in decision-making. Investors can make the information as a guide in constructing a portfolio.

2  The fact that IHSS moves at the opposite direction withIHSGmay indicate that IHSS can give a more accurate guide to investors who choose to invest inpalmshares. IHSG solely is not enough to describe the specific market conditions; with the presence of IHSS, investors can more easily read the movement of palm share price.

3  Investors should observe the movement of CPO global price. CPO is an important commodity in the food industry at both national and international scale. Declining prices of global CPO by 2015 up to Rp 558/Kg as the impact of declining demand for petroleum, encouraged the decline in IHSS. However, when the CPO global price was relatively higher in 2010, IHSS also experienced an increase. The indication of the declining CPO global pricewill lead to a decrease in IHSS, and vice versa.

4  Investors should consider the macro factors i.e monthly SBI interest rate. In April 2013, SBI interest rate was at the level of 5.75 per cent in January and reached 7.5 percent in November 2013, or an average of 6.52 percent by 2013. IHSS touched the highest level in 2013, namely at 163 on December 2013 despite previously reached the lowest level in January 2013. In 2013,monthly SBI interest rates reached anaverage of 5.77 percent, while IHSS was at172 averagely, considered an increase compared to the average of the previous month. On the other hand, IHSS experienced decline in the level of 118 in 2015, while SBI interest rate was climbing and reached the level of 7.5 percent. High SBI interest rate will be answered by lower IHSS and vice versa.

5  Investors are supposed to observe the movement of the exchange rate. The weakened exchange rate from the beginning to the end of 2015 caused IHSS to decline quite significantly to an average of 116, with the monthly average at 158 in 2014. Moreover, the stronger exchange rate by 2012 and 2010 caused IHSS to increase. Indication of the weakening of Rupiah exchange rate against US Dollar will cause a decrease in IHSS, and vice versa.

## V. CONCLUSION

This index has been built on the basis that there is no company that dominates, indicated from the number of Herfindahl Index < 1. The IHSS indicatesissuers in palm subsector are not the driving forceof IHSG because thecapitalization value is not big, as the shares move tothe opposite direction of IHSG. Investment in palm shares have quite high risks, that is clear from the persistent volatility of the index. Macroeconomic variables, namely food industry production index, inflation, SBI interest rate, exchange rate, CPO global price partially or jointly affect the volatility of IHSS.

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