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The Analysis of the Bank Interest Influence and Exchange Rate Towards Composite Stock Price Index in Indonesia Using Vector Error Correction Model Approach

Imam Mukhlis[1], Timbul Hamonangan Simanjuntak[2], and Teguh Prasetyo[1]

[1]Fakultas Ekonomi Universitas Negeri Malang
[2]Fakultas Ekonomi Universitas Kristen Maranatha

Corresponding Author:
Imam Mukhlis
imm_mkl@yahoo.com

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Abstract

This study aims to analyze the influence of bank interest and exchange rate towards composite stock price index in Indonesia under the period of January 2010-December 2016. The method applied is Vector Error Correction Model (VECM). The findings show that this method aces to show the pace of adjusting balance from the short period up to long period towards stock price index variable. The gap between bank interest level and the exchange rate has the low impact towards composite stock price index. For a longer period, the exchange rate would bring negative impact to composite stock price in Indonesia. Meanwhile, in a short period, it would not affect exchange rate and bank interest rate towards stock price index in Indonesia.

Keywords: Stock Price, Exchange Rate, Vector Error Correction Model, Bank Interest Rate

1. Background of the Study

A macroeconomy stability of a country is a state to be fulfilled in order to maintain the continuance of economic development. Economy stability is reflected in several macroeconomy indicators such as BI rate, inflation, currency exchange rate, economic development, share price index, and a number of unemployment. The development of this macroeconomy can be predisposed by either domestic factors or international factors. Domestic factors influencing the economic condition are president and vice-president election, head of a certain province or district or county election, and disasters. Meanwhile, the globalized economy development has caused a dynamic fluctuation in economic stability. One of the external factors which are growing nowadays is VUCA (Vulnerability, Uncertainty, Complexity, and Ambiguity). To anticipate, the government and monetary authority can elaborate their policies pleasingly so that

positive expectation will come up and optimism will keep going towards significant improvement.

There is one macroeconomy indicator which has become the concern of monetary authority, that is the development of stock price index in stock market. stock market under the economy development can be influenced by domestic and international factors [7]. Those factors can affect stock price index simultaneously. As a matter of fact, Indonesia in a country categorized as emerging market. A country under this circumstance has some characters: having an enormous number of the citizen, having high consumption, having growing number of middle-to-high class of society, and having more stable politic and social condition. The implication of emerging-market country is to be able to attract a foreign investor to invest in Indonesia. The purpose of the investment is to leverage the market provided under the national economic situation. The more flowing foreign investment coming to Indonesia, the more balance of "modal" surplus will become. This, at the end of the day, will upgrade the balance of payment surplus.

The more ranked-up number of investment in Indonesia can equip the national stock market. In this case, the money received can be accessed through valuable and important documents in form of either stock or obligation. Stock markets in Indonesia are noticed through companies owned by the government (Public Companies) such as PLN, Pertamina, Telkom, Garuda, Angkasa Pura, and Jasa Marga. Besides, there are also national non-government companies such as Gudang Garam, Djarum, et cetera. The stock market in Indonesia is organized by Indonesia Stock Exchange Company whereas relevant monetary authority is Financial Service Authority. The bigger number of stock possession draws the improved investment interest. Thus, this fact can enhance the multiplier of economic activities and in the long run, can boost up the national economic performance.

Composite stock price index development from 2010-2016 is graphically shown as follows:

Referred to the above data, it can be depicted that the development of composite stock price index has become an uptrend as the time goes by. Only in the year 2015 that the data shows the compact stock price decreases. This statement indicates the extensive capitalism of capital market in Indonesia as the effect of national openness economy. Consequently, volatility of composite stock price index occurs owing to both external and internal factors. Also, the external factor is figured out by the economic turbulence in several well-developed countries such as in USA, Europe, Asia,
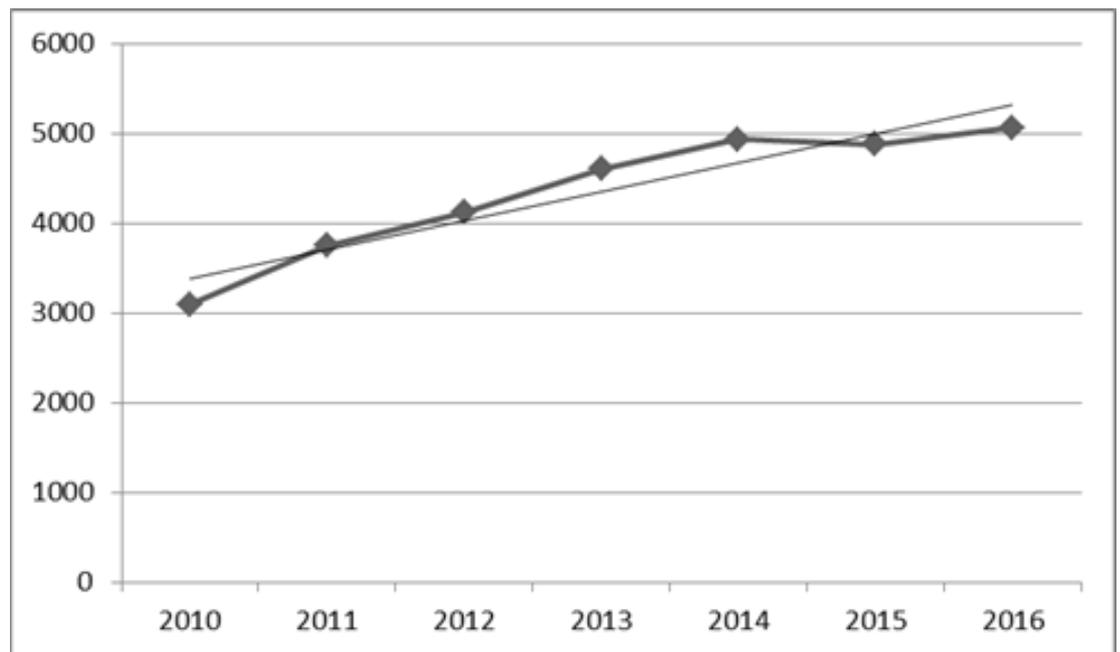
Figure 1: the development of stock price index in Indonesia, the year 2010-2016 (average rate). Source: Indonesia Stock Exchange, 2017, processed data

and the Middle East. The dissent between the USA and North Korea about establishing nuclear affects the pressure of world stock price index. Economy crisis happening in several countries in Europe (Greece, Portugal, Spain) has predisposed the foreign investors' expectation to invest in Indonesia. Supporting, ceaseless conflict in the Middle East results in an uncertainty of the economy and global financial market. Among these external factors, an announcement from America Federal Bank about the amount of federal fund reserve becomes the parameter of monetary policy in most countries in the world. Nevertheless, among these worldwide economic developments, the strength of China's economy stands out upon USA's economy (showed by the stronger currency in China among other foreign currency). Hereby, this fact eventually turns to affirmative information in relation to maintaining the balance and stability of the global economy.

Additionally, the initial indicator of an external factor is showed by the development of stock price index in USA (New York Stock Exchange). The development of stock prices in the USA reflects on how the economic condition in Amerika is. The stock price movement is the recommendation for global investors to determine their decision to purchase or sell stock. This circumstance will act on the funding flow to any countries, either developed or well-developed countries. Stable macroeconomy in the USA will drive the upgraded stock price on NYSE.

Internal factor influencing stock price index volatility in Indonesia is political issues in a democracy such as president and vice president election and head of a province/district/county. A wide apprehension about political escalation can cause a democracy leading to devastating public facilities. Besides that, the legal uncertainty to proceed business permission and investment are as well contributing to creating conducive business. The pressure of politic matters and that uncertainty of law result to those investors who will later choose to wait and observe in doing stock market business.

As a result, Indonesia as an emerging-market country should behave proactively in looking over the dynamic expanding at a volatile pace. Stock price index moving dynamically brings out impacts on the supply of adequate funding to improve business activities in a certain company. Depreciated stock price index contributes to give effects on capital outflow causing the balance of capital deficit in Indonesia. Viewing through from other sights, the movement of currency exchange Rp/ US$ is relevant to volatility happening in the stock market. This matter pertains to the investors' choices to investigate their funding in the stock market or in foreign currency exchange. In this case, Bank of Indonesia's policy has a tendency to get lower (since 2015 BI rate was 6,50% and at the end of 2016 BI rate changed to 4,75%). This attempt is obtained to anticipate the impact of economy downtrend coming up in various countries so that no negativity will interfere the national economic progress. The decreasing of interest rate hopefully becomes able to motivate common banks in Indonesia to downgrade their bank interest in order to develop business activities expansively. Considering without any qualms that there are still other economy policies administered by the government to maintain the national economic stability. This stability can arrive at its feasibility by presenting steady Indonesia composite stock price index in Indonesia Stock Exchange gradually. Recently, monetary authority and market agents are to apprehend the factors relating to stock price index volatility and spillover effect in economic activities. By employing stock market index volatility model, it can be also used to do forecasting to acknowledge the side effects faced by an institution [2]. According to the above grounds, this article intends to analyze the influence of interest rate and exchange rate towards composite stock price index in Indonesia during 2010-2016.

2. Literature Review

The stock market is a financial institution functioning as the connector between the stock seller and stock buyer. Stock purchaser is identically noticed as an investor in the

capital market. The presence of stock market can initiate financial liquidity required in economic activities. The financial liquidity is needed in economic activity in order to ease the transaction traded by economic agents. Thus, the more expansive the capital market is, the better economic activity expansion will be.

The performance of capital market can be measured from the rate of economy transaction done in the society. This transaction involves both sellers and buyers of the stock. Higher stock trade rate can increase stock price index. Besides, high stock price index optimistically affects the economic performance of a country. There are some contributing factors towards the motion of stock price index. They are namely inflation, bank interest rate, and real GDP Engle and Ragel (2008); bank interest rate [11]; currency exchange rate [4]. Then according to Sadorsky (2003), stock prices determine the inevitable company's profit. If the business cycle predisposes the company's profit in longer span, the business cycle expectation will affect the rate of a company nowadays. In accordance with this statement, Engle and Rangel (2008) state that stock price index volatility connects to a business cycle in a longer term.

Furthermore, a study by Yang and Wang (2007) shows that in short period, there is bivariate causality between currency exchange and stock price index in Malaysia. Another study by Ali at.al (2010) results in the cointegration between industrial production index and stock prices. Nevertheless, there is no causal relationship between macroeconomy indicators and stock prices in Pakistan. Rahman et al (2009) also find that stock market in Malaysia is quite sensitive towards the macroeconomy changes. These changes pertain to bank interest rate, circulated money, and currency exchange rate. Meanwhile, Patel (2012) finds in his research that there is a long-term relationship between macroeconomy variable and stock price index in India. Another research by Sadorsky (2003) implies that conditional volatility of gasoline and consumer price index significantly influences the conditional volatility of technology stock in America during the period of July 1986 until December 2000. Beside that, another research conducted by Nikmanesh and Mohd Nor (2016) indicated a significant relationship between same price volatility and macroeconomy variables in Indonesia and Malaysia. In this case, macroeconomy volatility and trade openness can explain the 81% stock price volatility in Malaysia and 76% stock price volatility in Indonesia. Lim and Sek (2014) in their research also imply that two-way causality between exchange rate volatility and stock returns in Indonesia exists in Indonesia, Korea, and Thailand.

Referring to initial empirical research above, it can be concluded that stock price index can influence macroeconomy state of a country. This statement implies that

investors' decision to invest through stock instruments pays attention a country's economic stability. Macroeconomy indicators are the signs of economic development in relation to economic development dynamic. These findings become a quintessential consideration of financial authority in a country to establish the stability of its economic state.

3. Research Method

This research uses secondary data from the period of January 2010 until December 2016 as the basis of the data collection. The determination of the pointed time is underpinned by a consideration of dynamic global economic development so that it can affect the national economic stability. The data involved comprises of a stock price index, currency Rp/US$, and bank interest rate. The data sources are collected from three websites : www.bei.go.id, www.bi.go.id,www.ojk.go.id. The method used in analyzing the data is Vector Error Correction Model (VECM). The steps are mentioned as follows: stationarity test applying Augmented Dickey-Fuller test, Johansen cointegration test, VECM, Impulse Response Functions, and variance decomposition.

The vecm model applied is shown as follows:

$$\Delta SP = \alpha \sum_{i=1}^{m} \beta i \Delta SP_{-i} + \sum_{j=1}^{n} \gamma j \Delta ESP_{t-j} + \sum_{k=1}^{0} \omega \Delta ER$$
$$= \sum_{l=1}^{0} \delta \Delta IR + \sum_{m=1}^{p} \xi \Delta NYSE + \theta Z_{t-1} = \epsilon_t$$

SP stands for a stock price, ER is exchange rate Rp/US$, BI Rate is bank interest rate.

4. Findings and Discussion

The result of stationary data using Augmented Dicket Fuller test (ADF test) is shown as follows:

According to the above table, it can be concluded that all variables are stationary (no unit root) in one degree (first difference), 1 %. The data without unit root means that the data does not have a tendency to result in spurious regression. The next step is to do cointegration test to validate whether there is a long-term relationship between estimated variable. The result of cointegration test using Johansen method is drawn as follows:

TABLE 1: The Result of Stationary Data using ADF Test.

Variable	Stationarity		Conclusion
	Level (D(o)) Stationarity Level	D(I)	
ER	-	1%	Stationary at the first difference
IR	-	1%	Stationary at the first difference
NYSE	-	1%	Stationary at the first difference
SP	-	1%	Stationary at the first difference
Source: data is processed using Eviews			
Note : sign (-1) is not stationary			

TABLE 2: Unrestricted Cointegration Rank Test (Trace).

Hypothesized		Trace	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.182591	22.09387	29.79707	0.2933
At most 1	0.074722	6.166192	15.49471	0.6759
At most 2	0.000392	0.030991	3.841466	0.8602
Trace test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

TABLE 3: Unrestricted Cointegration Rank Test (Maximum Eigenvalue).

Hypothesized		Max-Eigen	0.05	
No. of CE(s)	Eigenvalue	Statistic	Critical Value	Prob.**
None	0.182591	15.92768	21.13162	0.2291
At most 1	0.074722	6.135201	14.26460	0.5959
At most 2	0.000392	0.030991	3.841466	0.8602
Max-eigenvalue test indicates no cointegration at the 0.05 level				
* denotes rejection of the hypothesis at the 0.05 level				
**MacKinnon-Haug-Michelis (1999) p-values				

In relation to the above result, it can be indicated that there no cointegration similarity between variables in that model. It is corroborated statistically that the trace statistic value is lower than critical value at α= 5% (table 2). This fact goes the same as maximum eigen value which is lower than the critical value at α= 5% (table 3). This matter can be depicted as the conclusion implying that in the long period there is no tendency of the long-term relationship between bank interest variable and currency exchange Rp/US$ towards stock price index in Indonesia.

Based on the estimation result using VECM, there is dynamic increasing between Bank Indonesia interest rate and currency exchange rate towards IDX composite. Under this circumstance, the coefficient value CointEq1 is significant and signed as negative. Coefficient CointEq1 draws the adjustment speed from short-time period to long-term period towards stock price index. The presence of significance of coefficient CointEq1 indicates that estimation model elaborated in this research is validated.

The formula of estimation results applying VECM model is written as follows:

D(SP)= -0.159806 (CointEq1) + 0.093927 (BI RATE (-1)) - 0.706131 (ER (-1)) - 2.006360 + 0.191350 D (SP (-1)) + 0.077101 D (SP (-2)) + 0.187549 D (SP (-3)) - 0.235614 D (SP (-4)) + 0.084806 D (SP (-5)) - 0.025012 D (SP (-6)) + 0.046587 D (BI RATE (-1)) - 0.010280 D (BI RATE (-2)) - 0.075865 D (BI RATE (-3)) - 0.220304 D (BI RATE (-4)) + 0.120158 D (BI RATE (-5)) + 0.129205 D (BI RATE (-6)) + 0.163509 D (ER (-1)) + 0.197232 D (ER (-2)) - 0.115095 D (ER (-3)) - 0.167840 D (ER (-4)) + 0.143172 D (ER (-5)) - 0.136969 D (ER (-6)) + 0.004594.

Estimation result above indicates that only currency exchange variable (ER(-1)) which is influencing negatively and significantly towards the motion of IDX composite. The depreciation of currency Rp/US$ at 1% will increase stock price index to 0.706131 percent. This finding differs from the research conducted by Kennedy and Nourizad (2016) which concludes a positive relationship between currency exchange US$/Euro and stock price index in the USA. It means that increased exchange rate volatility exerts a positive and statistically significant effect on the volatility of stock returns. This difference occurs due to the dissimilarity of economic structure in USA and Indonesia. The economic structure in the well-developed country (USA) is corroborated sophisticated sectors and take places any trades using foreign currency and in the stock market. Also, the different strength of domestic currency in USA and Indonesia support the matter. USA currency is a hard currency employed in various countries whereas Indonesia currency is a soft currency. This exerts the economy agents' expectation in both countries in overcoming the economic shock.

Accordingly, the finding in this research is in line with Lim and Sek's study (2014). Lim and Sek (2014) altogether with Yang and Wang (2007) figured out that there is two-way causality between exchange rate volatility and stock returns in Indonesia, Korea, and Thailand. This means that exchange rate volatility and stock price have the reciprocal relationship in these three countries. The reciprocal relationship sternly confirms the relationship between macroeconomy condition and stock price index. Related to this, Sadorsky (2003) said that stock price is the reflection of company's profit. The profit level becomes the indication of economic agents to held stock trade in a certain company. As a result, stock prices will be raised.

The shock occurring in the economy can be explained using Impulse Response Function method. IRF is a shock from a system so-called VECM in drawing the dynamic in stock price index motion in IDX composite. Impulse Response Function identifies endogenous variable responsiveness in VECM if there should be any shock from error term. To illustrate, if the shoch is 1 standard deviation in error term, the response showed by endogenous variable will be shown by IRF. In calculating IRF, it is important to do ordering from the variable. Among all methods, Cholesky of adjusted is commonly used to analyze time series applying VECM method. The final result of data collection is used to identify IRF scale applying for Eviews program as shown as follows:

TABLE 4: Impulse Response Function on Variable SP, BI Rate, and ER.

Response of SP :			
Period	SP	BI RATE	ER
1	0.042506	0.000000	0.000000
2	0.040464	0.001054	0.004720
3	0.033084	-0.000247	0.009809
4	0.035875	-0.002098	0.007982
5	0.022008	-0.007398	0.005342
6	0.017442	-0.005770	0.007560
7	0.014698	-0.003980	0.004227
8	0.009155	-0.001699	0.004521
9	0.010103	0.000215	0.006196
10	0.006499	-0.000384	0.006642

The Impulse Response Test is used to see the contemporary influence of a variable to another variable. To exemplify derived from the research, the Impulsive Response Test is administered in three steps. First, it is used to identify contemporary influence

from variable stock price towards BI rate and exchange rate. Second, it is used to see the contemporary influence from BI rate variable towards stock price and exchange rate. Third, it is used to draw contemporary influence from exchange rate variable towards stock price and BI rate.

In accordance with the test conducted, the conclusion shows that one standard deviation from stock price is 0.042506. This does not bring any significance towards BI rate variable and exchange rate (standard deviation = 0). After one period, standard deviation from SP falls to 0.040464 and this influences the increase of standard deviation from BI rate variable 0.001054 and ER 0.004720.

On the other hand, one standard deviation from BI rate variable 0.030351 causes positive effect towards stock price variable to be 0.000663 and does not affect anything to ER variable (standard deviation= 0). In the following period, a standard deviation of BI rate increases to 0.033712 which affects negatively another standard deviation from SP variable to be -0.003919 and affects positively ER variable standard deviation to be 0.005127.

Gaining points from another viewpoint, one standard deviation of ER variable 0.017079 affects negatively to SP variable in the amount of -0.012316 and affects positively to BI rate variable in the amount of 0.015207. Then in the following period, a standard deviation of ER variable gets down to be 0.015207 and it affects negatively SP variable standard deviation to be -0.011665 and BI rate becomes -0.002477.

Variance decomposition gauges every contribution in form of shock towards error variance. The result obtained using Eviews program shows the calculation of variance decomposition as ensues:

According to the table for IHSG above, it can be drawn that in period 1, the approximation of overall error variance (100%) is explained by IHSG variable; yet in period 2, BI rate variable has the effect on error variance estimation in the percentage of 0.642470%. in period 3, BI rate variable has influenced towards error variance estimation in the percentage of 0.025150% and the currency variable has also predisposed error variance estimation in the percentage of 2.543801%. Meanwhile, in period 10, BI rate variable has influenced error variance estimation in the percentage of 1.488292% and currency variable has also predisposed error variance estimation in the percentage of 5.141879%.

Based on the table of variance decomposition for BI rate, it is noticeable that in period 1 HSG variable has an influence to error variance estimation in the percentage of 0.047630% and currency variable does not bring any impact on error variance estimation (0%). In period 2, IHSG variable has influenced error variance estimation in

TABLE 5: Variance Decomposition from Stock Price (SP).

Variance Decomposition of SP:				
Period	S.E.	SP	BIRATE	ER
1	0.042506	100.0000	0.000000	0.000000
2	0.058885	99.32551	0.032023	0.642470
3	0.068251	97.43105	0.025150	2.543801
4	0.077546	96.87735	0.092661	3.029987
5	0.081123	95.88155	0.916201	3.202249
6	0.083521	94.81796	1.341597	3.840439
7	0.085002	94.53054	1.514472	3.954988
8	0.085630	94.29229	1.531717	4.175996
9	0.086447	93.88532	1.503541	4.611137
10	0.086946	93.36983	1.488292	5.141879

the percentage of 0.752477% and currency variable also has influenced the percentage of 1.251701%. In period 3, IHSG variable influences as big as 0.455963% and currency variable has influenced as big as 2.586239%. In period 10, IHSG variable has influenced as big as 7.707452%and currency variable has influenced as big as 15.59399%. towards the estimation of error variance.

In addition, based on the variance decomposition table for ER variable, it is clearly shown that in period 1, SP variable has impacted 34.20140% and BI rate variable has impacted 0.026839%, both on the error variance approximation. In period 2, SP variable has impacted 35.22319% and BI rate variable has impacted 0.765344%, both on the error variance approximation. In period 3, SP variable has impacted 32.99169% and BI rate variable has impacted 2.069378%, both on the error variance approximation. Lastly, in period 10, SP variable has impacted 23.76569% and BI rate has impacted 5.230135%, both on the error variance approximation.

5. Conclusion

The development of stock price index reflects the economic condition of a certain country. Economy stability is a fundamental indicator proposed as the parameter to economic agents in organizing economy activities. The high stock price index draws the high expectation of economic agents in the expansive activities in the aspect of the economy. This expectation pertains to the profit level be obtained from the trade.

Theoretically, there are relationships between macroeconomy and the motion of stock price index. The stable condition influences the stock price index. In pertaining to examining factors of stock price index in Indonesia, the findings conclude that VECM model can explicate the pace of adjusting balance from a short period to a long period towards stock prices variable. Additionally, the coefficient of Error Correction Term is at the number of 0.159806.

Another finding indicates that the shock occurring in bank interest rate and currency exchange rate has small implication towards composite stock price index. In the longer term, exchange rate variable will negatively predispose the IDX composite. This statement points out an appreciation of Rp/US$ currency value downgrades stock price index in Indonesia. Meanwhile, in a shorter term, there will be no relationship between exchange rate variable and BI rate variable towards stock price index in Indonesia. The unresponsiveness of economy agents towards stock price monetary policy is corroborated with no connection between BI rate and stock price index.

In a nutshell, this research results in the recommendation to monetary authority in order to maintain the stability of the national economy. The policy of decreasing the BI rate can be followed by the policy in real sectors by utilizing the practicality of economic agents to invest. This policy can be in form of a package of economic policy. This package launched by the government can be directed to trade pace in real sectors under the progress of developing an economy.

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