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Article

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Long Run Association of Oil Prices and Stock Prices: A Case of Indonesia

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ABSTRACT

The study was aimed to investigate the long-run association of oil prices with the stock market index of Indonesia. The research consisted of crude oil prices as regressor, stock market index as regressand, GDP growth and inflation as control variables; and for these variables data were collected from 1990 to 2018. Meanwhile, for empirical investigation, ARDL and Granger Causality was applied to identify the long-run and short-run association of the oil crude oil prices with the stock market index in Indonesia. The findings of the study suggest that there is no long-run and short-run association of the crude oil prices with the stock index of Indonesia. However, a bi-directional association between the stock market and GDP growth but at 10%, the empirical study also suggested that GDP growth has unidirectional relation with inflation at 10%; whereas at 5% only stock market granger cause economic growth.

Keywords: Stock Returns; Oil Prices; Indonesia

JEL Classifications: H54, E31

1. INTRODUCTION

Stock market's positive growth reflects a sound financial market of a country, therefore, it is considered as measuring to tool or barometer to analyse the economic growth of the country (Onour, 2012). In this concern, the stock market's overall performance plays a imperative role in attracting the numerous investors toward the stock prices including both local and foreign investors. In this regard, the study assembled by Akoum et al. (2012) asserted that stock market can be considered as the imperative institution of the country that contributes in harbouring the financial development in the state by fostering productivity, risk sharing, capital accumulation, and by promoting good corporate governance system.

On the other hand, commodity market and specifically the crude oil market is regarded as another significant market influencing country's growth. Crude oil is considered as the one of the most

required and demanded commodity around the world and the prices of crude oil greatly depend on its global supply and demand conditions (Miller and Ratti, 2009). Crude oil can be considered as the highly demanded and required natural resource around the world because it helps to produce valuable products such as diesel, gasoline and other petrochemicals that are required by almost every country to drive their economies and keep the business operational (Bondia et al., 2016). Chittedi (2012) asserted that prices of crude oil play a central role in bringing the instability and variations in the economic growth of the country and it possesses the potential to cause the adverse effect on the share prices in stock markets.

However, certain studies have reflected on their nexus and their cumulative part in the economic prosperity of the country. The prices of oil prices can affect the stock market of the country either positively or negatively and it significantly depends on the fluctuations in the crude oil market (Arouri, 2011). It is evident that rise in crude oil prices increases the cost of production in

the organisation that adversely affects the financial position of investors and increases the inflation rate of the country declining its economic growth (Kang and Ratti, 2013). Moreover, dynamic fluctuations in crude oil threaten the financial position of the organisation due to variations in revenues and operational cost that might affects the value of stock returns (Raza et al., 2016).

Crude oil is considered as the driving source for the economic prosperity of the country and keep the system operational because every production industry, transportation and mills requires product develop from crude oil to run smoothly (Arouri and Rault, 2012). In 2017, worldwide crude oil consumption was estimated to be around 98.40 million barrels per day that increased to 99.84 million barrels per day in 2018 (Statista, 2020a). Similarly, in Indonesia also crude oil's consumption rate has been rising with time in 2017 it was 1.69 million barrels per day that was increased to 1.78 million barrel per day in 2018 (Statista, 2019). However, the US remains in the first position having the highest crude oil consumption rate that is 987.1 million metric tons (Statista, 2020b). Previously, numerous researches have been conducted over to examine the association amid crude oil prices and stock market returns because in some countries that are exporter of crude oil having it as the leading industrial sector adversely impacted by the decline in crude oil prices (Bhunia, 2012). However, stock markets of the country sustain that is the importer of crude oil and do not have it as their imperative economic sector. In 2018, 350.800 barrel per day has been imported by Indonesia (Ceicdata, 2018a). Besides, 284.114 barrel per day was exported by Indonesia in 2018 (Ceicdata, 2018b).

There has been an abundance of work on the correlation amid oil market shocks and stock market prices in the past two decades. The early influential studies have found an insignificant impact of oil market shocks on the stock prices and returns (Miller and Ratti, 2009). On contrary, there are also certain researches that have concluded that the influence of oil prices on the stock prices is actually dependent on the net position of the country in the oil industry (Wang et al., 2013). The newer studies have suggested that with the financialization of oil market, stock prices and returns are anticipated to be highly linked with them (Silvennoinen and Thorp, 2013). Considering the constant and recent developments, the literature in this regard is still underdeveloped with no consensus pertaining to oil price and stock prices. Therefore, this particular research intends to resolve this issue by evaluating the association amid crude oil prices and stock returns regarding the way whether it cause the positive or negative impact over each other.

This underlying research can be highly beneficial for the government and authorities of Indonesia in order familiarise them with the way fluctuations in prices of crude oil can affect the stock market values of the listed companies that used the crude oil in their manufacturing and production. Furthermore, low stock prices can hinder the path for foreign investments to enter the country and affect the economic conditions of Indonesia in a negative way. This research can be highly significant because it incorporates the discussion over different ways changes in crude oil price can affect the stock market value of the companies. In this regard, government authorities can be familiarised with the importance

of managing the rate of crude oil consumption in an efficient way and explore the availability of crude oil natural resource within the lands and mines of their own country rather than relying on the foreign states. Moreover, companies listed in the stock market institution of Indonesia can get benefit from this study to manage their crude oil consumption in such a way that during the period of high crude oil demand and price it does not affect the stock market return of the company and threatens its financial position. For this purpose, the following aims and objectives have been addressed in this particular research.

- To evaluate the relationship between crude oil prices and the stock market
- To study the impact of oil prices on the stock prices in Indonesia
- To draw the set of recommendations for the government of Indonesia to manage their crude oil consumption rate.

2. LITERATURE REVIEW

The study assembled by Bondia et al. (2016) highlighted that the stock market of the country obtains the indication from variation in oil prices regarding the way it can affect the future economic conditions of the country. Raza et al. (2016) asserted that the relation amid stock prices and crude oil prices is an added dimension because it varies for all countries that exports and imports the crude oil. In regard, Adam et al. (2015) advocated that sudden surge in oil price comes as the source of treasure for countries that are engaged in oil exporting business and offers numerous opportunities to earn sufficient additional income. Furthermore, additional values earned through high oil prices adds to the economic growth of their countries increasing the stock indexes (Kisswani and Elian, 2017). In addition, the research conducted by Onour (2012) implied that in alternative scenario low crude oil prices tend to exert the negative pressure on the economic positioning of the country leading the GDP rate towards decline. It is evident that long run relation between costs of crude oil and shares prices in stock market is different as per the dynamics of each country (Aloui and Aïssa, 2016). It is essential to consider the GDP of the country because crude oil is considered as the driver for economic growth and keep the industries operational (McCarthy and Orlov, 2012). The relation amid the stock market prices and crude oil prices is quite contrasting for both importing as well as exporting country because the rise in crude oil is the nightmare for the economies where industries heavily rely on the import of the crude oil (Huang et al., 2011). Saudi Arabia, Kuwait, Iraq, Russia, UAE, Nigeria and Canada are some major economies and exporters of crude oil around the world (Desjardins, 2016).

In 2016, crude oil's market value slumped to the lowest level that is \$28 per barrel that declined the Russia's revenue severely because it greatly depends on the export of the crude oil and national currency of the country dropped rapidly (BBC, 2016). The study conducted by BBC (2015) implied that Indonesia is the net importer of crude oil that indicated that lower oil price is the sign of sustainable economic growth of the country. However, the government of Indonesia take it as the threat for their revenues and coffers of the country because low oil prices mean organisation operating in oil and gas sector spending low amount on crude oil

imports and returning less amount of tax (Diela, 2016). Forbes (2014) specified that Indonesia is not the country that can benefit from low crude oil rates because Indonesia is the evident and biggest producer of crude oil in Southeast Asian region and also the prominent net importer of the crude oil. However, despite being the producer of crude oil the rapid population and industrialisation growth has made it necessary for Indonesia to import the crude oil from foreign countries (Akoum et al., 2012). The volume of oil import, export, GDP and stock market position of the country plays significant part in influencing both commodity and stock market because these factors indicate the economic condition of the country regarding the prospects that whether it is operating in deficit or surplus (Fang and You, 2014).

In this regard, Adam et al. (2015) asserted that Indonesia stands among the key producers of the crude oil however in 2003 it turned into the net importer to address the crude oil needs of the country. Medco energy international, Elnusa and Sugih energy are some major companies operating in the oil and gas industry of Indonesia that stock market gets affected negatively with low oil prices (Indonesia Investments, 2017). The study conducted by Zhu et al. (2014) to evaluate the relation between stock price and oil price in Indonesia specified that being the producer and net importer of the crude oil Indonesia stands at crucial spot because stock market of the country can hit in either way whether it is a rise in oil prices or fall. However, Akoum et al. (2012) argued that all GCC countries especially Saudi Arabia tend to experience the greatest blow on their economy and stock market due to the alterations and variations in crude oil rates because oil is one of the leading element of commodity market and the economy as well as the business sector of the country. In this regard, the government of KSA has always emphasised over diversifying their industries because their economy heavily relies on the production and exporting of oil (Naifar and Al Dohaiman, 2013). In most of the existing literature, it is specified that changes in supply and demands condition are the main factors that influence the variations in prices of crude oil. However, Adaramola (2012) argued that oil-importing countries do not ask to reduce the demand when the international prices of crude oil surge rapidly because it is essential to run the economy.

The study accumulated by Arouri and Nguyen (2010); Gospodinov and Ng (2013) highlighted that drop in the dollar value, OPEC quota, low supply and high demand are the dominant factors that drive the variations in crude oil prices the leads the economies to face the rise and recessions in their oil sector frequently. Saboori et al. (2016) asserted that fluctuation in oil prices are unpredictable that has urged the oil-producing countries to diversify their industrial sector rather than relying on the oil and gas to empower their economy. Organization of the Petroleum Exporting Countries (OPEC) has the greater power to control the crude oil prices through its price over volume strategy because it is the organisation that consists of countries that are the biggest exporter of Crude oil. According to OPEC (2020), 79.4% of oil reserves of the world are occupied by 15 nations that are part of OPEC having reserves of 1,189.80 billion barrels. Previously, various researches has been carried to evaluate the long term alliance amid stock returns and prices of oil by evaluating the case of different countries and output

for each country was different according to their oil consumption rate and production rate (Rahmanto et al., 2016). The study carried out by Adam et al. (2015) tested the relation amid both variables that is stock market values and prices of crude oil taking west texas intermediate (WTI) as the proxy with the help of LVAR model and identified that there is a positive association amid both variables in the context of Indonesia. Being the producer of the crude oil government of Indonesia holds the power to increase the prices of crude oil to scale up the economic conditions of the country. In 2014, the BBC reported that the government of Indonesia has increased the prices of fuel by 30% to save the economy of the country by increasing the \$0.16 (BBC, 2014). Based on the theoretical underpinnings, the following hypothesis has been proposed for further testing:

H₁: There is a long-run association between oil prices and stock prices in the prevailing Indonesian market is significant.

3. METHODS

The data for the variables are collected for the period ranging from 1990 to 2018 subject to the availability. The data is inspected for the existence of unit root via the Augmented Dickey-Fuller test, then descriptive statistics is applied to study the variables, the correlation among variables is studied via Granger Causality test, and ARDL model is used to determine the impact of oil prices on stock prices in Indonesia.

3.1. Unit Root Test: Augmented Dickey-Fuller (ADF)

The study deals with the analysing the long term oil prices and stock prices for the case of Indonesia. As discussed, the study has gathered time series for the variables stock market, crude oil, GDP growth and inflation from 1990 to 2018. However, concerning the findings of Emirmahmutoglu and Omay (2014) it has been stated that different assumptions and criteria have been set while processing time series. Among which, one of the essential tests which are being applied for testing the stationary of time series is concerned with Augmented Dickey Fuller (ADF). Here it becomes important to mention that ADF forms the basis with the supposition through the null hypothesis that time series exhibit unit-roots. Meanwhile, with the acceptance of the null hypothesis, it can be inferred that time series is non-stationary. The model based on ADF technique for determining the stationarity of time series is presented below:

$$\Delta h_t = \lambda_0 + \lambda_1 t + \lambda_2 h_{t-1} + \sum_{i=1}^n \mu_i \Delta h_{t-i} + \mu_t$$

In the aforementioned equation, Δ is considered as the difference operator. Meanwhile, n in the above equation represents lag whereas μ_t is assumed as a random error of stationary. The null hypothesis h_t is reflects non-stationary series.

3.2. Granger Causality

Concerning the findings of Pala (2013) the long term association between the variables are often tested through VECM and VAR. However, it has also been stated that VECM or VAR does not fit to determine the short term causality. In

realisation of this, the Granger causality test is being referred to as the effective method for determining the short term association between the variables. Since Granger causality helps in determining whether a particular time series is beneficial for predicting the other time series, therefore both the short and long-run testing has also been proceeded in the current study, The model for determining the short and long term causality have been represented below:

Short-run:

$$H_0: \theta_{nth}=0 \text{ and } H_0: \Gamma_{ith}=0$$

Long-run causality:

$$H_0: \psi_{nth}=0$$

Here it becomes important to mention that all the tests have been performed through the statistical package EViews. Meanwhile, the analysis for short and long term association has also been supported through descriptive statistics.

3.3. Autoregressive Distributed Lag (ARDL)

In an econometric assessment, autoregressive distributed lag is considered as the one important constituent for single equation regression. The technique forms based on an iterative maximising approach which is considered as essential for structural equations with auto-correlated residuals.

The model, log-log model that forms the basis of the model has been presented as followed:

$$LCrude\ OilPB = \beta_1 + \beta_2 SM_t + \beta_3 LGDP_t + \beta_4 Inf_t + \hat{\epsilon}_t$$

Where,

LCrude OilPB: Log of Crude Oil PB

LSM: Log of stock market

LGDP = Log of GDP growth

LInf: Log of inflation

$\hat{\epsilon}$: error term

Different reasons can motivate a researcher to utilise the ARDL approach to predict one-time series from that of others. For instance, the lead and lags concept helps in determining the long and short effect of one-time series on other. Furthermore, due to its robustness, the model is also being effectively utilised to determine the short term and long term effect.

Considering the same robustness, the ARDL auto-correction model can also be devised as follows:

$$\begin{aligned} \Delta Z_t = & \beta_1 + \sum_{i=1}^{m1} ae_{1i} \Delta Z_{t-i} + \sum_{j=0}^{n1} ae_{1j} \Delta SM_{t-j} \\ & + \sum_{j=0}^{n1} ae_{1j} \Delta GDP_{t-j} + \sum_{j=0}^{n1} ae_{1j} \Delta Inf_{t-j} + \gamma_1 Z_{t-1} \\ & + \gamma_2 SM_{t-1} + \gamma_3 GDP_{t-1} + \gamma_4 Inf_{t-1} + \mu_t \end{aligned}$$

Meanwhile, the estimation for short term and long term dynamics has also been presented below:

$$\begin{aligned} \Delta Z_t = & \beta_2 + \sum_{i=1}^{m3} ae_{2i} \Delta Y_{t-i} + \sum_{j=0}^{n3} ae_{2j} \Delta SM_{t-j} \\ & + \sum_{j=0}^{n3} ae_{2j} \Delta GDP_{t-j} + \sum_{j=0}^{n3} ae_{1j} \Delta Inf_{t-j} + \mu_{2t} \end{aligned}$$

$$\begin{aligned} \Delta Z_t = & \beta_3 + \sum_{i=1}^{m3} ae_{3i} \Delta Z_{t-i} + \sum_{j=0}^{n3} ae_{3j} \Delta SM_{t-j} \\ & + \sum_{j=0}^{n3} ae_{3j} \Delta GDP_{t-j} + \sum_{j=0}^{n3} ae_{3j} \Delta Inf_{t-j} + \mu_{3t} \end{aligned}$$

In the aforementioned equation,

Where is specified as the statistically significant coefficient error.

4. RESULTS AND ANALYSIS

4.1. Descriptive Statistics

The following table (Table 1), demonstrates descriptive statistics for the referred time series. In the table below, the mean, maximum, minimum, standard deviation and Jarque-Bera are essential to consider. The mean for the stock market has appeared as 0.035. Further, the maximum and minimum variables for the same time series have appeared as 0.452 and -0.520 respectively. In addition to this, the standard deviation of 0.202 suggests that values deviate significantly from its mean. In addition to this, Jarque -Bera's value for the stock market has appeared as 2.420 (0.298). This suggests that the data is normally distributed.

The mean for crude oil PB has been computed as 168.821. Meanwhile, the maximum and minimum values have appeared as 342.840 and 70.380 respectively. In addition to this, the standard deviation for this time series has been computed as 88.609. Based on the considerable difference between the maximum and minimum values along with the standard deviation, it can be inferred that values significantly deviates from its mean. Further, the Jarque-Bera values for the same time series have

Table 1: Descriptive statistics

	STOCK_ MARKET	CRUDE_ OILPB	GDP_ GROWTH	INFLATION
Mean	0.035	168.821	5.837	2.731
Median	0.008	146.980	5.788	2.663
Maximum	0.452	342.840	10.003	5.441
Minimum	-0.520	70.380	-7.359	0.583
Std.Dev.	0.202	88.609	3.649	1.286
Skewness	-0.425	0.567	-1.844	0.383
Kurtosis	4.132	1.869	7.405	2.384
Jarque-Bera	2.420	3.102	39.888	1.166
Probability	0.298	0.212	0.000	0.558
Sum sum Sq.	1.014	4895.800	169.270	79.187
Dev.	1.147	219841.00	372, 763	46.328
Observations	29	29	29	29

been computed as 3.102 ($P = 0.212$) thereby suggesting that the data is normal.

The mean for GDP Growth has appeared as 5.837. Also, the maximum and minimum value have appeared as 10.003 and -7.359. Further, the standard deviation of 3.649 has also been computed. Since there is a considerable difference between the maximum and minimum values therefore, it can also be inferred that the value greatly deviates from its mean value. In terms of Jarque-Bera, the value has been computed as 39.888 ($P = 0.000$). As the p-value has appeared lesser than 0.05 therefore, it can be suggested that data is not normal.

The mean for inflation has appeared as 2.731 while, the maximum and minimum values have appeared as 5.441 and 0.583. Further, the standard deviation of 1.286 also suggests that values within the time series do not greatly deviate from its mean value. In light of Jarque-Bera, the values have been computed as 1.166 ($P = 0.588$). This obtained p-value suggests that data is normal.

4.2. Augmented Dickey-Fuller (ADF)

As already discussed in the method section, the ADF test is mainly applied for determining whether time series entails unit-roots. The absence or presence of unit roots claims whether the time series is stationary or non-stationary. Moreover, the null hypothesis of the ADF model suggests that time-series entails unit-roots. In this sense, it can be suggested that the p-value must be lesser than 0.05 to reject the null hypothesis and to claim that the time series is stationary.

With the application of the ADF test, the t-statistics of crude oil PB has been obtained as -1.701 (0.420). Since p-value has been obtained as >0.05 therefore, it can be suggested that time series entails unit-roots. Hence, it can also be stated that the time series is non-stationary. The t-statistics of the stock market has appeared as -5.667 (0.000). Since p-value has been appeared as lesser than the threshold of 0.05. Therefore, it can be suggested that the time series does not entail unit-roots. In this aspect, it can be determined that data is stationary. Further, t-statistics for GDP growth has appeared as -3.722 (0.010). As p-value has appeared lesser than the threshold of 0.05. In this aspect, it can be suggested that time series does not possess unit and the data is stationary. Lastly, the t-statistics for Inflation has appeared as -4.488 (0.001). Since the p-value has also appeared lesser than the threshold of 0.05. In this sense, it can be articulated that time series does not entail unit-roots thus the claim data is stationary can be claimed.

4.3. Autoregressive Distributed Lag (ARDL)

ARDL is a dynamic model that consistently captures the effect over time, and it also accompanies lagged value of dependent variables along with the regressors to evaluate how regressand y is being predicted by all independent variables and the lagged value of the dependent variable (Nkoro and Uko, 2016; Sam et al., 2019). Hence, pattern of effect of x variables on y variable is being captured, and this enable to detect the long run association within the variables (Akinbode and Ojo, 2017). Table 2 elucidates results of ARDL along with the model specifications.

The r-square of the ARDL model is 0.87 suggesting that 87% variability in stock market prices can be forecasted by the all regressors and associated lagged value of the dependent variables. Furthermore, power of the coefficients shows that stock market (-1)¹ and crude oil prices (0) can be used to forecast the stock market prices. It implies that effect of independent variables on the dependent variable is present that can be further used to detect the presence of long-run association, and to test the claim, bound test is being used and results are presented in Table 3.

The null of the hypothesis of the f-bound test is that there is no levels relationship among the variables; and in this model

1 (0)=no lag, (-1)=First lag, (-2)=second lag, (-3)=First lag and (-4)=fourth lag

Table 2: ARDL

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
STOCK_	-1.317616	0.406753	-3.239355	0.0177
MARKET(-1)	0.852396	0.721659	1.181162	0.2822
STOCK_	-0.843541	0.898819	-0.938499	0.3842
MARKET(-2)	1.228031	0.64432	1.905933	0.1053
STOCK_	0.002071	0.000785	2.639342	0.0386
MARKET(-3)	-0.001152	0.001169	-0.985256	0.3625
CRUDE_OILPB	0.001341	0.001396	0.960645	0.3738
CRUDE_	-0.002256	0.001026	-2.19998	0.0701
OILPB(-1)	0.061214	0.027337	2.239215	0.0664
CRUDE_	-0.090167	0.047758	-1.888013	0.1079
OILPB(-2)	0.073161	0.051097	1.431801	0.2022
CRUDE_	-0.063119	0.037422	-1.686714	0.1426
OILPB(-3)	0.028461	0.014326	1.986714	0.0941
GDP_GROWTH	-0.028788	0.058891	-0.48883	0.6423
GDP_	-0.034317	0.071335	-0.481066	0.6475
GROWTH(-1)	0.110514	0.073716	1.499186	0.1845
GDP_	-0.118725	0.067493	-1.75907	0.1291
GROWTH(-2)	0.04888	0.046958	1.040944	0.338
GDP_	0.038795	0.218123	0.17786	0.8647
GROWTH(-3)				
GDP_				
GROWTH(-4)				
INFLATION				
INFLATION(-1)				
INFLATION(-2)				
INFLATION(-3)				
INFLATION(-4)				
C				
R-squared		0.878444		
Prob. (F-statistic)		0.140658		

Table 3: Bound test

F-bounds test null hypothesis: No levels relationship				
Test statistic	Value	Signif.	I(0)	I(1)
Asymptotic: n=1000				
F-Statistic	0.830839	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.50%	3.15	4.08
		1%	3.65	4.66
Actual Sample Size	25			
		Finite sample=30		
		10%	2.67	3.586
		5%	3.272	4.306
		1%	4.614	5.966

the dependent variable was also stock market represented by the Indonesian stock index and independent variables included lagged value stock market, crude oil prices, GDP growth and inflation; since the f-bound test f-statistic value is 0.83 that is less than upper-bound critical value at I (1) 3.2 at 5% significance (See Table 4). Therefore, there is no statistical evidence to not reject the null hypothesis; hence it is to be stated that there is no levels relationship among the variables. Consequently, the long-run association between the variables does not exist and this implies that no independent variable, their lagged values and lagged value of the dependent variable can forecast the long-run association among the variables. In other words, there is no evidence of long run association of crude oil prices, GDP growth and inflation with the stock market in case of Indonesia. This finding also suggests that no long run effect means that variations in the GDP growth, inflation and crude oil may not affect the stock market in long-run but this implication is also limited to Indonesia.

4.4. Granger Causality

Granger causality is a closely related to the concept of cause-and-effect that assess presence of cause and effect relation within the variables to evaluate either a variable predict another variable in short-run or not (Appiah, 2018). Unlike regression in which correlation is used to estimate effect of regressors on regressand, but in Granger Causality causation is being captured to estimate short-run relation. In addition to, in causation process the lagged values of the estimators are also used to estimate observed variable (Bilen et al., 2017). The result of granger causality are presented in Table 5.

The result of the granger causality shows that there is no bi-directional association between the variables which means pairs

Table 4: Unit root testing

Augmented Dickey-Fuller test statistic	t-Statistic	Prob.*
CRUDE_OILPB	-7.701	0.420
STOCK_MARKET	-5.667	0.000
GDP_GROWTH	-3.722	0.010
INFLATION	-4.488	0.001

Table 5: Granger causality

Null hypothesis	Obs	F-Statistic	Prob.
STOCK MARKET does not granger cause CRUDE OILPB	27	0.083	0.92
CRUDE_OILPB does not granger cause STOCK_MARKET		0.891	0.42
GDP_GROWTH does not granger cause CRUDE_OILPB	27	0.566	0.58
CRUDE_OILPB does not granger cause GDP_GROWTH		1.149	0.34
GDP_GROWTH does not granger cause STOCK_MARKET	27	2.656	0.09
STOCK_MARKET does not Granger Cause GDP_GROWTH		23.450	0.00
INFLATION does not granger cause STOCK_MARKET	27	1.345	0.28
STOCK_MARKET does not granger cause INFLATION		0.551	0.58
INFLATION does not granger cause GDP_GROWTH	27	0.837	0.45
GDP_GROWTH does not granger cause INFLATION		2.650	0.09

of variables do not Granger cause each other at 5% except a pair having bi-directional relation at 10% significance. It can be interpreted that GDP growth and stock market prices granger cause each other at 10% significant, hence variations and fluctuations within the variables can be used to estimate the short-run relationship. Meanwhile, it can also be claimed as that there is a short-run relation between the GDP growth and stock market where each one granger cause to one another. Meanwhile, GDP growth also granger causes inflation at 10% significance, hence it can be said that GDP has short-run relation with the inflation. However, stock market Granger causes the GDP market at 5% significant which is only unidirectional relation of the stock market with the GDP growth in Indonesia.

5. DISCUSSION

The effect of variation in the oil prices on the stock returns has been a subject of researchers since the future economic conditions of the country can be associated with the variations in the stock market since it reflects the deteriorating investor's expectations from the economy. This phenomenon has also been empirically tested for instances Bondia et al. (2016) stated that variations in oil prices lead to fluctuations in the stock prices in the market but as per Adam et al. (2015) sudden surge can enable to benefit from the prices to earn an income. However, the surge in prices is only in short-run and the rise in the expenditures of the organizations through oil would not let them terminate the operations. Hence, it is also not necessary that stock market show any reaction to fluctuations in the oil prices given that prices variation could only affect the share prices of the oil-producing companies and oil marketing companies; but would not affect the other stocks in the market. In contrast, Kisswani and Elian (2017) argued that added value earned through the surge in oil prices adds value to economic growth and stock index but in contrast, Aloui and Aïssa (2016) concluded their study that long-run relation between stock market oil prices differs as per the dynamics of each country. Similarly, the findings of the following study suggest that there is no long-run association of oil prices, GDP growth and inflation stock market index. Whereas the stock market and GDP growth have a bi-directional association, and only GDP growth granger causes inflation at 10% significance. However, in the case of 5% significance then only stock market granger cause the GDP growth implying that stock market has short-run relation with the economic growth of Indonesia. In this regards, Akoum et al. (2012) have argued that Indonesia doesn't need to benefit from the declining prices of the crude despite being the biggest producer in Southeast Asian region, it is because the industrialization and rapid population growth have enforced government to import the oil from other international markets. Hence, the null hypothesis of the study is accepted that there is no long-run and short-run association of the crude oil prices on the economic growth of Indonesia.

6. CONCLUSION

The study was aimed to investigate the long-run association of oil prices with the stock market index of Indonesia. For which ARDL model to cointegration was developed which consisted of

crude oil prices, GDP growth and inflation were estimators and stock market index was used as regressand variable but along with ARDL short-run relation was also assessed. It has been found that there is no long-run and short-run association of the crude oil prices with the stock index of Indonesia. However, a bi-directional association between the stock market and GDP growth but at 10%, the empirical study also suggested that GDP growth has unidirectional relation with inflation at 10%; whereas at 5% only stock market granger cause economic growth. Therefore, it is concluded based on the findings that there is no long and short-run association of oil prices with the stock market.

7. LIMITATIONS AND IMPLICATIONS

Limitations of a study always lie at gaps to which study could not fulfil or cover due to certain reasons either from the author's end or due to limited scope. Similarly, referring to the gaps of the current study, then it is found that oil prices fluctuations in Indonesia has no effect on the country's stock exchange, and no long and short-run association exists between crude oil prices and stock index. This finding is limited to Indonesia and it cannot be generalised for all countries in Southeast Asian region; hence this is a gap to which the following study could not cover since it was not in the scope of the study. Thus, it is suggested for the future researchers to focus on the identified gap by increasing the scope of the study to all Southeast Asian countries.

REFERENCES

- Adam, P., Rianse, U., Cahyono, E., Rahim, M. (2015), Modeling of the dynamics relationship between world crude oil prices and the stock market in Indonesia. *International Journal of Energy Economics and Policy*, 5(2), 550-557.
- Adaramola, A.O. (2012), Oil price shocks and stock market behaviour: The Nigerian experience. *Journal of Economics*, 3(1), 19-24.
- Akinbode, S.O., Ojo, O.T. (2017), Exchange Rate Volatility and Agricultural Exports in Nigeria: An Autoregressive Distributed Lag (ARDL) Bound Test Approach. No. 2223-2019-1702.
- Akoum, I., Graham, M., Kivihaho, J., Nikkinen, J., Omran, M. (2012), Co-movement of oil and stock prices in the GCC region: A wavelet analysis. *The Quarterly Review of Economics and Finance*, 52(4), 385-394.
- Aloui, R., Aïssa, M.S.B. (2016), Relationship between oil, stock prices and exchange rates: A vine copula based GARCH method. *The North American Journal of Economics and Finance*, 37, 458-471.
- Appiah, M.O. (2018), Investigating the multivariate Granger causality between energy consumption, economic growth and CO₂ emissions in Ghana. *Energy Policy*, 112, 198-208.
- Arouri, M.E.H. (2011), Does crude oil move stock markets in Europe? A sector investigation. *Economic Modelling*, 28(4), 1716-1725.
- Arouri, M.E.H., Nguyen, D.K. (2010), Oil prices, stock markets and portfolio investment: Evidence from sector analysis in Europe over the last decade. *Energy Policy*, 38(8), 4528-4539.
- Arouri, M.E.H., Rault, C. (2012), Oil prices and stock markets in GCC countries: Empirical evidence from panel analysis. *International Journal of Finance and Economics*, 17(3), 242-253.
- BBC. (2014), Indonesia Raises Fuel Prices by 30%. Available from: <https://www.bbc.com/news/business-30092295>. [Last accessed on 2020 Mar 07].
- BBC. (2015), The Benefits of Cheap Oil. Available from: <https://www.bbc.com/news/business-34849384>. [Last accessed on 2020 Mar 07].
- BBC. (2016), Oil Prices: How are Countries Being Affected? Available from: <https://www.bbc.com/news/world-35345874>. [Last accessed on 2020 Mar 07].
- Bhunja, A. (2012), Association between crude price and stock indices: Empirical evidence from Bombay stock exchange. *Journal of Economics and Sustainable Development*, 3(3), 25-34.
- Bilen, M., Yilanci, V., Eryüzlü, H. (2017), Tourism development and economic growth: A panel Granger causality analysis in the frequency domain. *Current Issues in Tourism*, 20(1), 27-32.
- Bondia, R., Ghosh, S., Kanjilal, K. (2016), International crude oil prices and the stock prices of clean energy and technology companies: Evidence from non-linear cointegration tests with unknown structural breaks. *Energy*, 101, 558-565.
- Ceicdata. (2018a), Indonesia Crude Oil: Imports [1980-2020] [Data and Charts]. Available from: <https://www.ceicdata.com/en/indicator/indonesia/crude-oil-imports>. [Last accessed on 2020 Mar 07].
- Ceicdata. (2018b), Indonesia Crude oil: Exports [1980-2020] [Data and Charts]. Available from: <https://www.ceicdata.com/en/indicator/indonesia/crude-oil-exports>. [Last accessed on 2020 Mar 07].
- Chittedi, K.R. (2012), Do oil prices matters for Indian stock markets? An empirical analysis. *Journal of Applied Economics and Business Research*, 2(1), 2-10.
- Desjardins, J. (2016), Chart: Which Countries are Damaged Most by Low Oil Prices? Visual Capitalist. Available from: <https://www.visualcapitalist.com/chart-countries-damaged-most-low-oil-prices>. [Last accessed on 2020 Mar 07].
- Diela, T. (2016), Low oil prices a risky boon for Indonesia's economy. Available from: <https://www.jakartaglobe.id/business/low-oil-prices-risky-boon-indonesias-economy>. [Last accessed on 2020 Mar 07].
- Emirmahmutoglu, F., Omay, T. (2014), Reexamining the PPP hypothesis: A nonlinear asymmetric heterogeneous panel unit root test. *Economic Modelling*, 40, 184-190.
- Fang, C.R., You, S.Y. (2014), The impact of oil price shocks on the large emerging countries' stock prices: Evidence from China, India and Russia. *International Review of Economics and Finance*, 29, 330-338.
- Forbes. (2014), What to Buy to Benefit from Low Oil Prices. Part Three: Indonesia. Available from: <https://www.forbes.com/sites/chriswright/2014/12/29/what-to-buy-to-benefit-from-low-oil-prices-part-three-indonesia/#513ca01c352a>. [Last accessed on 2020 Mar 07].
- Gospodinov, N., Ng, S. (2013), Commodity prices, convenience yields, and inflation. *Review of Economics and Statistics*, 95(1), 206-219.
- Huang, A., Cheng, C.M., Hu, W.C., Chen, C.C. (2011), Relationship between crude oil prices and stock prices of alternative energy companies with recent evidence. *Economics Bulletin*, 31(3), 2434-2443.
- Indonesia Investments. (2017), The Impact of Low Oil Prices on Listed Companies in Indonesia. Available from: <https://www.indonesia-investments.com/finance/financial-columns/the-impact-of-low-oil-prices-on-listed-companies-in-indonesia/item7803>. [Last accessed on 2020 Mar 07].
- Kang, W., Ratti, R.A. (2013), Oil shocks, policy uncertainty and stock market return. *Journal of International Financial Markets Institutions and Money*, 26, 305-318.
- Kisswani, K.M., Elian, M.I. (2017), Exploring the nexus between oil prices and sectoral stock prices: Nonlinear evidence from Kuwait stock exchange. *Cogent Economics and Finance*, 5(1), 1286061.
- McCarthy, J., Orlov, A.G. (2012), Time-frequency analysis of crude oil and S&P 500 futures contracts. *Quantitative Finance*, 12(12), 1893-1908.
- Miller, J.I., Ratti, R.A. (2009), Crude oil and stock markets: Stability,

- instability, and bubbles. *Energy Economics*, 31(4), 559-568.
- Naifar, N., Al Dohaiman, M.S. (2013), Nonlinear analysis among crude oil prices, stock markets' return and macroeconomic variables. *International Review of Economics and Finance*, 27, 416-431.
- Nkoro, E., Uko, A.K. (2016), Autoregressive distributed lag (ARDL) cointegration technique: Application and interpretation. *Journal of Statistical and Econometric Methods*, 5(4), 63-91.
- Onour, I.A. (2012), Crude oil price and stock markets in major oil exporting countries: Evidence of decoupling feature. *International Journal of Monetary Economics and Finance*, 5(1), 1-10.
- OPEC. (2020), OPEC Share of World Crude Oil Reserves. Available from: https://www.opec.org/opec_web/en/data_graphs/330.htm. [Last accessed on 2020 Mar 07].
- Pala, A. (2013), Structural breaks, cointegration, and causality by VECM analysis of crude oil and food price. *International Journal of Energy Economics and Policy*, 3(3), 238-246.
- Rahmanto, F., Riga, M.H., Indriana, V. (2016), The effects of crude oil price changes on the Indonesian stock market: A sector investigation. *Indonesian Capital Market Review*, 8(1), 12-22.
- Raza, N., Shahzad, S.J.H., Tiwari, A.K., Shahbaz, M. (2016), Asymmetric impact of gold, oil prices and their volatilities on stock prices of emerging markets. *Resources Policy*, 49, 290-301.
- Saboori, B., Al-Mulali, U., Bin, B.M., Mohammed, A.H. (2016), Oil-induced environmental Kuznets curve in organization of petroleum exporting countries (OPEC). *International Journal of Green Energy*, 13(4), 408-416.
- Sam, C.Y., McNown, R., Goh, S.K. (2019), An augmented autoregressive distributed lag bounds test for cointegration. *Economic Modelling*, 80, 130-141.
- Silvennoinen, A., Thorp, S. (2013), Financialization, crisis and commodity correlation dynamics. *Journal of International Financial Markets Institutions and Money*, 24, 42-65.
- Statista. (2019), Indonesia Oil Consumption 2018. Available from: <https://www.statista.com/statistics/610015/oil-consumption-in-indonesia>. [Last accessed on 2020 Mar 07].
- Statista. (2020a), Oil-Global Consumption in Barrels Per Day 2018. Available from: <https://www.statista.com/statistics/265239/global-oil-consumption-in-barrels-per-day>. [Last accessed on 2020 Mar 07].
- Statista. (2020b), Petroleum consumption top countries worldwide 2017. Available from: <https://www.statista.com/statistics/264768/top-countries-based-on-petroleum-consumption>. [Last accessed on 2020 Mar 07].
- Wang, Y., Wu, C., Yang, L. (2013), Oil price shocks and stock market activities: Evidence from oil-importing and oil-exporting countries. *Journal of Comparative Economics*, 41(4), 1220-1239.
- Zhu, H.M., Li, R., Li, S. (2014), Modelling dynamic dependence between crude oil prices and asia-pacific stock market returns. *International Review of Economics and Finance*, 29, 208-223.