DETERMINANTS OF UNITED STATES - INDONESIA EQUITY MARKET'S DYNAMIC CORRELATION: THE ROLE OF COMMODITIES AND EXCHANGE RATE'S VOLATILITIES

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Abstract

This study aims to analyze the effect of oil price volatility, gold price volatility and exchange rate volatility on the dynamic relationship between Indonesian and United States capital market. The data used in this study are daily closing prices of oil, gold and exchange rates (USD/IDR) as well as Indonesian capital market (JKSE) and United States capital market (DJIA) composite indices during period of January 2005 to October 2020. This study uses DCC-GARCH method to calculate the dynamic correlation between two capital markets and GARCH with the GED parameter to analyze oil volatility, gold volatility and exchange rate volatility on the integration of Indonesian capital market and United States capital market. The results of this study show positive and strong results on the integration of Indonesian and United States capital markets, thus proving that the movements of Indonesian market and American market tend to be strong and mutually influence the two capital markets. Moreover, the oil, gold and exchange rates volatilities have a negative effect on the integration of the Indonesia capital market and the US capital market. This finding implies investors should take oil, gold and exchange rates volatilities in their investment consideration.

INTRODUCTION

Technological developments and economic globalization encourage integration between capital markets. An integrated market will form a close relationship with the world capital market, so that it mutually influences the increase and decrease in the stock value. Basically, capital market integration is a very

interesting topic for researchers in the capital markets. Therefore, it is not surprising that there have been many studies conducted both internationally – such as by Chevallier, Nguyen, Siverskog, and Uddin (2018); Devos and Li (2021); Habiba, Peilong, Zhang, and Hamid (2020)– and regionally – such as by Batten, Kinateder, Szilagyi, and Wagner (2019); Karim and Rahman (2020); Robiyanto, Frensidy, Setyawan, and Huruta (2021). The integration in the ASEAN market has also been investigated by Gugler and Vanoli (2017) after the implementation of the ASEAN Economic Community (AEC). Some studies concluded that the ASEAN capital markets were integrated with each other. In addition, there was a long-term equilibrium relationship between the ASEAN capital markets (Robiyanto, Nugroho, Handriani, & Frensidy, 2023; Yu, Fung, & Tam, 2010) as well as developed capital markets such as the U.S. capital market (Boubaker & Jouini, 2014; Robiyanto, 2018b). Also, hypothetically, integration of those capital markets will be stronger in the era of Covid-19 pandemic, because Covid-19 pandemic affect financial sectors globally (Buğan, 2021; Sugiyanto & Robiyanto, 2021).

Empirically, researches on the capital market integration had been widely carried out. However, the research results still focus on the capital market integration relationship, and have not investigated factors causing the integration between capital markets. This present study aims to examine the integration of capital markets and factors triggering the integration relationship. This study uses oil price volatility, gold price volatility and exchange rate volatility. Limited studies used volatility of these instruments (i.e. Babatunde (2015); Jones and Paul (1996); Shabbir, Kousar, and Batool (2020); Syahri and Robiyanto (2020). These variables used because they could affect all monetary variables in the host countries (Alqahtani, Lahiani, & Salem, 2020; Filis,

Degiannakis, & Floros, 2011; Gisser & Goodwin, 1986; Hamilton, 1983; Joo & Park, 2021; Robiyanto, Nugroho, Handriani, & Huruta, 2020; Syahri & Robiyanto, 2020). Detail explanation shown in the next paragraphs.

The oil price volatility refers to a condition in which the oil price fluctuates so high and fast. A high volatility means that the price goes up very fast and then the price will go down fast too. This phenomenon is a condition that is not expected for both companies and countries because it will bring positive or negative impacts. These shocks must be anticipated by the companies and the government in the short and long term to prepare policies dealing with oil fluctuations in the future. According to Aravind and Nayar (2020), the oil price affects the integration of a capital market as the oil is the main and most important source of funding in the financial sector, and it has a long-term relationship with all macroeconomic variables (Filis et al., 2011; Gisser & Goodwin, 1986; Morales, 2009).

Furthermore, the gold price volatility also plays a role in the capital market integration. In the midst of COVID-19 pandemic, most people were hunting for assets that they thought were safe to invest in, one of which was gold. This caused the gold price increased aggresively and it was also followed by the sale of risky assets, for example stocks. These conditions created negative sentiment in the capital market, then many investors were doubtful about the performance of the capital market in a particular country. As a result, there was a domino effect in companies that needed capital. If many companies had a lack of capital due to investors' distrust, then this could lead to a shock to a country and might result in the international relations with other countries. This was proven in a study conducted by Akhtaruzzaman, Boubaker, Lucey, and Sensoy (2021); Shabbir et al. (2020); Syahri and Robiyanto (2020) which stated

that gold is an asset considered safe for volatile conditions, as in this study the gold was used as a hedge against inflationary events that hit a country.

The last factor is the exchange rate volatility. The exchange rate volatility forms price volatility in currencies which is the influence of the supply and demand for a country's currency. The greater the exchange rate volatility, the more unstable the currency and the higher the risk will be. If a currency volatility occurs to extremes, it will cause economic instability in a country, both micro and macro. From a macro perspective, exchange rate movements or fluctuations have an impact on international trade, both imports and exports. A high exchange rate volatility also affects foreign capital that will enter the domestic market, causing the investors hesitant to invest their capital because of the instability and doubts about the return that will be obtained Dada (2021); Kumar and Robiyanto (2021). If this is ignored for a long period of time, it will affect the movement or integration between the capital markets. For this reason, many countries attempt to maintain the exchange rate stability so that extreme fluctuations do not occur. This is done to maintain the economic stability and good cooperation with other countries. Raji, Abdulkadir, and Badru (2018) stated that the oil and exchange rates have a relationship influencing each other in dynamic conditions.

For these reasons, this present study aims to examine the integration of capital markets and the influencing factors, including oil price volatility, gold price volatility and exchange rate volatility. The results of this study are expected to benefit the investors in making decisions and contribute to further researches.

LITERATURE REVIEW
Capital Market Integration

Capital market integration describes a measure that shows how far the price changes in the main capital market will affect other capital markets with lower levels (Do, Bhatti, & Kónya, 2016; Karim, Jais, & Karim, 2011). The integration between the capital markets makes the relationship between countries to be closely intertwined. An integrated capital market tends to have a high transmission effect. Further, an integrated capital market also shows interdependence with one another, both from the public sector, the economic sector and other sectors (Do et al., 2016). Several major conditions could enhance capital market integration. Some studies such as Alexakis (1999); Batten et al. (2019); Karim and Karim (2012); Karim, Kassim, and Arip (2010); Karim and Rahman (2020); Robiyanto, Frensidy, et al. (2021) show Asian Financial Crisis, Global Financial Crisis, and Covid-19 could changed the degree of capital market integration. Robiyanto (2018b) found the degree of capital market integration tend higher after the Global Financial Crisis, while Sugiyanto and Robiyanto (2021) found the degree of capital market integration tend higher during the Covid-19 period.

Dynamic Conditional Correlation-Generalized Autoregressive Conditional Heteroskedasticity (DCC-GARCH)

DCC-GARCH method introduced by Engle (2002), this method been used in order to solve static correlation's limitations. This metode widely used in finance in order to calculated contagion effect, integration, even to formulate dynamic portfolios (see Bala and Takimoto (2017); Filis et al. (2011); Ku, Chen, and Chen (2007); Robiyanto, Nugroho, Huruta, Frensidy, and Suyanto (2021); Zinecker, Balcerzak, Faldzinski, Pietrzak, and Meluzin (2016). By using this method, we can see the time varying correlation during period of observation in detail manner. Robiyanto (2018b); Robiyanto et al. (2023) and Habiba et al. (2020) using this method to scrutinize the integration of several prominent capital markets in the world.

Volatility

Volatility is a measure of the amount of fluctuation in an asset's value (Handayani, Muharam, Mawardi, & Robiyanto, 2018; Joo & Park, 2021). Higher volatility indicates the greater possibility of experiencing profits or losses. Measuring volatility is important for the investors not only to understand potential returns, but also potential losses that will arise in the capital market. The volatility occurs because of new information in a market. This new information can change the investors' opinion about the asset value, and alsso their motivation in buying or selling assets.

Oil Price Volatility

The oil price volatility that occur in a country can affect its exchange rate movements (Babatunde, 2015). Oil commodities, including oil prices and oil exports, have proven a strong long-term integration relationship with several variables including time deposits, demand deposits and gross domestic savings (Aravind & Nayar, 2020). High volatility in oil prices tends to be triggered by increased demand that cannot be met by suppliers, resulting in scarcity both in developed markets and emerging markets (Abdelaziz, Chortareas, & Cipollini, 2008; Kuper, 2002; McAleer, 2010; Xu, Ma, Chen, & Zhang, 2019). Pandey (2018); Robiyanto (2018a) explained that a contraction in oil prices can affect an increase in the consumer price index (CPI). One of the negative responses to the increased oil price is a slowdown in investment growth in a country (Robiyanto, 2018a). The slow investment growth in a country can have an impact on the performance of a country. Shabbir et al. (2020) confirmed that the oil is the biggest need in a country, thus the oil price affects the relationship between capital markets and the performance of a country. Because each economy can be affected differently by oil price volatility (Robiyanto, 2018a), so it will weaken the capital market integration. For these reasons, the first hypothesis that can be proposed is as follows:

H1: Oil price volatility negatively influences the integration of Indonesia capital market and United States capital market.

Gold Price Volatility

Gold price volatility influences the integration between capital markets. The existence of gold at this time is as important as oil – the most needed commodity in a country. The current pandemic situation has had a positive impact on the gold price. Gold is a safe haven product that continues to be in demand by most investors in the face of market uncertainty. Similar findings on the gold as a safe asset and influential to the integration between capital markets were also confirmed by Arfaoui and Ben Rejeb (2017); Padungsaksawasdi (2020); Shakil, Mustapha, Tasnia, and Saiti (2018); Yousaf, Hanif, Ali, and Moudud-Ul-Huq (2021). For these reasons, the second hypothesis that can be proposed is as follows:

H2: Gold price volatility positively influences the integration of Indonesia capital market and United States capital market.

Exchange Rate Volatility

Exchange rate volatility is a condition not expected by most countries. According to Putra and Robiyanto (2019), fluctuations in an exchange rate are influenced by several factors, one of which is the amount of demand and supply. The greater the volatility, the more unstable the exchange rate of a country (currency appreciation or depreciation) and the riskier it is. If the currency appreciates, it implies that the purchasing power of imported goods increases. Conversely, if the exchange rate depreciates, it implies that there is a decreasing purchasing power of imported goods. If the volatility occurs in a country, there will be economic instability on both micro and macro economic conditions. Furthermore, according to Dada (2021);

Hammoudeh, Yuan, McAleer, and Thompson (2010); Makoto (2020), the volatility affects the behavior of economic actors, bringing impacts on profit uncertainty and trade volume which ultimately cause income instability in a country. Therefore, it can be concluded that the exchange rate volatility has an important role in the development of a country's trade. For these reasons, the third hypothesis that can be proposed is as follows:

H3: Exchange rate volatility negatively influences the integration of Indonesia capital market and United States capital market.

RESEARCH METHOD

The data used in this study was secondary data obtained from www.yahoofinance.com and www.stooq.com including closing prices on Gold, WTI Crude Oil and the Rupiah-US Dollar Exchange Rate. The data used was daily data taken from the period of January 7, 2005 to October 27, 2020.

The 15-year period was selected, considering that there were several important events between Indonesia and the United States during the period, including the financial crisis in mid-2007 to 2008 namely the Subprime Mortgage crisis. Sugema (2012) explained that this financial crisis had a significant impact on the financial sector, including fluctuating exchange rates and decreasing commodity prices. This crisis was also experienced by several countries, including Indonesia. After the financial crisis in 2008, there was a trade war between the United States and China in 2018. At the end of 2019 to 2020, the Covid-19 pandemic occurred and significantly brought negative impacts on the world economy.

This research was conducted to analyze the dynamic relationship between the Indonesia capital market and the US capital market. The oil price volatility, gold price volatility and exchange rate volatility were independent variables, and the dynamic relationship was the dependent variable. Before calculating the conditional volatility, a calculation of returns from the oil, gold and exchange rates was carried out.

This study used the WTI oil price. It was because the WTI oil had a strong correlation with the Organization of the Petroleum Exporting Countries (OPEC). In addition, the OPEC also drove the performance and movement of WTI oil in the long term (Robiyanto, 2018a). The following formula is used to calculate the WTI oil returns:

$$RWTI_t = \frac{WTI_t - WTI_{t-1}}{WTI_{t-1}} \qquad (1)$$

Note:

$RWTI_t$ = Return of WTI oil in period t

WTI_t = Closing price of WTI oil in period t

WTI_{t-1} = Closing price of WTI oil in period t-1

The gold return was calculated by the following formula:

$$Return\ Gold_t = \frac{Gold_t - Gold_{t-1}}{Gold_{t-1}} \qquad (2)$$

Note:

$Return\ Gold_t$ = Return of gold in period t

$Gold_t$ = Closing price of gold in period t

$Gold_{t-1}$ = Closing price of gold in period t-1

Changes in the USD/IDR exchange rate were calculated using the following formula:

$$Return\ USD/IDR_t = \frac{USD/IDR_t - USD/IDR_{t-1}}{USD/IDR_{t-1}} \qquad (3)$$

Note:

$Return\ USD/IDR_t =$ Return of the USD/IDR exchange rate in period t

$USD/IDR_t =$ Closing of USD/IDR exchange rate in period t

$USD/IDR_{t-1} =$ Closing of USD/IDR exchange rate in period t-1

The Calculation of Oil Price Volatility, Gold Price Volatility and Exchange Rate Volatility

This study uses 3 independent variables, namely oil price volatility, gold volatility and exchange rate volatility. The following is the formula used to calculate the volatility of each instrument:

$$h_t = \alpha_0 + \sum_{i=1}^{q} \alpha_i\,\epsilon_{t-1}^2 + \sum_{j=1}^{p} \beta_t\,\sigma_{t-j}^2 \quad (4)$$

Note:

$h_t =$ Conditional variance

$\alpha_i\epsilon_{t-1}^2 =$ Volatility of the ARCH component

$\beta_t\sigma_{t-j}^2 =$ Volatility of GARCH component

$$R_t = b'_{x_t} + \partial h_t^{1/2} + u_t \quad (5)$$

$$h_t = \omega + \alpha\epsilon_{t-1}^2 + \beta h_{t-1} + \gamma' z_t \quad (6)$$

With:

$$h_t = \omega + \sum_{j=1}^{q} \alpha_j\,\epsilon_{t-j}^2 \quad (7)$$

$$h_t = \omega + \sum_{j=1}^{q} \alpha_j\,\epsilon_{t-j}^2 + \sum_{j=1}^{p} \beta_j\,\epsilon_{t-j}^2 \quad (8)$$

Where: $R_t =$ return of each instrument, $x_t =$ return of instrument explanatory vector, $\partial =$ impact of volatility on return, $h_t^{1/2} =$ conditional standard deviation, $u_t =$ error, $\epsilon_{t-1}^2 =$ squared residual for period t-1; $h_{t=}$ conditional variance; $\sum_{j=1}^{q} \alpha_j\epsilon_{t-j}^2 =$ volatility (ARCH component); $\sum_{j=1}^{p} \beta_j\epsilon_{t-1}^2 =$ volatility (GARCH component).

Analysis Technique

To analyze the dynamic relationship between the Indonesia capital market and the United States capital market, the Dynamic Conditional Correlation-Generalized Autoregressive Conditional Heteroskedasticity (DCC-GARCH) approach was used. The DCC-GARCH model is a development of the GARCH model introduced by Bollerslev (1986). This method was selected because the DCC-GARCH method was the most appropriate method for an analysis of conditions that tended to change. The DCC-GARCH model had been used by several studies including by Bala and Takimoto (2017); Jiang, Jiang, Nie, and Mo (2019); Zinecker et al. (2016). The results of this calculation will be used as the dependent variable.

The following formula is used for calculating the effect of WTI oil price volatility, gold price volatility and exchange rate volatility on the dynamic relationship between the Indonesia capital market and the United States capital market:

$$DCC_t = \alpha + \beta_1(VWTI) + \beta_2(VGold) + \beta_3(VUSD/IDR) + \varepsilon_t \quad (9)$$

With:

$$\varepsilon_t = \emptyset_t\varepsilon_{t-1} + \cdots + \emptyset_t\varepsilon_{t-q} + \eta_t \quad (10)$$

$$\eta_t = \sigma_t\varepsilon_t \quad (11)$$

$$\sigma_t^2 = \alpha_0 + \alpha_1\,\eta_{t-1}^2 + \cdots + \alpha_p\eta_{t-p}^2 + \beta_1\sigma_{t-1}^2 + \cdots + \beta_q\sigma_{t-q}^2 \quad (12)$$

Where DCC_t refers to the dynamic relationship between the Indonesia capital market and the United States capital market; VWTI is the volatility of WTI oil; VGold is the volatility of gold; VUSD/IDR is the volatility of the USD/IDR exchange rate; ε_t is the standard error; σ_{t-1}^2 is variant conditional; $\alpha_1\varepsilon_{t-1}^2$ is a component of the Autoregressive Conditional Heteroskedasticity (ARCH) model; and $\beta_1\sigma_{t-1}^2$ is a component of the Generalized Autoregres-

sive Conditional Heteroskedasticity (GARCH) model.

This study was analyzed using the GARCH method, but before carrying out the GARCH analysis, a stationary test was first carried out using the Augmented Dickey-Fuller (ADF) test to understand whether the data used was stationary or not.

RESULTS AND DISCUSSION

Descriptive Statistics

Descriptive statistics were used to determine the mean, minimum, maximum and standard deviation of a data. The descriptive statistics of this study can be seen in Table 1 and Table 2.

Table 1 shows that the oil variable has a mean value of -0.0007 and a standard deviation value of 0.0611. The gold variable has a mean value of 0.0004 and a standard deviation value of 0.0115. Meanwhile, the USD/IDR exhange rate has a mean variable of 0.0046 and a standard deviation value of 0.2121.

Table 2 shows that the average of oil volatility variable is 0.9284 and its standard deviation value is 0.6170. Meanwhile, the average of gold volatility

variable is 1.0001 and its standard deviation value is 0.1299. Then, the average of USD/IDR exchange rate volatility variable is 0.9999 and its standard deviation value is 0.0196. Thus, it could be concluded that the standard deviation of oil volatility variable has the highest risk compared to the gold volatility varibale and USD/IDR exchange rate volatility variable.

Stationarity Test

The stationarity test in this study used the Augmented Dickey-Fuller Test. The results can be seen in Table 3. Table 3 shows that the oil price variable, gold price variable and the USD/IDR exchange rate variable are stationary or no unit root found. Then, the three variables were tested using the GARCH analysis.

Normality Test

The normality test in this study was done to examine whether the data used was normally distributed or not. The following Table 4. presents the results of normality test. Table 4 shows that data do not normally distributed. Hence, the Generalized Error Distribution (GED) test should performed.

Table 1. Descriptive Statistics of The Return of Oil Price, Gold Price and USD/IDR Exchange Rate

Variable	N	Minimum	Maximum	Mean	Dev. Std
Oil	3.664	-3.0596	0.3766	-0.0007	0.0611
Gold	3.664	-0.0935	0.0902	0.0004	0.0115
USD/IDR	3.664	-0.9004	9.0288	0.0046	0.2121
DJIA	3.664	-0.1292	0.1136	0.0003	0.0121
JKSE	3.664	-0.1212	0.1019	0.0005	0.0135

Source: Processed data from www.yahoofinance.com; www.stooq.com (2021)

Table 2. Descriptive Statistics of Oil Price Volatility, Gold Price Volatility and USD/IDR Exchange Rate Volatility

Variable	N	Minimum	Maximum	Mean	Dev. Std
Oil	3.664	0.6839	5.9231	0.9284	0.6170
Gold	3.664	0.8190	2.6111	1.0001	0.1299
USD/IDR	3.664	0.2340	1.0008	0.9999	0.0196

Source: Processed data from www.yahoofinance.com; www.stooq.com (2021)

Table 3. Results of Augmented Dickey-Fuller Test

Variable	Augmented Dickey-Fuller	Probability	Conclusion
Oil	-3.4101	0.0000*	No Unit Root
Gold	-12.2370	0.0000*	No Unit Root
USD/IDR	-37.0926	0.0107*	No Unit Root

Source: Processed data from www.yahoofinance.com; www.stooq.com (2021)
Note:
*significant at 1% significance level

Table 4. Results of Normality Test

Variable	Probability	Conclusion
Oil	0.0000*	Not normally distributed
Gold	0.0000*	Not normally distributed
USD/IDR	0.0000*	Not normally distributed

Source: Processed data from www.yahoofinance.com (2021)
Note:
*significant at 1% significance level

The Dynamic Correlation of the Indonesia and the United States Capital Market

Dynamic relationship is an interrelationship between one party and another. The dynamic relationship occured in certain countries would bring both positive and negative impacts. One of the positive impacts was adding diversity to a country, both economically and socially. Integration would also have a positive impact on developing countries, including productivity that would increase due to the existance of appropriate technology from developed countries. An integrated country will have a high transmission rate and dependency on one another (Suganda & Hariyono, 2018). By using the DCC-GARCH, this study found the time varying correlation between Indonesia capital market and U.S. capital market. The following Figure 1 is results of the dynamic correlation between the Indonesia capital market and the US capital market.

Figure 1 shows the results of a dynamic correlation analysis between the Indonesia capital market and the US capital market. The lowest DCC-GARCH value on both capital markets is in the range of 0.0575 and the highest is in the range of 0.2986.

The lowest JKSE-DJIA DCC value occurred in December 2019 when the COVID-19 case outbreak began, and the highest JKSE-DJIA DCC value occurred in October 2019 when the US trade war broke out with China, causing global uncertainty in developed countries and impacted the developing countries. The highest DCC found in Covid-19 pandemic period. Because every nation in the world facing the Covid-19 pandemic, so the capital markets tend to have higher degree of integration. This finding supports Buğan (2021); Sugiyanto and Robiyanto (2021).

Generalized Error Distribution (GED) Test

The GARCH analysis was done after the stationarity test and normality test were carried out. It is find that the returns on oil price, gold price and exchange rates are not normal. Then, the Generalized Error Distribution (GED) test was performed. The GED test is carried out if the data is not normally distributed or the probability in the normality test is below 5%. The results of the GED test can be seen in Table 5.

Table 5. displays the results of GARCH analysis with the Generalized Error

Distribution (GED). Based on the GARCH analysis, it could be concluded that the first hypothesis proposing that the oil price volatility influences the Indonesia capital market and the United States capital market is supported. Likewise, the third hypothesis proposing that the exchange rate volatility negatively influences the integration of Indonesia capital market and United States capital market is also supported empirically. However, the second hypothesis proposing that the gold price volatility positively influences the integration of Indonesia capital market and United States capital market is not supported empirically. It was because the GARCH results show that the gold variable has a negative effect on the two capital markets. Based on the variance equation above, it can be seen that the probability of the GED parameter shows a significant value, which means that this research model can follow the GARCH pattern.
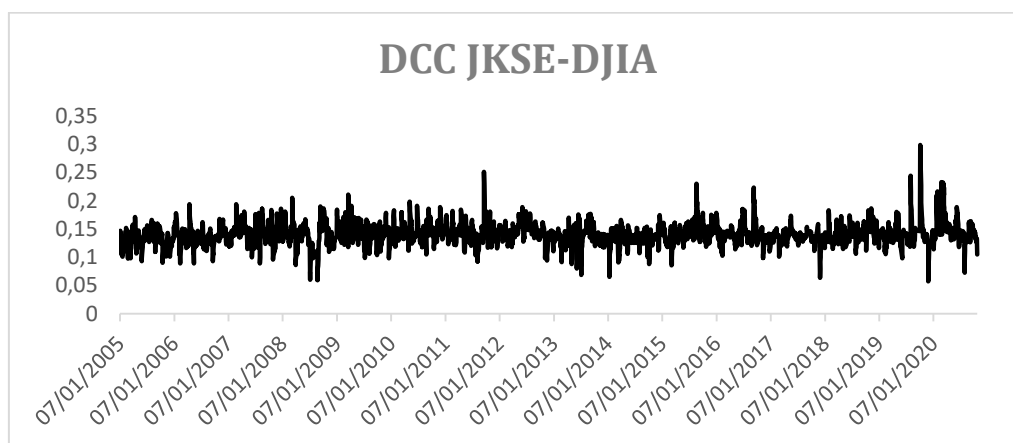

Figure 1. The Dynamic Correlation of Indonesia Capital Market and United States Capital Market

Table 5. Results of GED Test on Oil Price Volatility, Gold Price Volatility and USD/IDR Exchange Rate Volatility Towards The Integration of Indonesia Capital Market and United States Capital Market

Dependent Variable	Independent Variable	Coefficient	Std. Error	z-Statistics	Probability
	C	0.1391	0.0001	916.5594	0.0000
JKSE	Oil	-0.0011	0.0022	-0.5137	0.6074
DJIA	Gold	-0.0143	0.0134	-1.0656	0.2866
	USD/IDR	-0.0002	-0.0006	-0.3595	0.7192
		Variance Equation			
	C	6.5585	4.1512	15.7991	0.0000*
	RESID (1)^2	0.9807	0.0785	12.4801	0.0000*
	GARCH (-1)	0.0872	0.0292	2.9851	0.0028*
GED Parameter		1.2219	0.0204	59.8227	0.0000*

Source: Processed data from www.yahoofinance.com; www.stooq.com (2021)
Note:
*significant at 1% significance level

Discussion

Figure 1 shows the DCC-GARCH value and it implies that the correlation between Indonesia and the United States in this study has a positive and strong integration which is in line with a previous study Robiyanto (2018b) on the GARCH analysis in Table 5. This show that the connection between these capital markets is strong. For Indonesia, an event in the U.S. capital market will affect Indonesian capital market. This is understandable because the U.S. capital market is one of developed market and biggest market in the world. It will affect global capital markets also.

This study found oil has a negative effect on the integration of the Indonesia capital market and United States capital market. It was because the oil had an important role in the economic structure of a country. If the oil experienced a contraction, it could cause a chain effect in the country's economy, starting from affecting the currency exchange rates to affecting the returns on the capital market. Thus, if this happened, it would affect the integration relationship of each interconnected country. The results of this study are also supported by a previous research conducted by Joo and Park (2021).

This study found that the oil had a negative effect on the stock market and returns in India, China, Japan, Korea and the United States. Furthermore, this study finds that the gold has a negative influence on the integration of Indonesia capital market and the U.S. capital market. This was because the fluctuations in the gold price had a close relationship with the state of a country's economy. The fluctuative gold price had an impact on the integration of a country, from the aspect of risk and return. The gold had also been one of the largest commodities. Thus, if the gold did not provide certainty in terms of returns, then this could be one of evaluations to consider for the investors. Further, if this happened in the long term, it would cause

a correction in the gold investment which would affect a country's economy and the integration relationship of each country. The other explanation is gold always seen as safe haven asset and hedge against inflation (Beckmann & Czudaj, 2012; Joy, 2011; Robiyanto et al., 2020), its volatility can negatively affect the integration, because observed countries have different inflation which affect the integration in the end.

This was in line with a research by Thampanya, Nasir, and Huynh (2020) which stated that the gold did not provide a return according to the risk, and the gold was not the right asset to be used as a hedge. This had a negative impact on the integration of capital markets in countries that hold large amounts of gold. In addition, this study also finds that the exchange rate had a negative effect on the integration of the Indonesia capital market and United States capital market. This was because there was a substitution effect with the money market. When the local currency weakened, it caused greater profits from the money market. This made the investment in the capital market unattractive, so that the capital market experienced concomitant turmoil and had a negative impact on the capital market integration.

Banik and Roy (2021) stated that the exchange rates had a negative effect on the capital market integration. It was caused by the exchange rate volatility which decreased the trade flows. This indicated that fluctuating conditions would have an impact on the market uncertainty and return uncertainty, both of which would have a negative impact on the integration of a country's capital market. The higher volatility of USD/IDR exchange rate will burden the Indonesian economy as well as its listing companies because some big listed companies in Indonesia have high exposure on USD, this condition could lead to negative impact on the performance of those companies while for the U.S. companies, this condition has minor

impact since Indonesia just a small market to U.S.

CONCLUSION AND RECOMMENDA-TION

This study aims to determine the integration between the Indonesia capital market and the US capital market. By using the DCC-GARCH analysis, it was found that there is a positive and strong correlation between the Indonesia capital market and the US capital market. The finding also shows the time varying correlation between the Indonesia capital market and the US capital market during Covid-19 pandemic period tend to be higher than any periods. It means the degree of integration between the two capital markets increasing during the pandemic period. This is possible because all country (or capital market) in the world facing the same problem due pandemic. Based on the results of GARCH analysis, the oil, gold and exchange rates volatilities have a negative effect on the integration of the Indonesia capital market and the US capital market.

The results of this study are expected to benefit the investors and analysts in the financial sector to be used as a consideration in making investment decisions by understanding the effect of oil, gold and exchange rates volatilities on the integration of the Indonesia capital market and United States capital market.

The limitation of this study is this study are short research period which coming from 2005 to 2020 and the effect of Covid-19 has not been studied. Further researches are suggested to use a longer period of time, namely during the 1997 financial crisis to the COVID-19 period. It is because during this period, the effects of turmoil can be found on the capital market integration.

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