PORTFOLIO INVESTMENT AND ITS IMPACT ON EXCHANGE RATE AND COMPOSIT STOCK INDEX VOLATILITY IN INDONESIA

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Abstract

This study aims to analyze the investment portfolio is proxied by the buy and sale of foreign securities traded on the Indonesia Stock Exchange and to test the impact on the volatility of the JKSI and the Rupiah exchange rate. Data analysis was performed with the path analysis approach by SPSS version 17. The results showed that tend to dominate the flow of foreign capital stocks in the infrastructure sector, utilities and transportation, banking stocks, and automotive, which in general are at stake shares of government-owned companies, especially in the shares of PT Telekomunikasi Indonesia (Persero) Tbk (TLKM), PT Bank Mandiri (Persero) Tbk (BMRI), PT Bank Rakyat Indonesia (Persero) Tbk (BBRI), PT Bank Negara Indonesia (Persero) Tbk (BBNI), and PT Bank Central Asia Tbk (BBCA). The results also show that foreign purchases directly affect the volatility of stock index and exchange rate and exchange rate changes directly affect the volatility of JCI. While foreign sales affect the volatility of stock index via exchange rate. Mobilisation of foreign capital through portfolio investment tends to flow in the short term and oriented towards the acquisition of gain, so that the negative effects of the investment portfolio tends to be higher than the positive effect that it provides.

Keywords: Portfolio Investment, Volatility, Exchange Rate
JEL Classification: G10, G170, G190

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I. INTRODUCTION

The flow of foreign capital in the form of portfolio investment is an important topic widely discussed in the international financial system, particularly among emerging markets that urgently need the mobilization of foreign funds to finance national development programs. Although it is believed that the mobilization of foreign funds flowing through portfolio investments would have a positive impact on the national economy of a country (the destination of foreign investors), especially in the capital markets sector, it can also cause extreme volatility for the stock market (Bekaert and Harvey, 2003; Edwards, 2000) and would affect the stability of the exchange rate (Chayawadee and Ho, 2008), which would automatically affect the economy and the investment climate in the country concerned.

In Indonesia, foreign capital inflows through portfolio investment has been allowed since the 1980s, particularly at the time of the enactment of the Minister of Finance Decree No. 1059 / KMK / 1989, that formally allowed foreign investors to control up to 49% security holdings that existed in the Indonesian capital market. The decision was a major gateway for the liberalization and the integration of capital markets in Indonesia, which subsequently grew in its share of foreign ownership up to 100%, by the time of the enactment of the Capital Market Law No. 8, 1995 (Capital Market Law). With an opening up of foreign investors to participate in the activity of securities trading in the capital market, foreign capital through portfolio investments began flowing into Indonesia from 1989. The inflows of foreign capital had a very positive effect on the growth and development of the capital markets, which were previously segmented and had experienced a prolonged vacuum.

Since the enactment of the finance minister’s decision, the flow of foreign capital into Indonesia through the capital market reached Rp. 230.40 billion or 23.9% of the 433 million listed shares. The next year (1990), the flow of foreign capital increased significantly concurrently with the increasing number of listed companies and stocks. The flow of foreign capital in 1990 reached Rp 1,817.52 billion, which grew 688.85% from the previous year, and this growth continued to be positive in subsequent years.

Capital inflows spontaneously encouraged the growth and development of the Indonesian capital market, which began in 1989 to 1995. The Composite Stock Price Index (CSPI) on average was at the level of 415.92 with an average increase of 94.57 points, and grew at 30.99 % per year. The average market capitalization reached Rp 55,021.72 million, an increase of 216.78%, and the number of publicly listed companies grew by 46.33% from 24 companies in 1988 to 217 companies in 1994.

Growth and development was very significant compared with the growth and development during the time of market segmentation and vaccum where the average Jakarta Composite Index (JCI) was around the level of 72.94 with an average increase of only 5.35 points (7.75%) per year and an average market capitalization of $ 195.5 million (4.00%) and 24 public companies listed without experiencing growth. Furthermore, at the time of the enactment of the Capital
Market Law No. 8, 1995, foreign investors increasingly had a significant role for the growth and development of the market. The average flow of foreign capital during the period reached Rp 41,568.65 billion, or 41.7% of the total trade value.

Increased shares of foreign ownership and the inflow of foreign capital encouraged the growth and development of the market, where the average stock index stood at 1,645.97 with an average increase of 208.91 points (19.38%) per year, had an average market capitalization of Rp 1,398,613.50 million (29.27%), and had a 4.08% per year increase in the number of public companies listed, from 253 companies (1995) to 506 companies (2015).

Although the flow of foreign capital during this period was also significant and had a positive effect on the development of the capital markets (due to the high and free-flow of foreign capital in and out), it was also a significant cause of extreme volatility for the Indonesian capital market that was offset by the increased volatility of the rupiah as a result of supply and demand in foreign securities transactions.

Withdrawal of foreign funds suddenly occurred on a large scale in 1997 due to the shocks of the financial crisis that hit Asia and the contagion effect of the regional exchange rates that resulted in a significant slump of the Indonesian capital market, and the weakening of the rupiah against foreign currencies, particularly the United States Dollar (IDR / USD). This condition was also worsened by the herding behavior of domestic investors in anticipation of dismal foreign trade in the future.

In the post-recovery period of the crisis, foreign capital flows re-entered the market, which was relatively higher compared to previous periods. However, the markets were hit again by the global financial crisis in 2008 followed by the European crisis and soaring world oil prices in 2009. The post-global financial crisis recovery and stability (years 2010-2014) was supported by strong economic fundamentals, foreign capital flows in Indonesia. But the flow of foreign capital during the period caused extreme volatility when compared with previous periods. The average flow of foreign capital into Indonesia reached Rp 4,700.79 billion per day, and the average capital outflow was Rp 4,097.09 billion per day.

Generally, for some periods it can be seen that the inflow of foreign capital was followed by a decrease in JCI and a weakening of the rupiah against some foreign currencies, especially the USD. The capital outflows during these periods were followed by a decrease in JCI and a weakening of the IDR / USD exchange rate. In some periods the foreign capital outflows were offset by an increase in the stock index and the IDR / USD exchange rate.

This phenomenon is opposite to conditions that occurred in previous periods, where the foreign capital flows generally tended to move in line with JCI and the IDR / USD exchange rate. In addition, these conditions were also in contrast with a variety of theoretical studies, in particular the portfolio-balance theory and the good market approach.
However, the above phenomenon appears in line with the results of a study by Sourionis (2003), which did not find a dynamic relationship between these variables. That is, it might be in the short-term these variables do not have the same movement patterns, but in the long-term it might tend to adjust to each other or between each other, or be in line with the results of Hau and Rey (2004) who found a negative relationship between net equity flows and market return.

The findings could be hypothesized as portfolio rebalancing behavior, where the investor re-allocates assets that have appreciated (because of price rises) to the assets that have depreciated with the aim of optimizing the portfolio balance. In addition, in the relationship between the stock index and the exchange rate, there was research that did not show any significant interaction between the two (as Jorion, 1990; Jorion, 1991; Bodnar and Gentry, 1993). However, the study results of Evan and Lyons (2002), and Froot and Ramadorai (2002) showed that the rate of order flows have a significant effect on the exchange rate, but only in the short-term.

This study aims to analyze the impact of changes in the flow of foreign capital proxied by Net Foreign Purchase (NFP) on the volatility of capital markets proxied by the JCI and exchange rate (IDR / USD). Analysis of changes in capital inflows to these two proxy variables used a Vector Auto Regression (VAR) and Vector Error Correlation Model (VECM), so that the approach can also examine the relationship between the three variables, relationship cointegration, causality, and the dynamics.

The second part of this paper outlines the theory and literature review. The third section outlines the data and methodology used, while the fourth section presents the results of the calculations and analysis. The fifth section outlines the conclusions of this paper.

II. THEORY

The flow of capital in the context of the investment portfolio is one of the most important topics widely discussed in the international financial system, particularly for developing countries like Indonesia because it always involves trade-offs for the country of destination. On one hand, the entry of foreign capital (foreign purchases) can raise capital for companies in the country of destination, increase capitalization, and help develop the efficiency of domestic capital markets (Todaro & Smith, 2004).

Helping the domestic capital market through more sophisticated instruments and technology introduced by foreign investors in portfolio management, can help strengthen domestic capital markets and improve the functioning of the monetary authorities in these countries (Evans, 2002). It can also increase domestic savings, improve capital allocation making it more efficient, have an impact on the economy through capital markets such as stock prices, and encourage the development of domestic capital markets (Baepam-LK, 2008).

On the other hand, in emerging markets, an over-reliance on capital flows from the investment portfolio to cover the weaknesses of basic structural field of the economy has to
bear the negative consequences in the long-term, in which foreign investors have no concern for the interests of development in the country of their investment goals (Todaro and Smith, 2004). As such, the investment portfolio may cause extreme volatility for the stock market (Bekaert & Harvey, 2000) and would affect the exchange rate (Chayawadee & Corrine, 2008). Withdrawal of foreign funds (foreign sales) would lead to a stock market index decline which may be offset by increased demand for foreign currency, and in turn would cause a depreciation of the domestic currency.

Several studies have also found that changes in the flow of foreign capital has a relationship with the volatility of capital markets or the stock price index (Parthapratim Pal, 2008; Frensidy, 2008; Wang, 2007; Richard, 2005; Ibrahim, 2000; Bohn and Tesar, 1996; Froot & Donohue, 2002; Karolyi, 2002; Chayawadee & Corinne, 2008), and exchange rate fluctuations (Chai-anant, 2003; Karolyi, 2002; Brennan and Cao, 1997), where the change would affect the supply and demand of currency, which in turn affects the volatility of the stock index. In addition, the results of research by Brennan and Cao (1997), Karolyi (2002), and Chai-anant (2003) also found a dynamic relationship between capital flows and exchange rates; however Souriounis (2003) did not find a dynamic relationship between the two. Notably, the study results of Evan (2002), and Froot and Ramadorai (2002) showed that the rate of order flows have a significant effect on the exchange rate, but only in the short-term.

In addition to having a dynamic relationship with cointegration and capital inflows in portfolio investment, the exchange rate and stock prices also have a relationship of mutual influence on each other. There are two approach theories that may explain the relationship between the exchange rate and stock prices, i.e., good market approach and portfolio balance approach. The good market approach states that changes in exchange rates will affect the competitiveness of companies, which in turn will affect the company’s earnings and subsequent share price (Dornbusch & Fischer, 1980). While the portfolio balance approach, states that a rising stock market will attract capital flow which will further increase the demand of domestic currency and cause the exchange rate of the domestic currency to appreciate (Franke, 1993).

In this regard, the stock price might cause volatility of exchange rate, or vice-versa, the exchange rate might cause stock return volatility, depending on the situation of the country concerned and dependent time (Ramasamy & Mathew, 2001). Although theoretically there is a causal relationship between the exchange rate and stock prices, empirical evidence suggests that there is a weak relationship between them on the micro order.

A number of studies have shown the exchange rate affect on the stock price (Ma & Kao, 1990; Abdalla & Murinde, 1997; Wongbangpo & Sharma, 2002). The results were consistent with the results of the studies by Bohn and Tesar (1996) and Bekaert (2002) which is supported by the results of the research of Froot (2001), Griffin (2002), Richards (2005), Karolyi (2002), and Bonser-Neal (2002), who also found a positive relationship between equity flows and market returns, where equity flows are likely to enter the market with a rise followed by a return, and
similarly equity flows out of the market would be followed by a decrease in market returns. This positive relationship has always been hypothesized as return chasing, chasing a trend or momentum trading.

However, Hau and Rey (2004) found a negative relationship between net equity flows and market returns, which was hypothesized to be the behavior of portfolio rebalancing, where the investor re-allocates assets that have appreciated (because of price rises or currency gains) to depreciated assets with the aim of optimizing the portfolio balance.

Results of empirical studies also show that company’s of the United States (Jorion, 1990, 1991) and Japan (Bodnar and Gentry, 1993) found no significant relationship between the exchange rate and stock prices. However, He and Ng (1998) found that only 25% of 171 Japanese multinationals had significant exposure to the exchange rate on stock returns.

At the macro level, currency appreciation negatively affects a country’s domestic capital market in a country that predominantly exports, and it would have a positive influence on the domestic capital market for countries that predominantly imports (Ma & Kao, 1990), which is consistent with the goods market approach. In addition, the study results of Mougoue Ajayi (1996) of eight countries showed that there is a significant interaction between the exchange rate and capital markets, while Abdalla and Murinde (1997) showed that the exchange rate tended to be associated with the stock price.

The study results of Bapepam-LK (2008) in Indonesia showed that there is a relationship of cointegration between capital inflows, volatility of capital markets and the exchange rate, but the volatility of the capital markets (JCI) were better able to explain its influence to change the flow of foreign capital, yet was not able to explain its influence on changes in exchange rates (IDR / USD). The flow of foreign capital could only explain the effect of changing the exchange rate. Also, changes in exchange rates was not able to explain the effect on the volatility of stock index and exchange rate.

III. METHODOLOGY

3.1. Types and Sources of Data

The secondary data used were daily time-series for five years of observation (January 2010 - December 2014), including net foreign purchases and the closing prices of the JCI (obtained from the publication of the Indonesia Stock Exchange), and the middle rate of the rupiah against the US Dollar (obtained from publications Bank Indonesia).

The Net Foreign Purchase (NFP) was used as a proxy for changes in the flow of foreign capital in the Indonesian capital market, where a positive NFP would show the inflow of foreign capital and a negative NFP would show the outflow of foreign capital, and in this case represented by the NFP growth ratio.
The JCI was used as a proxy for the Indonesian capital market volatility expressed in growth. Changes in IDR / USD exchange rate was used as a proxy of the rupiah against foreign currencies, which was also expressed in the growth rate.

3.2. Empirical Model

The data analysis methods used multivariate Vector Auto Regression (VAR) or Vector Error Correlation Model (VECM), assisted by the program Eviews 8. Systematically, the VAR basic model is as follows:

\[ Y_t = A_0 + A_1 Y_{t-1} + A_2 Y_{t-2} + \cdots + A_p Y_{t-p} + \varepsilon_t \]

where \( Y_t \) is vector \( (n \times 1) \) which contains \( n \) from each variable in VAR, \( A_0 \) is vector \( (n \times 1) \) intercept, \( A_{1,2,p} \) is the matrix coefficient \( (n \times n) \), and \( \varepsilon_t \) is the vector \( (n \times 1) \) from the error term.

Based on the general form above, then the VAR model applied in this study can be written as follows:

\[
NFP_t = \alpha_{10} + \sum_{i=1}^{k} \alpha_{11,i} NFP_{t-i} + \sum_{i=1}^{k} \alpha_{12,i} IHS_{t-i} + \sum_{i=1}^{k} \alpha_{13,i} KURS_{i-t} + \varepsilon_{1,t}
\]

\[
IHSG_t = \alpha_{20} + \sum_{i=1}^{k} \alpha_{21,i} NFP_{t-i} + \sum_{i=1}^{k} \alpha_{22,i} IHS_{t-i} + \sum_{i=1}^{k} \alpha_{23,i} KURS_{i-t} + \varepsilon_{2,t}
\]

\[
KURS_t = \alpha_{30} + \sum_{i=1}^{k} \alpha_{31,i} NFP_{t-i} + \sum_{i=1}^{k} \alpha_{32,i} IHS_{t-i} + \sum_{i=1}^{k} \alpha_{33,i} KURS_{i-t} + \varepsilon_{3,t}
\]

where \( NFP \) is the change in capital inflows (net foreign purchase), \( JCI \) is the volatility of the capital markets or changes of \( JCI \), \( KURS \) is a change or growth of the rupiah against the US dollar, \( \alpha \) the constant, and \( \varepsilon \) is the error term.

The shape of the VAR above the VAR form is usually used if the data is stationary at level. A variant VAR form usually occurs due to differences in the degree of integration of data on the variables, known as VAR in level and VAR in difference. VAR in level is used when the research data are stationary in level form. If the data is not stationary in levels, but does not have a cointegration relationship, the estimated VAR is done in the form of difference.

VECM is a form of VAR that is restricted due to the existence of form data that is not stationary but cointegrated. VECM is often referred to as a VAR for the design of non-stationary series that have a cointegration relationship. VECM specification is restricted to long-term relationships of endogenous variables that converge into a cointegration relationship, but still
allows for the existence of short-term dynamics. Systematically, the VECM models applied in this study can be written as follows:

\[ NFP_{t-1} = \alpha_{10} \sum_{i=1}^{1} \alpha_{11} IHSG_{t-1} + \sum_{i=1}^{1} \alpha_{12} KURS_{t-1} + \varepsilon_t \]

\[ IHSG_{t-1} = \alpha_{20} \sum_{i=1}^{1} \alpha_{21} NFP_{t-1} + \sum_{i=1}^{1} \alpha_{22} KURS_{t-1} + \varepsilon_t \]

\[ KURS_{t-1} = \alpha_{30} \sum_{i=1}^{1} \alpha_{31} NFP_{t-1} + \sum_{i=1}^{1} \alpha_{32} IHSG_{t-1} + \varepsilon_t \]

Analysis of the data with the VAR approach, especially VECM includes three main analysis tools, the Granger Causality Test, Impulse Response Function and Variance Decomposition. The Causality Test was performed to determine whether an endogenous variable can be treated as an exogenous variable. This stems from the influence of ignorance between variables. The Impulse Response Function analysis aims to test the dynamic behavior of the VECM model, which can be seen through the response of each variable to the shock of those variables and the other endogenous variables. The analysis of Variance Decomposition aims to examine the characteristics of the model used, i.e., how big the difference between the variance before and after a shock, a shock that comes either from the variable itself, and a shock of other variables to look at the relative effects of the research variable to another variable. The Variance Decomposition procedure was done by measuring the percentage of the shocks on each variable. In particular, the Impulse Response analysis and Variance Decomposition in this study was used for analyzing the changes in foreign capital flows in and out in the Indonesian capital market in assessing volatility.

IV. RESULT AND ANALYSIS

Data analysis was performed with the approach Vector Autoregression (VAR) or Vector Error Correlation Model (VECM), but because the time-series data used were very large (1,224 series), some basic analysis of the data was required. The time-series analysis used the unit root test, for determining the optimal lag length, and the cointegration test. All of this preliminary analysis aimed to test whether the data used in this study could be used for the estimation process (VAR and VECM) or not. The results of the stationary test data in this study are shown in Table 1 below:
Table 1 shows, that only data of the NFP variable (capital inflows of portfolio investment) were stationary at level, while the data of the JCI and KURS variables were non-stationary (containing a unit root); therefore the two variables required testing of the degree of integration (stationary test on a first difference) which was followed by a cointegration test. The NFP required no stationary testing, and can be used in the VECM and VAR estimation process. The test results for the degree of integration of the JCI and KURS variables are shown in Table 2 below:

Table 2 shows that the two variables (JCI, and KURS) are stationary at 1st level (does not contain a unit root). Before continuing on with the cointegration test, it was first necessary to determine the optimal lag length for these data. Lag length determination results are shown in Table 3 below:
Based on the analysis of Long Lag determination above, it appears that the majority of indicators (LR, FPE and AIC) have the smallest value in the ninth Lag (Lag 9), so that Lag 9 was chosen as the optimal lag. After getting the optimal lag, then the cointegration test was proceeded. Usually this test is not required if the data is stationary at level. This test determines whether the data used show or have the same stochastic trend, and further have the same direction of movement in the long-term. The cointegration test results are shown in Table 4 below:

<table>
<thead>
<tr>
<th>Hypothesized No. of CE(s)</th>
<th>Eigenvalue</th>
<th>Trace</th>
<th>Max-Eigen</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Statistic</td>
<td>Critical Value</td>
</tr>
<tr>
<td></td>
<td></td>
<td>5%</td>
<td>1%</td>
</tr>
<tr>
<td>None **</td>
<td>0.134680</td>
<td>325.3171</td>
<td>29.68</td>
</tr>
<tr>
<td>At most 1</td>
<td>0.067826</td>
<td>149.8493</td>
<td>15.41</td>
</tr>
<tr>
<td>At most 2</td>
<td>0.051905</td>
<td>64.65361</td>
<td>3.76</td>
</tr>
</tbody>
</table>

The cointegration test results, both with the Trace and the Max-Eigen approach, shows that the data used in this study is cointegrated, meaning that although the variables used are non stationary at level, in the long-term these variables tend towards equilibrium. Accordingly, a linear combination of these variables is called a cointegration regression, and parameters resulting from the combination may be referred to as cointegrated parameters.

During the observation period, the average capital inflow of portfolio investment in Indonesia reached 1,474.90 billion per month (US $ 67.9 billion per day) with an average value
of foreign purchases at Rp 42,623.48 billion per month (US $ 966.23 billion per day) and sales at Rp 41,148.56 billion per month (US $ 898.34 billion per day). This means that in general for the period indicated, the existence of capital inflows (capital inflow) to Indonesia was through the capital markets.

The highest capital inflow occurred in April 2011 which reached Rp 17,515.00 billion, with the value of purchase of USD 42,997.00 billion and the value of sales was Rp 25,482.00 billion. This value increased by USD 19,781.00 billion, or grew significantly, reaching 872.95% by March 2011, which recorded a capital outflow of up to Rp 2,266 billion. While the highest capital outflow occurred in June 2013, which reached Rp 20,132.0 billion, with the value of foreign purchases of only Rp 63.005 billion, the value of sales was much higher, reaching Rp 83.137 billion. As for the Composite Stock Price Index (CSPI), the average stood at 4,100.75 with a growth rate as much as 43.60 points (1.26%) per month.

The highest growth occurred in September 2010 at 419.42 points (13.61%), in February 2013 at 419.42 points (7.68%), and in July 2011 at 242.23 (6.23%). However, the lowest growth (highest decline) occurred in August 2013 at 415.29 points (-9.01%), in May 2012 at 347.91 points (-8.32%), and in January 2011 at 294.34 points (-7.95%).

Generally, the JCI grow positively every month, this meant that the performance of the capital markets and the investment climate as well as the Indonesian national economy was getting better over time. As for the exchange rate variable, the IDR / USD average exchange rate was at the level of USD 9,942.17 per month, which generally grew positively, as much as 50.58 points per month (12.49%).

This indicated that the Rupiah would likely depreciate to the US dollar every month. In that period, the rate of depreciation of the Rupiah was highest in August 2013 at 927.00 points, or 9.04% from the level of USD 10,257.00 to Rp 11,184.00 later in November 2013 at 704.00 points (6.25%) of US $ 11,273.00 to Rp 11,977.00, and in September 2014 at 498.0 points (4.26%) of US $ 11,690.00 to Rp 12,188.00. While the level of appreciation of the rupiah was highest in February 2014 at 601.00 points (4.92%) with US $ 12,210.00 to Rp 11,609.00, then in July 2014 at 295.00 points (2.48%) with US $ 11,875.00 to Rp 11,580.00, and in March 2014 at 249.00 points (2.14 %) with US $ 11,609.00 to Rp 11,360.00.

Thus, although in the short-term the three variables had movement patterns that varied widely, in the long-term all three showed the same trend. Therefore, the second hypothesis (H2) in this study was supported, meaning that changes in foreign capital flows, volatility of capital markets and the exchange rate have a relationship of cointegration between one another, and this is in line with most of the results of previous studies, either in Indonesia itself and outside Indonesia as already mentioned in the earlier literature review section.

Having found a cointegration relationship between these three variables, then the data from these three variables were used in the VECM or VAR estimation process. The estimation
results can be seen in the attachment, and based on the level of significance of each variable, the substitution VECM estimation result in the VAR model can be simplified to:

\[
\begin{align*}
D(JCI) &= -1.207(JCI(-1) + 0.168*KURS(-1) + 1.312*NFP(-1)) + 0.234D(JCI(1)) + 0.238D(JCI(-2)) + 0.204D(KURS(-1)) + 0.269D(KURS(-2)) + 0.256D(KURS(-3)) + 0.215D(KURS(-4)) + 0.216D(KURS(-5)) + 0.216D(KURS(-6)) + 0.167D(KURS(-7)) + 0.076D(KURS(-8)) + 1.492D(NFP(1)) + 1.457D(NFP(-2)) + 1.340D(NFP(-3)) + 1.216D(NFP(-4)) + 0.923D(NFP(-5)) + 0.810D(NFP(-6)) + 0.724D(NFP(-7)) + 0.242D(NFP(-8)) + 0.150D(NFP(-9)) \\
D(KURS) &= 0.168*(KURS(-1) + 1.312*NFP(-1)) - 0.874D(KURS(-1)) - 0.767D(KURS(2)) - 0.672D(KURS(3)) - 0.572D(KURS(-4)) - 0.526D(KURS(5)) - 0.424D(KURS(-6)) - 0.325D(KURS(-7)) - 0.221D(KURS(-8)) - 0.123D(KURS(-9)) \\
D(NFP) &= -0.092*(JCI(-1) + 0.168*KURS(-1) + 1.312*NFP(-1)) + 0.073D(JCI(1)) - 0.028D(KURS(8)) - 0.030D(KURS(-9)) - 0.873D(NFP(-1)) - 0.848D(NFP(-2)) - 0.841D(NFP(-3)) - 0.694D(NFP(-4)) - 0.574D(NFP(-5)) - 0.464D(NFP(-6)) - 0.336D(NFP(-7)) - 0.217D(NFP(-8)) - 0.094D(NFP(-9))
\end{align*}
\]

Based on the above models, it appears that not all lag is significant in each equation, which according to Pyndick and Rubinfeld (1998) is typical in the VECM and VAR. In the first equation with JCI as the dependent variable, it appears that both the short-term and long-term JCI movement is due to its own movement, the exchange rate IDR / USD, and the flow of foreign capital. In both the short- and long-term, changes in the flow of foreign capital had the largest contribution in moving the JCI, which is seen from the higher average coefficient than the coefficients of other variables.

This condition is very relevant to the facts that occurred in the field, where the number of foreign investors were very high in Indonesia stock exchange and generally they also had greater funds than domestic investors, so in buying (selling) they would spontaneously increase (decrease) the JCI. This also showed that the Indonesian stock market still had a high degree of volatility, making it very vulnerable to shocks, both internal and external. While in the second equation with the exchange rate as the dependent variable, it appeared that in the short-term exchange rate changes of IDR / USD were positively related to the change in itself and the flow of foreign capital that occurred in the previous period, but the change was not related to JCI.

While in the long-term, changes in the exchange rate of IDR / USD was fully influenced by its own negative movement, indicating that long-term changes were more explained by macro variables, such as import-export and economic growth. In the short-term, changes in the flow of foreign capital had a major contribution in moving the supply and demand of foreign exchange.

As for the third equation with NFP as the dependent variable, it appeared that in the short-term, foreign capital flows was positively related to its own amendments and changes in
the exchange rate that occurred in the previous period, but the change was negatively related to the JCI movement. While in the long-term, foreign capital flows were almost entirely affected by its own changes.

The estimation results above only showed models or patterns of the relationships between variables. The equations above showed that each of the variables are related to each other, but it is questionable whether there is strength in the relationship to mutually influence one another. To answer this question, it was necessary to test causality using the Granger Causality Test, and the test results are shown below in Table 5:

<table>
<thead>
<tr>
<th>Excluded</th>
<th>Dependent Variable</th>
<th>NFP</th>
<th></th>
<th></th>
<th>D(JCI)</th>
<th></th>
<th>D(KURS)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>D(JCI)</td>
<td>12.59372</td>
<td>9</td>
<td>0.8119</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>D(KURS)</td>
<td>16.74093</td>
<td>9</td>
<td>0.0529*</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>All</td>
<td>30.50732</td>
<td>18</td>
<td>0.0328**</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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*Significant at the 1% level; **Significant at the 5% level; *) Significant at the 10% level

The Granger Causality Test results showed that the change in the flow of foreign capital in Indonesia, both incoming (capital inflow) and out (capital outflow) were significantly affected by changes in IDR / USD exchange rates, but were not significantly affect by the JCI. In connection with the earlier results of the VECM and VAR model estimation, the appreciation of the Rupiah against the US dollar encouraged foreign investors to invest in Indonesia, and the strengthening of the domestic currency also indicated that the national economy was good with a positive impact on the investment climate.

However, the Indonesian capital market performance as shown by JCI did not significantly affect foreign investment, likely because this might be a characteristic of international investment, where international investment decisions are based on a low correlation between the stock market, and not based on market performance.

Movement on the JCI was significantly affected by changes in foreign capital flows and the IDR / USD exchange rate, meaning that in addition to having a strong relationship with changes
in the flow of foreign capital, any significant increase in JCI also caused by an appreciation of the Rupiah (and subsequent depreciation of the USD) as occurred in the previous period. In other words, for every day of selling by foreign investors (current sales = capital outflow), the rupiah appreciated, and the JCI significantly increased.

The opposite condition was seen with foreign buying and a depreciated rupiah, where the JCI significantly decreased. Since the change in the IDR / USD exchange rate was not significantly affected by the JCI movement and changes in the flow of foreign capital, this indicated that the change in the IDR / USD exchange rate was more influenced by other macro variables.

From the results of Granger Causality Test it was also seen that there was no causal relationship between changes in capital flows of portfolio investments in Indonesia by the JCI and with changes in the IDR / USD exchange rate. Further, there was no causal relationship found between JCI and the IDR / USD exchange rate changes. As the third hypothesis (H3) in this study was not supported, then the concept of good market and the portfolio-balance approach is not applicable in Indonesia.

These findings are also consistent with several previous studies, both in Indonesia and outside Indonesia, that also did not find any causal relationship between these three variables. The models and mechanisms between the research results tend to vary according to the prevailing conditions in the country investigated, some of which found that the stock market volatility affected the exchange rate changes and foreign capital inflows.

This refers to the concept of the good market approach, but others found that the changes in exchange rates influenced the volatility of the capital markets and capital inflows, which in turn leads to the concept of the portfolio-balance approach. Specifically, the results of this study were consistent with the results of the studies by Jorion (1990, 1991) in the United States and Bodnar and Gentry (1993) in Japan, which also showed that these two concepts (good market approach and the portfolio-balance approach) do not apply in these respective countries. Schematically, the analysis of the relationship between the three variables in this study is shown in Figure 1 as follows:

![Figure 1. Relationship of Changes in the Investment Capital Flow, Exchange Rate (KURS), and the JCI](image)
Furthermore, to determine the shock effect and the length of the shock of a variable on other variables was tested using the Impulse Response Function (IRF) approach. Besides being able to determine the effect and duration of a shock, IRF approach can also be used to predict how long a shock effect would last. Results for a 20 day IFR analysis is shown in Figure 2.

In these Figures, the response of each variable changes as a result of new information as measured by the 1-standard deviation. The vertical axis on the Figure represents the value or growth response of each variable, while the horizontal axis depicts the time or the period after the shock, which in this case is for a 20 day period.

The first Figure (the first column and first row) describes the JCI response (against a shock), where every stock index increased by 1%, and responded positively in the period thereafter until it reached 1.15%, and continued to fluctuate until returning to normal in the eighth period. At the same time, JCI responded positively to changes in the IDR/USD exchange rate and changes in the flow of foreign capital, but based on the estimated VECM and VAR, these two variables were not significantly affected by the JCI movement, so that the response is considered weak and is not a focus of the discussion in this paper.
The second chart (the second row of the second column) describes the response of IDR / USD exchange rate changes against itself, in which any changes as much as 1% in the exchange rate of IDR / USD would respond positively to the period there after until it reaches 1.26%, but in the second period it went back down and fluctuated to normal in the twelfth period. At the same time, any changes in the exchange rate of IDR / USD (depreciation Rupiah) would be responded to negatively by investors in the capital market, where the rise in the IDR / USD
exchange rate (depreciation Rupiah), as much as 1%, would trigger a downturn in the stock index as much as 0.197%, and continue to fluctuate until back to normal in the eighth period.

This condition may be caused by a shift in investor capital from the capital market to the foreign exchange market. In addition, changes in the IDR / USD exchange rates also responded negatively by foreign capital inflows in the second period thereafter, where a 1% increase in the IDR / USD exchange rate would lead foreign investors to pull their funds out of Indonesia or direct it into forex until 0.06% where the rate would continue to fluctuate until normal back in the twelfth period.

The third Figure (third row of the third column) describes the response of a change in the flow of foreign capital to itself, where any capital inflow as much as 1% would respond positively to the period thereafter until it reaches 0.4%, then drop and increased again in the fifth period and back to normal in the twelfth period. This condition shows that the inflow of foreign capital into Indonesia would trigger other sources of foreign funds to enter also into Indonesia, or would reflect a decision of foreign investors to invest more in Indonesia. But one should be wary in case of a reverse phenomenon.

These estimates also indicated the possibility that foreign investors in Indonesia may tend to herd among each other. At the same time, changes in foreign capital flows were also addressed by an increase in JCI. The influx of foreign funds into Indonesia would boost the stock index by 0.42% in the period there after and continue to grow until normal back in the tenth period. Besides that, it also responded to the IDR / USD exchange rate changes, but the VECM and VAR estimation results did not show any significant relationship, so that the response is considered weak and is not a focus of discussion in this paper.

Furthermore, the variance decomposition model characteristics would be seen after analyzing the behavior dynamics through the Impulse Response Function. Variance Decomposition is useful to draw up a forecast of the error variance of the variables, i.e., how big the difference between the variance before and after a shock (that comes either from itself or a shock from other variables), and to see the relative influence of each of the variables investigated and other variables outside the model. The results of Variance Decomposition analysis of foreign capital inflows (NFP), JCI, and the IDR / USD exchange rate over a 20 day period are shown in Table 6 below:
The results of the Variance Decomposition analysis indicates the forecasted error variance of changes in capital inflows (NFP) in Indonesia in the first period. A variability of 99.07% was determined by changes in itself and in subsequent periods it tended to decrease, though still at a high level. As much as 0.91% in the first period of NFP variability was explained by JCI movement and it would continue to increase until it reaches 2.20% in the fifth period and 3.30% in the twentieth period thereafter.

Until the 20th period, 95.19% of the NFP forecasted error variance can be explained by the changes in itself, which suggests that changes in the capital flows of portfolio investment in Indonesia, both in and out, would be more influenced by the behavior of investors rather than other factors. For the JCI forecasted error variance in the first period, 100% of variability was determined by a shock on itself, while changes in IDR / USD exchange rates and NFP changes had no contribution at all in the first period.

However, in the next period, the JCI variability can be explained by changes in IDR / USD exchange rates and changes in the NFP, and even though the variability was higher up, the contribution of shock on itself waned. When compared with the IDR / USD exchange rate changes, changes in NFP had a higher contribution in explaining the variability changes in the JCI. The forecasted error variance of the IDR / USD exchange rate changes in the first period was
also almost completely was influenced by its own movement (99.97%), while the contribution of changes in the NFP and JCI did not show a meaningful contribution. This condition again showed that changes in the IDR / USD exchange rates is more explained by macro variables compared with the JCI and NFP.

Based on the Impulse Response and Impulse Decomposition analysis, it is clear that the change in the flow of foreign capital in the context of portfolio investments would bring positive and negative impacts to the volatility of the capital markets. The flow of foreign capital was a significant positive impact on the volatility of Indonesia capital markets (that boosted the JCI), but the reverse flow of foreign capital out was a significant negative impact on the volatility of capital markets (that decreased the JCI).

Thus, the first hypothesis (H1) in this study is supported. This is consistent with the views of mainstream economists and other economists, where mainstream economists stated that capital inflows will have a positive impact on the economy through the capital market. Further, other economists (non-mainstream) stated that foreign capital flows are likely to increase the extreme volatility for the stock market in the country of destination.

So this trade-off would bring the Indonesian capital market to an investment vehicle with more promising business prospects among other capital markets in the world and would increase the opportunities for progress and development in the future. The results of the Impulse Response analysis and Variance Decomposition also showed the dynamic behavior of the three variables, so that the fourth hypothesis (H4) is also accepted.

V. CONCLUSIONS

The results showed that there is a relationship between cointegration and dynamic changes in the flow of foreign capital, the JCI, and the IDR / USD exchange rate, but a causal relationship cannot be found between the three. Changes in the flow of foreign capital significantly affected the JCI, but did not significantly affect the change in IDR / USD in exchange rate. However, change in the IDR / USD exchange rate significantly affected the flow of foreign capital and the JCI. The JCI movement did not significantly affect change in foreign capital flows and the IDR / USD exchange rate.

As in this study, only three variables were tested (NFP, JCI, and the exchange rate), the research results cannot fully explain the real conditions that occurred in Indonesia, particularly on foreign capital flows in and out of Indonesia. That is, the flow of foreign capital in and out of Indonesia is not only explained by the volatility factors of capital markets and changes in exchange rates, and vice versa.

Therefore, further research may include some other relevant variables, such as changes in interest rates in short-term and long-term, the growth rate of the national economy (GNP), and international macro factors (e.g. changes in international interest rates and the volatility
of global capital markets). To get a more specific description associated with the problem, the analysis of the data can also be directed using a semi-quantitative method (a blend of quantitative and qualitative methods), so that the facts can be synchronized with the statistical aspects of behavioral finance.
REFERENCES


