

The Effect of Interest Rate, Exchange Rate, Amount of Money Supply, World Oil Price and Singapore Stock Index on the Jakarta Composite Index for August 2016 – October 2022 Period

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Abstract:- This study aims to determine and prove the effects of interest rates, exchange rates, money supply, oil prices, and the Singapore stock index on the Jakarta Composite Index (JCI). The sampling technique used in this study was purposive sampling, with 75 samples selected based on the research period from August 2016 to October 2022. The data analysis method used Auto Regressive Distributed Lag (ARDL), and the data processing was performed using E Views application version 12. The results of this study indicate that interest rates, money supply, and the Singapore stock index have a positive effect on the JCI, whereas the exchange rate has a negative effect. However, there is no significance effect of oil prices on the JCI.

Keywords:- Component; Exchange Rates, Interest Rates, Jakarta Composite Index, Money Supply, Oil Price, Singapura Stock Index.

I. INTRODUCTION

Indonesia is one of the destination countries for investors to invest their funds in the capital market. However, the impact of the Covid-19 pandemic which began in early 2020 has put its own pressure on the Indonesian capital market. Capital market conditions are slowly recovering along with a decrease in active cases of Covid-19 and an increase in Covid-19 vaccinations in Indonesia. As of 29 December 2021, the JCI was at the level of 6600 with a stock market capitalization as of 29 December 2021 reaching IDR 8,275 trillion or an increase of 18.72 percent year to date (Financial Services Authority [OJK], 2021).

The condition of the Indonesian capital market is also supported by the large number of companies going public on the Indonesia Stock Exchange. In 2021 OJK has issued an Effective Statement of Registration Statements in the framework of a Public Offering for 192 emissions. Meanwhile, from the investor side, there are 7.48 million investors in 2021, an increase of 92.70 percent compared to 2020 (OJK, 2021). This indicates an increase in public confidence in the Indonesian capital market, thereby increasing stock market capitalization (Badruzaman, Andriyani, and Firmansyah, 2018).

Bank Indonesia also has a mandate to maintain the amount of money in circulation. Indonesia's geographical contour, consisting of thousands of islands, poses a challenge for Bank Indonesia to be able to maintain the amount of money in circulation at a safe level. Limited studies have tested the effect of the money supply on stock index movements. One study states that the money supply will have a positive effect on the stock index (Qing and Kusairi, 2019). The higher the amount of money in circulation, the more likely the country's stock index will increase. While Septyana and Agustian (2022) state that the money supply has a negative effect on the JCI however Thampanya, et al, (2020), Suwaibah and Seftarita (2021) states that the money supply has no effect on the JCI. The JCI development was also influenced by the movement of stock price indices of neighboring countries. Based on the research's results of Jovy (2021), the Association of South East Asia Nation (ASEAN) stock market is integrated, implying that if one stock exchange changes, the other stock exchanges will change. Based on previous research, the STI movement will have a positive effect on the JCI movement (Pinem, 2019).

This study uses the Auto Regressive Distributed Lag (ARDL) approach to determine the influence between the dependent variable and the independent variable. ARDL has an important role when there is a need to analyze economic scenarios, especially for conditions with a small number of samples and the independent variables affect the dependent variable in different lags. From an economic point of view, changes in various economic variables will change other economic variables over time. Changes in this variable cannot be realized in a short time but will be distributed over the next several periods.

The novelty of this research is to examine 3 macroeconomic variables published by the central bank, world oil prices, and stock indices of neighboring countries together on the development of stock indices in Indonesia. Previous research generally discussed the effect of macroeconomic variables and the effect of the neighboring country's stock price index separately. In addition, not too many studies have studied the relationship between macroeconomic variables and stock indexes using the ARDL model. Based on the above background, this research will comprehensively develop previous studies related to the factors that influence the JCI with the research title "The Effect of Interest Rates, Exchange Rates, Money Supply,

World Oil Prices, and Singapore Stock Index on the Jakarta Composite Index Period August 2016 – October 2022”.

Based on the background referred to, the formulation of the problem in the research is as follows:

- Does central bank interest rates affect the Jakarta Composite Index?
- Does the exchange rate affect the Jakarta Composite Index?
- Does the money supply affect the Jakarta Composite Index?
- Does the movement of world oil prices affect the Jakarta Composite Index?
- Does the Singapore stock index affect the Jakarta Composite Index?

II. LITERATURE REVIEW

A. Arbitrage Pricing Theory

First, the Arbitrage Pricing Theory (APT) was introduced by Ross (1976) which has three main assumptions, namely:

- Stock market conditions in perfect competition.
- Investors prefer conditions that are richer than less wealthy by holding a certain amount of certainty.
- The stochastic process that generates asset returns can be described in terms of a linear function of a number of risk factors (or risk indices) and can distinguish all unsystematic risks with the following model:

$$R_i = E(R_i) + b_{i1}\delta_1 + b_{i2}\delta_2 + \dots + b_{ik}\delta_k + \epsilon_i \text{ for iterations } i = 1 \text{ to } n$$

Where

R_i is the actual rate of return on asset i during a certain period, $i = 1, 2, 3, \dots, n$

$E(R_i)$ is the expected return on asset i for all fixed risk factors

b_{ij} is the reaction to the return of asset i to the movement of the general risk factor j

δ_k is a collection of factors/indices with a zero average that affect the rate of return of all assets

ϵ_i is the unique effect on the return on asset i

n is the number of assets

Furthermore, Reilly and Brown (2012) added that the APT assumption above does not need to pay attention to several factors including investors having a quadratic utility function, distributed securities rates, and a market portfolio that contains all risky assets with an efficient average variance.

B. Monetary Transmission to Financial Market Theory

Monetary policy transmission has undergone several evolutions using the Neoclassical channels built in the mid-20th century or also called traditional and non-neoclassical channels. The traditional channel of monetary policy transmission is built on the core models of investment, consumption and international trade behavior.

The most traditional monetary transmission channel which is part of the macroeconomic model involves the impact of interest rates on the cost of capital which then influences investment spending. According to Jorgensen in Boivin, Kiley, and Mishkin (2010), the standard neoclassical model shows that the cost of capital is the main determinant of capital demand, one of which is investment tools, housing, and consumer goods which can be formulated as follows:

$$u_c = p_c [(1 - \tau_i - e^{\pi_c} + \delta)]$$

Where

p_c is the relative price for new capital

i is the interest rate

e^{π_c} is the expected increase in the price of capital assets

δ is the depreciation rate

The formula states that interest rates affect the spending of firms or households. Because capital assets have a long term and these stock adjustments involve costs, firms and households will factor interest rates into investment decisions. Furthermore, in Tobin's (1969) model I, it is stated that welfare (W) consists of the quantity of capital (qK) and the quantity of money (M/p) with the following equation:

$$W = qK + M/p$$

In this case the quantity of money and capital is a function of the real profit rate that comes from holding money and capital and the income function is divided by welfare to welfare. In business investment q is the value of the company divided by the replacement cost of capital. When q is high, the market value of the firm will rise relative to the replacement cost of capital and the firm will be cheaper to purchase new plant and equipment.

C. Contagion Effect Theory

Contagion Effect according to Eichengreen, Rose, and Wyplosz (1996) comes from economic interdependence between markets caused by macroeconomic similarities, trade relations and loans from banks. Another definition of contagion effect is market participants who take part in collective action or market action, without paying attention to analysis and considering there are errors in market collective action or so-called herding behavior (Christie and Huang, 1995). Tan et al. (2008) explain that it is very important to know that investors' decisions in the stock market can originate from investors' investment decisions in other markets. A crisis will spread between countries if these countries have similar economic or macroeconomic conditions or if they have trade relations.

Three definitions of contagion effect from the World Bank according to Yang in Adisetiawan and Ahmadi (2018) are as follows:

- In a broad sense, the contagion effect is a shock that is transmitted across national borders, or the occurrence of a relationship of mutual influence between several countries whether negative or positive shocks.

- The second definition is the transmission of a shock across national borders or in general the occurrence of significant inter-country correlations that occur outside some fundamental channels.
- The third definition relates contagion to a phenomenon when the correlation between countries increases during crisis periods compared to the correlation during normal economic periods.

D. Policy Rates/Interest Rates Theory

Fisher (1930) suggests that the nominal interest rate (i_t) describes the real interest rate (r_t) with inflation expectations (π_t^e) from period t to period $t+1$ according to the formula below:

$$i_t = r_t + \pi_t^e$$

These interest rates can be in the form of interest rates listed on securities or other investment products as well as reference interest rates which are one of the central bank policies. Inflation expectations and nominal interest rates will move together and interest rate movements will have a negative impact on stock prices through the inflation effect.

E. Money Supply

The money supply can be seen as the total amount of money circulating in the economy and the various aggregate monetary components represent statistical measures of the money supply (Viitanen, 2022). The money supply is generally divided into narrow money supply (M1) and wide money supply (M2). The money supply published by Bank Indonesia on a monthly basis covers:

- Narrow money supply (M1) in the form of currency outside commercial banks and rural banks, rupiah demand deposits including electronic money, and rupiah savings.
- Quasi money in the form of time deposits (rupiah and foreign currency), savings (rupiah and foreign currency), and foreign currency demand deposits.
- Securities other than shares.
- Wide money supply (M2) which is the total of narrow money supply (M1), quasi money and securities other than shares.

F. World Oil Prices

Crude oil, which consists of crude oil and refined petroleum products, is one of the main sources of energy in the world. Petroleum fueled the rapid post-war economic growth achieved in Organization for Economic Co-operation and Development or OECD countries (Bandyopadhyay, 2009). Petroleum has played an increasingly significant role. The cost of energy, fuel, gas, electricity for transportation and manufacturing is a direct determinant of the cost of living and the funds that people deposit in the bank before the next month's payday period (Okwanya, Moses, and Pristine, 2015). World crude oil prices are measured by spot prices which generally use West Texas Intermediate (WTI) and Brent standards. World oil traded on WTI is high-quality crude oil which is very suitable for use as fuel so that this standard oil price is the benchmark for world oil trade (Antonio et al, 2021).

G. Singapore Stock Index

One of the indices used by the Singapore stock exchange is the Straits Times Index (STI). STI consists of the shares of 30 representative companies listed on the Singapore Exchange. The index is calculated based on market value weighted market index. The STI replaced the Straits Times Industrials Index (STII) on 31 August 1998 with the first index of 885.26 points which was the same index level when the STII was last used. The index was developed by Singapore Press Holdings, Singapore Exchange and Tse Yiu Kuen from Singapore Management University. The review of index-forming stocks is carried out at least once every year or can be done at any time if necessary.

According to Chitkasame and Tansuchat (2019), the transmission volatility of the contagion effect occurs in part in developing countries such as the Association of South East Asia Nation (ASEAN) and there is a high correlation between the stock markets in the ASEAN region. Putra, Rizkianto, and Chalid (2017) prove the existence of herding behavior in Indonesia and Singapore. In addition, the study found that herding behavior in Indonesia is stronger than in Singapore. However, this study cannot find any spillover from the Indonesian stock market to Singapore and vice versa.

H. Jakarta Composite Index

The Indonesia Composite Index (IHSG) is an index that measures the price performance of all stocks listed on the Main Board and Development Board of the Indonesia Stock Exchange. This index is a statistical measure that reflects the overall price movement of a group of stocks that are selected based on certain criteria and methodologies and are evaluated periodically. The JCI was used for the first time on April 1, 1983, as an indicator of stock price movements on the IDX, which at that time was still called the Jakarta Stock Exchange (BEJ). In the classification of indices on the IDX, the JCI is classified as a headline index in the composite sub-classification.

The benefits of JCI include:

- Measure market sentiment.
- Make passive investment products such as Index Mutual Funds.
- Benchmarks for active portfolios.
- Proxies in measuring and modeling return on investment (return), systematic risk, and risk-adjusted performance.
- As a proxy for the asset class on asset allocation.

The research framework was developed as follows:

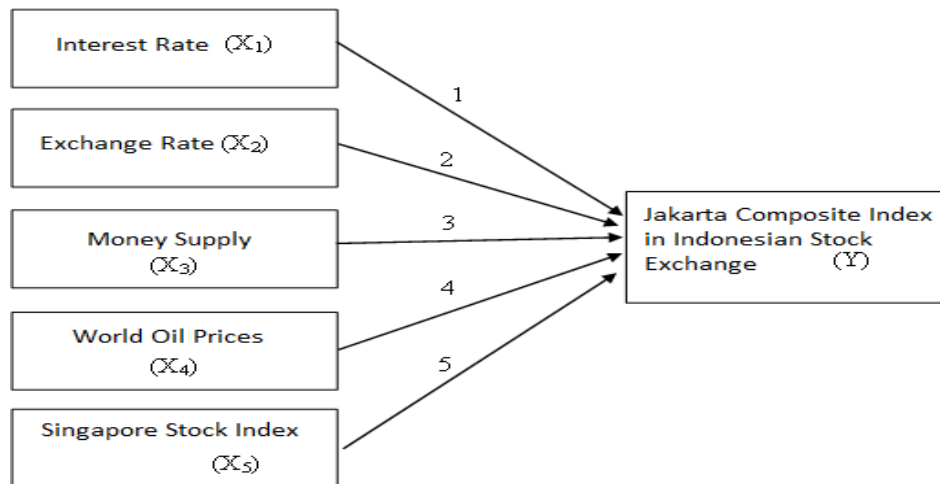


Fig. 1: Conceptual Framework

➤ Information:

- H1: It is suspected that the central bank's interest rate has a positive effect on the Jakarta Composite Index.
- H2: It is suspected that the exchange rate has a negative effect on the Jakarta Composite Index.
- H3: It is suspected that the money supply has a positive effect on the Jakarta Composite Index.
- H4: It is suspected that world oil prices have a positive effect on the Jakarta Composite Index.
- H5: It is suspected that the Singapore stock index has a positive effect on the Jakarta Composite Index.

III. LITERATURE REVIEW

This research is a method or procedure aimed at conducting data analysis with certain techniques and begins with the data collection stage. The design used in this study is research with a causal model, which investigates causal relationships between variables. Causal analysis aims to test the hypotheses regarding the effect of one or more independent variables on the dependent variable. This analysis illustrates how the independent variables, including Bank Indonesia's macroeconomic variables such as interest rates, exchange rates, and the money supply, as well as other independent variables such as oil prices and the Singapore stock index, can affect the dependent variable, namely the JCI.

The sample represents a portion of the population and encompasses the characteristics possessed by the population. The sampling of companies in this study used a purposive sampling method, namely samples to be taken based on certain criteria with the aim of obtaining a representative sample in accordance with predetermined criteria. The research sample period started in August 2016, when Bank Indonesia first implemented the BI-7 Day Reverse Repo Rate replacing the BI Rate as the benchmark interest rate up to data for October 2022. Within this timeframe, the research sample will consist of 75 data.

The analytical method used in this research is the Autoregressive Distributed Lag (ARDL) approach. The EViews version 12 program was used as the analytical tool for conducting the analysis and testing.

The ARDL equation in this study is as follows:

$$\begin{aligned}
 LnIHSG_t = & a_0 + \sum_{i=1}^{n1} b_i LnIHSG_{t-8} + \sum_{i=0}^{n2} c_i LnINT_{t-8} + \sum_{i=1}^{n3} d_i LnFX_{t-8} + \sum_{i=1}^{n4} e_i LnUB_{t-8} \\
 & + \sum_{i=1}^{n5} f_i LnOIL_{t-8} + \sum_{i=1}^{n6} g_i LnSTI_{t-8} + \alpha_1 LnIHSG_{t-8} + \alpha_2 LnINT_{t-8} + \alpha_3 LnFX_{t-8} \\
 & + \alpha_4 LnUB_{t-8} + \alpha_5 LnOIL_{t-8} + \alpha_6 LnSTI_{t-8} + e_t
 \end{aligned}$$

Where

- IHSG : Jakarta Composite Index
- INT : Interest rate
- FX : Exchange rate
- UB : Amount of Money in Circulation
- OIL : World Oil Prices
- STI : Singapore Stock Index
- $a_0, b_i, c_i, d_i, e_i, f_i, g_i$: Short Run Coefficient
- $\alpha_1, \alpha_2, \alpha_3, \alpha_4, \alpha_5, \alpha_6$: Long Term ARDL Coefficient
- e_t : Disturbance Error (White Noise)

IV. RESULTS AND DISCUSSION

Descriptive statistics provide an overview of the data that become research variables. Descriptive statistical analysis was carried out by providing an explanation of the results of data processing, especially related to information on the average value (mean), median value (median), maximum value and minimum value of the research data. The following are the results of the descriptive statistical analysis of the research.

Table 1: Descriptive Statistics

	IHSG	INT	FX	UB	OIL	STI
Mean	6023.813	4.513333	14.173.96	6.215.874	60.93787	3107.967
Median	5996.000	4.500000	14.234.00	6.004.277	57.40000	3166.940
Maximum	7229.000	6.000000	16.367.00	8.223.055	114.6700	3613.930
Minimum	4539.000	3.500000	12.998.00	4.737.631	18.84000	2423.840
Std. Dev.	617.1855	0.829048	617.9818	992946.3	18.50111	264.3889
Skewness	-0.189761	0.358045	0.492519	0.399541	0.709907	-0.927698
Kurtosis	2.758735	2.033906	3.957780	1.942744	3.747422	3.529547
Jarque-Bera	0.632017	4.519133	5.898887	5.488501	8.045357	11.63412
Probability	0.729053	0.104396	0.052369	0.064296	0.017905	0.002976
Sum	451786.0	338.5000	1063047.	4.66E+08	4570.340	233097.6
Sum Sq. Dev.	28187931	50.86167	28260713	7.30E+13	25329.55	5172709.
Observations	75	75	75	75	75	75

Source: Results of data processing using Eviews version 12, 2023

Where:

IHSG = Jakarta Composite Index

INT = Interest rate

FX = Exchange rate

UB = The amount of money in circulation

OIL = World oil prices

STI = Strait Times Index

Based on Table I, this study involved 75 data observations. The average value of the resulting composite stock price index (IHSG) is 5,996. The lowest value of the JCI during the study period was 4,539 which occurred in March 2022 as a result of the weakening of global markets and negative sentiment over the massive spread of the Covid-19 virus, which reduced investor interest in the stock market. While the highest value of the JCI was 7,229 in April 2022 which was driven by the strengthening of the stock market as a result of a number of government National Economic Recovery policies which were well received by investors.

In the interest rate independent variable (INT), an average value of 4.513333 is obtained. The lowest value of this variable is 3.50 which occurs 18 times in the observation period. The lowest value occurred in February 2021 and continued until July 2022 when Bank Indonesia lowered the BI-7 Day Reverse Repo Rate and continued to maintain it at its lowest position in order to support the continued growth of the Indonesian economy in the face of the Covid-19 pandemic. The highest variable value is 6.00 which occurs 8 times in the observation period. The highest value occurred in November 2018 and continued until June 2019 which was the peak of the gradual increase in the BI-7 Day Reverse Repo Rate set by Bank Indonesia.

In the exchange rate independent variable (FX), an average value of 14,173.96 is obtained. The lowest value of this variable was 12,998.00 in September 2016 which was the peak of the strengthening or appreciation of the rupiah exchange rate against the US dollar during the observation period. The highest variable value was 16,367.00 in September 2016 which was the peak of the weakening or depreciation of the rupiah exchange rate against the US dollar during the observation period.

In the independent variable money supply (UB), an average value of 6,215,874 is obtained. The lowest value of this variable was 4,737,631 which occurred in September 2016 when the broad money supply was at its lowest point in the study period. The highest value of this variable is 8,223,055 which occurs in October 2022 when the money supply is widely in the highest position in the study period.

In the world oil price independent variable (OIL), an average value of 60.93787 is obtained. The lowest value of this variable was 18.84 which occurred in April 2020 when world oil prices touched their lowest level in the study period. The highest value of this variable was 114.67 which occurred in May 2022 when world oil prices touched their highest level in the study period. The increase in oil prices was triggered by the impact of Russia's invasion of Ukraine which caused a shortage of world oil supplies considering that the two countries are one of the world's oil producing countries.

In the independent variable Singapore stock index (STI), in this case the Straits Times Index, an average value of 3107.967 is obtained. The lowest value of this variable was 2423.840 which occurred in October 2020 when the STI touched its lowest level in the research period. The highest value of this variable was 3613.930 which occurred in April 2018 when the STI touched the highest level in the research period.

The normal test is carried out to ensure that the data has a normal distribution as evidenced by the probability value of the data being above the significant level of 0.05. Based on the test in Figure II, a probability of 0.72 is obtained which implies that the data has a normal distribution.

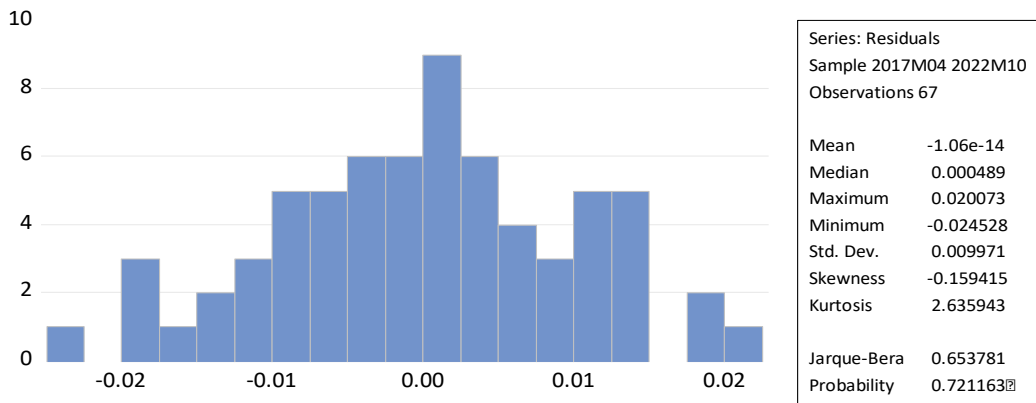


Fig. 2: Normal Distribution Test

Source: Results of data processing using Eviews version 12, 2023

A. Multi Collinearity Test Results

The data does not experience multi collinearity if all the independent variables have a value less than 0.9. Based on data processing, the results obtained are the correlation

values between the variables of interest rates, exchange rates, money supply, world oil prices, and STI less than 0.9. This indicates that there is no multi collinearity in the data.

Table 2: Multicollinearity Test

	LN_IHSG	LN_FX	LN_INT	LN_UB	LN_OIL	LN_STI
LN_IHSG	1.000000	0.083814	-0.164089	0.443393	0.852887	0.724052
LN_FX	0.083814	1.000000	-0.164795	0.692178	0.065117	-0.325686
LN_INT	-0.164089	-0.164795	1.000000	-0.661880	-0.321346	0.097073
LN_UB	0.443393	0.692178	-0.661880	1.000000	0.439966	-0.131701
LN_OIL	0.852887	0.065117	-0.321346	0.439966	1.000000	0.648839
LN_STI	0.724052	-0.325686	0.097073	-0.131701	0.648839	1.000000

Source: Results of data processing using Eviews version 12, 2023

B. Autocorrelation Test Results

Data is free from autocorrelation if the Chi square probability value is greater than 0.05. Based on data processing using the Breusch-Godfrey Serial Correlation

Linear Model Test approach, a Chi square data probability of 0.4587 is obtained, which means that there is no autocorrelation in the data.

Table 3: Autocorrelation Test

Breusch-Godfrey Serial Correlation LM Test:		
Null hypothesis: No serial correlation at up to 1 lag		
0.165251	Prob. F(1,20)	0.6887
0.549055	Prob. Chi-Square(1)	0.4587

Source: Results of data processing using Eviews version 12, 2023

C. Heteroscedasticity Test Results

Data is free from heteroscedasticity if the Chi square probability value is greater than 0.05. Based on data

processing using the Breusch-Pagan-Godfrey approach, the probability of Chi square data is 0.3533, which means that there is no heteroscedasticity in the data.

Table 4: Heteroskedasticity Result

Heteroskedasticity Test: Breusch-Pagan-Godfrey			
Null hypothesis: Homoskedasticity			
F-statistic	1.176488	Prob. F(45,21)	0.3514
Obs*R-squared	4.797157	Prob. Chi-Square(45)	0.3533
Scaled explained SS	3.854881	Prob. Chi-Square(45)	10.000

D. Granger Causality Test Results

The Granger Causality test is carried out by looking for Granger values on all independent variables and the dependent variable. Based on data processing, there is no two-way causality relationship in all combinations of variables. This is evidenced by the fact that there is no

probability below 0.05 in both directions of the relationship between the two variables. A one-way relationship with a significant level of 5% occurs between the interest rate variable and the JCI, the JCI and the Singapore stock index, and the money supply and interest rates. The Granger Causality test results are as shown in Table V.

Table 5: Ganger Causality Test

Pairwise Granger Causality Tests; Sample: 2016M08 2022M10; Lags: 8			
Null Hypothesis:	Obs	F-Statistic	Prob,
LN_FX does not Granger Cause LN_IHSG	67	1.81555	0.0961
LN_IHSG does not Granger Cause LN_FX	67	1.45700	0.1969
LN_INT does not Granger Cause LN_IHSG	67	3.08886	0.0066
LN_IHSG does not Granger Cause LN_INT	67	1.24516	0.2933
LN_UB does not Granger Cause LN_IHSG	67	1.21005	0.3125
LN_IHSG does not Granger Cause LN_UB	67	0.92480	0.5044
LN_OIL does not Granger Cause LN_IHSG	67	1.66351	0.1309
LN_IHSG does not Granger Cause LN_OIL	67	1.47570	0.1899
LN_STI does not Granger Cause LN_IHSG	67	2.01870	0.0631
LN_IHSG does not Granger Cause LN_STI	67	3.99689	0.0010
LN_INT does not Granger Cause LN_FX	67	1.89426	0.0817
LN_FX does not Granger Cause LN_INT	67	1.43018	0.2074
LN_UB does not Granger Cause LN_FX	67	2.03814	0.0606
LN_FX does not Granger Cause LN_UB	67	0.29855	0.9631
LN_OIL does not Granger Cause LN_FX	67	0.86037	0.5556
LN_FX does not Granger Cause LN_OIL	67	1.00041	0.4476
LN_STI does not Granger Cause LN_FX	67	0.94458	0.4892
LN_FX does not Granger Cause LN_STI	67	0.42773	0.8989
LN_UB does not Granger Cause LN_INT	67	2.65936	0.0163
LN_INT does not Granger Cause LN_UB	67	0.74244	0.6539
LN_OIL does not Granger Cause LN_INT	67	1.19078	0.3235
LN_INT does not Granger Cause LN_OIL	67	1.94686	0.0733
LN_STI does not Granger Cause LN_INT	67	1.44915	0.1999
LN_INT does not Granger Cause LN_STI	67	1.79017	0.1013
LN_OIL does not Granger Cause LN_UB	67	1.11884	0.3670
LN_UB does not Granger Cause LN_OIL	67	1.00426	0.4448
LN_STI does not Granger Cause LN_UB	67	0.69400	0.6949
LN_UB does not Granger Cause LN_STI	67	1.14521	0.3506
LN_STI does not Granger Cause LN_OIL	67	0.82441	0.5851
LN_OIL does not Granger Cause LN_STI	67	0.68883	0.6993

Source: Results of data processing using Eviews version 12, 2023

Based on the results of these calculations, all variables in this study are not mutually influencing or have a two-way relationship. Odiche and Udeorah (2020) also found that there is no two-way relationship between the independent variables and the dependent variable for the relationship between inflation, interest rates, exchange rates, and money supply on stock performance. In addition, the results of the Granger causality test are not the main determinant in determining a causal relationship but can be used as an additional consideration (Islam and Habib, 2016).

E. Stationary Data Test Results

The data stationary test uses the unit root test or the Unit Root Test which is used to determine whether the data used in a study is stationary or not. A set of data is declared stationary if the statistical t value is lower than the critical value at several significant levels. This study uses the Augmented Dickey-Fuller Test (ADF) to determine the stationary level of the data. The summary of the ADF test results using the Eviews application version 12 is as shown in Table VI below.

Table 6: ADF Test

Variable	N	Lag	Critical Point			t-Statistic	Probability
			1%	5%	10%		
Level 0							
LN_IHSG	74	0	-3.521579	-2.901217	-2.587981	-1.3905630	0.5825
LN_INT	73	1	-3.522887	-2.901779	-2.588280	-1.5523480	0.5016
LN_FX	74	0	-3.521579	-2.901217	-2.587981	-2.3118220	0.1710
LN_UB	73	1	-3.522887	-2.901779	-2.588280	0.2180420	0.9720
LN_OIL	74	0	-3.521579	-2.901217	-2.587981	-1.9676630	0.3003
LN_STI	74	0	-3.521579	-2.901217	-2.587981	-2.2818020	0.1805
Level 1							
LN_IHSG	73	0	-3.522887	-2.901779	-2.588280	-7.3073770	0.0000*
LN_INT	73	0	-3.522887	-2.901779	-2.588280	-3.8550340	0.0038*
LN_FX	73	0	-3.522887	-2.901779	-2.588280	-9.4343780	0.0000*
LN_UB	73	0	-3.522887	-2.901779	-2.588280	-12.3096500	0.0001*
LN_OIL	73	0	-3.524233	-2.902358	-2.588587	-7.2209970	0.0000*
LN_STI	73	0	-3.522887	-2.901779	-2.588280	-10.1053600	0.0001*

Source: Results of data processing using Eviews version 12, 2023

Note: *) Significant data at the level of 1%, 5% and 10% Based on the test results, the data is still not stationary at the level level test. Furthermore, testing was carried out at level 1 with the results of all variables being stationary. The data is stationary either at a significant level of 1%, 5% or 10%. Taking into account the test results, all data is concluded to be stationary at level 1 (first difference) so that it complies with the requirements for carrying out the ARDL approach.

F. Optimal Lag Determination

The search for the best model to form a general ARDL model was carried out using the Hannan-Quinn criteria. Hannan-Quinn will produce the optimal lag for each variable to develop the best ARDL model. The ARDL model uses a lag of 8 because according to Pesaran (1999) it is recommended to use data with a monthly period using data with a minimum lag of 7. The results of determining the optimal lag in this study are shown in Table VII below.

Table 7: ARDL Optimal Lags

Variable	Lag Criteria	Information
LN_IHSG	8	Optimal on the 8th lag
LN_INT	8	Optimal on the 8th lag
LN_FX	7	Optimal on the 7th lag
LN_UB	6	Optimal on the 6th lag
LN_OIL	3	Optimal on the 3rd lag
LN_STI	8	Optimal on the 8th lag

Source: Results of data processing using Eviews version 12, 2023

The lag model (8, 8, 7, 6, 3, 8) is the model with the best lag because it has a smaller error than other ARDL models.

G. Short Term ARDL Estimation

Based on the formation of the optimal lag using the Hannan-Quinn approach, the short-term ARDL model is obtained as follows:

Table 8: Short Term ARDL Model

Dependent Variable: LN_IHSG					
Method: ARDL					
Date: 05/08/23 Time: 18:14					
Sample (adjusted): 2017M04 2022M10					
Included observations: 67 after adjustments					
Maximum dependent lags: 8 (Automatic selection)					
Model selection method: Hannan-Quinn criterion (HQ)					
Dynamic regressors (8 lags, automatic): LN_INT LN_FX LN_UB LN_OIL					
LN_STI					
Fixed regressors: C					
Number of models evaluated: 472392					
Selected Model: ARDL(8, 8, 7, 6, 3, 8)					
Variable	Coefficient	Std. Error	t-Statistic	Prob.*	
LN_IHSG(-1)	0.718858	0.175532	4.095.316	0.0005	
LN_IHSG(-2)	0.534900	0.262096	2.040.856	0.0540	
LN_IHSG(-3)	-0.570115	0.191333	-2.979.696	0.0071	
LN_IHSG(-4)	0.383538	0.180044	2.130.240	0.0451	
LN_IHSG(-5)	-0.175756	0.259212	-0.678041	0.5051	
LN_IHSG(-6)	0.566111	0.186705	3.032.111	0.0063	
LN_IHSG(-7)	0.642213	0.267257	2.402.980	0.0256	
LN_IHSG(-8)	-0.191559	0.166150	-1.152.929	0.2619	
LN_INT	-0.041007	0.201858	-0.203145	0.8410	
LN_INT(-1)	-0.446309	0.246219	-1.812.652	0.0842	
LN_INT(-2)	0.289182	0.306891	0.942298	0.3568	
LN_INT(-3)	-0.285168	0.358776	-0.794836	0.4356	
LN_INT(-4)	0.003408	0.380606	0.008954	0.9929	
LN_INT(-5)	0.085073	0.342535	0.248364	0.8063	
LN_INT(-6)	0.357928	0.297526	1.203.014	0.2424	
LN_INT(-7)	0.357077	0.311698	1.145.587	0.2649	
LN_INT(-8)	-0.782464	0.216304	-3.617.430	0.0016	
LN_FX	-0.928476	0.312610	-2.970.073	0.0073	
LN_FX(-1)	1.355.651	0.367016	3.693.712	0.0013	
LN_FX(-2)	0.048498	0.337095	0.143869	0.8870	
LN_FX(-3)	-0.549176	0.302370	-1.816.240	0.0836	
LN_FX(-4)	0.464128	0.290584	1.597.222	0.1252	
LN_FX(-5)	-0.682826	0.352789	-1.935.509	0.0665	
LN_FX(-6)	0.675103	0.315640	2.138.837	0.0444	
LN_FX(-7)	0.671441	0.330382	2.032.318	0.0550	
LN_UB	0.333620	0.281008	1.187.225	0.2484	
LN_UB(-1)	-0.580765	0.340007	-1.708.096	0.1024	
LN_UB(-2)	0.478060	0.340022	1.405.969	0.1744	
LN_UB(-3)	0.563214	0.416733	1.351.500	0.1909	
LN_UB(-4)	-0.374281	0.394063	-0.949799	0.3530	
LN_UB(-5)	-0.748238	0.395115	-1.893.720	0.0721	
LN_UB(-6)	-0.772964	0.404269	-1.912.006	0.0696	

LN_OIL	0.059559	0.032072	1.857.011	0.0774
LN_OIL(-1)	-0.038329	0.039912	-0.960316	0.3478
LN_OIL(-2)	0.007959	0.046332	0.171774	0.8653
LN_OIL(-3)	0.142614	0.044672	3.192.454	0.0044
LN_STI	-0.168662	0.205643	-0.820171	0.4213
LN_STI(-1)	0.276351	0.182130	1.517.324	0.1441
LN_STI(-2)	-0.153457	0.161340	-0.951142	0.3524
LN_STI(-3)	-0.452513	0.195729	-2.311.935	0.0310
LN_STI(-4)	-0.447272	0.174746	-2.559.547	0.0183
LN_STI(-5)	-0.225180	0.175082	-1.286.139	0.2124
LN_STI(-6)	0.119137	0.119045	1.000.773	0.3283
LN_STI(-7)	-0.101557	0.107752	-0.942507	0.3567
LN_STI(-8)	-0.146849	0.102915	-1.426.897	0.1683
C	9.680.650	3.375.730	2.867.720	0.0092
R-squared	0.990572	Mean dependent var		8.711521
Adjusted R-squared	0.970368	S.D. dependent var		0.102683
S.E. of regression	0.017676	Akaike info criterion		-5.020273
Sum squared resid	0.006561	Schwarz criterion		-3.506603
Log likelihood	2.141.791	Hannan-Quinn criter.		-4.421310
F-statistic	4.902.945	Durbin-Watson stat		1.870810
Prob(F-statistic)	0.000000			

*Note: p-values and any subsequent tests do not account for model selection.

Source: Results of data processing using Eviews version 12, 2023

Based on this test, each independent variable has a different effect on the JCI in the short term. Interest rates only have a negative effect on the JCI in the short term for the 8th lag condition the probability value of each is 0.0016 which is smaller than the significant level of 0.05. Meanwhile interest rates have no significant effect on the JCI for current conditions until the 7th lag because the probability value is greater than the significant level of 0.05, namely 0.8410; 0.0842; 0.3568; 0.4356; 0.9929; 0.8063; 0.2424; and 0.2649. Meanwhile, in the current condition, the interest rate has a negative effect on the JCI in the short term with a probability of 0.0073 and in the 1st lag condition, the interest rate has a positive effect on the JCI in the short term with a probability of 0.0013. Both probabilities for these conditions are smaller than the 0.05 significant level. Meanwhile for the conditions of the 2nd to 7th lag, the exchange rate does not have a significant effect on the JCI in the short term with a probability of 0.8870 each; 0.0836; 0.1252; 0.0665; 0.0444; as well as 0.0550. The money supply variable has no significant effect on the JCI in the short term for current conditions up to the 6th lag. The probability of these variables is respectively 0.2484; 0.1024;

0.1744; 0.1909; 0.3530; 0.0721; and 0.0696 which is smaller than the significant level of 0.05.

World oil prices have a positive effect on the JCI in the short term for the 3rd lag condition with a probability of 0.0044 or smaller than a significant level of 0.05. While world oil has no effect on the JCI in the short term for current conditions until the 2nd lag with a probability of 0.0774 each; 0.3478; and 0.8653 or smaller than the significant level of 0.05.

The Singapore stock index has a negative effect on the JCI in the short term for the 3rd and 4th lag conditions with respective probabilities of 0.0310 and 0.0183 or smaller than the significant level of 0.05. While the Singapore stock index has no effect on the JCI in the short term for current conditions up to the 2nd lag, as well as the 5th to 8th lag with a probability of 0.4213; 0.1441; 0.3524; 0.2124; 0.3283; 0.3567; and 0.1683 or smaller than the significant level of 0.05.

H. Long Term ARDL Estimation

The long-term ARDL model of this study is as follows:

Table 9: Long Term ARDL Model Table

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LN_INT	0.509011	0,106840	4,764,242	0,0001
LN_FX	-1.160.926	0,406699	-2,854,509	0,0095
LN_UB	1.212.691	0,268877	4,510,212	0,0002
LN_OIL	-0.189170	0,104127	-1,816,726	0,0836
LN_STI	1.431.419	0,337490	4,241,374	0,0004
C	-1.065.927	5,228,974	-2,038,502	0,0543
EC = LN_IHSG - (0.5090*LN_INT -1.1609*LN_FX + 1.2127*LN_UB - 0.1892*LN_OIL + 1.4314*LN_STI - 10.6593)				

Source: Results of data processing using Eviews version 12, 2023

The long-term ARDL estimation model coefficients in this study are as follows:

$$EC = LN_IHSG - (0.5090*LN_INT - 1.1609*LN_FX + 1.2127*LN_UB - 0.1892*LN_OIL + 1.4314*LN_STI - 10.6593)$$

Table 10: Cointegration Bound Test

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	4.554506	10%	2.08	3
K	5	5%	2.39	3,38
		2.5%	2.7	3,73
		1%	3.06	4,15
Actual Sample Size	67		Finite Sample: n=70	
		10%	2.193	3,161
		5%	2.564	3,65
		1%	3.373	4,717
			Finite Sample: n=65	
		10%	2.209	3,201
		5%	2.596	3,677
		1%	3.43	4,721

Source: Results of data processing using Eviews version 12, 2023

I. Simultaneous Test Results (F)

Testing the regression coefficient simultaneously is carried out using the F test statistic. The F test is a test to see

the effect of the independent variables together. The results of the F test are as shown in the table below.

Table 11: Test F

R-squared	0.990572	Mean dependent var	8,711521
Adjusted R-squared	0.970368	S.D. dependent var	0.102683
S.E. of regression	0.017676	Akaike info criterion	-5.020273
Sum squared resid	0.006561	Schwarz criterion	-3.506603
Log likelihood	214.1791	Hannan-Quinn criter.	-4.421310
F-statistic	49.02945	Durbin-Watson stat	1.870810
Prob(F-statistic)	0.000000		

Source: Results of data processing using Eviews version 12, 2023

The statistical F value is 49.03 and a probability of 0.000 which implies that all independent variables simultaneously influence the dependent variable.

J. Coefficient of Determination

The coefficient of determination (R²) is carried out to see how much influence the independent variables have on the dependent variable. The R² value ranges from 0-1 with an explanation that the closer the R² value is to 1, the greater the influence of the independent variable on the

dependent variable and vice versa. From the regression results, as shown in Table XI, the R2 result is 0.99, which means that the independent variables affect the JCI by 99% while the remaining 1% is explained by other variables not included in the regression.

K. Partial Test Results (t)

The t test is a test of the independent variables partially or individually which is carried out to see the significance of the independent variables individually to the dependent variable. This partial test is carried out by looking at the magnitude of the t count by looking at the probability value with a significant level of 0.05. The hypothesis made in this test is as follows:

- H0 : the independent variable has no effect if the probability value is > 0.5 .
- H1 : independent variables have an effect if the probability value < 0.05 .

Based on Table IX of the long-term ARDL model, the conclusions obtained from the results of the t statistical test in this study are as follows:

➤ *The influence of interest rates on the JCI*

The results of the research data t test in the table above show that the interest rate variable has a coefficient value of 0.51 with a probability value of 0.0001 meaning that H0 is rejected and H1 is accepted. So it can be concluded that interest rates have a positive effect on the JCI.

H1: interest rates have a positive effect on the JCI.

➤ *Effect of the exchange rate on the JCI*

The results of the research data t test in the table above show that the exchange rate variable has a coefficient value of -1.16 with a probability value of 0.0095 meaning that H0 is rejected and H1 is accepted. So it can be concluded that the exchange rate has a negative effect on the JCI.

H2: the exchange rate has a negative effect on the JCI

➤ *The influence of the money supply on the JCI*

The results of the research data t test in the table above show that the money supply variable has a coefficient value of 1.21 with a probability value of 0.0002 meaning that H0 is rejected and H1 is accepted. So it can be concluded that the money supply has a positive effect on the JCI.

H3: money supply has a positive effect on the JCI.

➤ *The effect of oil prices on the JCI*

The results of the research data t test in the table above show that the world oil price variable has a coefficient value of -0.19 with a probability value of 0.0836 meaning that H0 is accepted and H1 is rejected. So it can be concluded that world oil prices have no effect on the JCI.

H4: world oil prices have no effect on the JCI.

➤ *The influence of the Singapore stock index on the JCI*

The results of the research data t test in the table above show that the Singapore stock index variable has a coefficient value of 1.43 with a probability value of 0.0004 meaning that H0 is rejected and H1 is accepted. So it can be concluded that the Singapore stock index has a positive effect on the JCI.

H5: The Singapore stock index has a positive effect on the JCI.

L. *The Effect of Interest Rates on JCI*

Based on Table IX, the conclusion from testing the hypothesis is that interest rates have a positive effect on the JCI in the period August 2016 to October 2022. These results are in line with the research hypothesis. This condition was supported by the gradual increase in the BI-7 Day Reverse Repo Rate from September 2017 to June 2019 which was responded by strengthening the JCI. During this period, the investment climate was very enthusiastic, which was reflected in the increase in the number of stock investors, the addition of a number of new issuers on the Indonesia Stock Exchange, and an increase in the flow of foreign capital to Indonesia. This condition triggered an increase in stock trading transactions thereby driving up the JCI while BI also raised its policy interest rate.

The results of this study are in line with previous study conduct by Emamian and Mazlan (2021) which state that interest rates have a positive effect on the JCI. In addition, this study also supports the theory of monetary transmission to financial markets from Boivin, Kiley, and Mishkin (2010) which states that interest rates can affect public spending in the investment sector.

The conclusion of testing the hypothesis is that the money supply has a positive effect on the JCI in the period August 2016 to October 2022. This result is in line with the research hypothesis. One component of the broad money supply is quasi-money, which consists of public savings and time deposits. An increase in public quasi-money deposited in banks will push up the money supply. The higher savings and time deposits make people have excess funds to be allocated in investments other than to meet their daily needs.

The results of this study are in line with previous research, namely Qing and Kusairi (2019), Salim and Siregar (2022) which state that the money supply has a positive effect on the JCI. In addition, this study also supports the Arbitrage Price Theory which states that one of the macroeconomic variables that can affect stock price movements is the money supply.

The conclusion of the hypothesis testing is that world oil prices have no effect on the JCI in the period August 2016 to October 2022. This result is not in line with the research hypothesis which states that world oil prices have a positive effect on the JCI. This condition was due to the general increase in world mining commodity prices so that the driving factor for the increase in the JCI was not only influenced by shares of oil mining-based companies. The results of this study are in line with previous studies, namely

Haroon, Aziz, and Batool (2019) which states that world oil prices have no significant effect on the JCI.

The conclusion of testing the hypothesis is that the Singapore stock index has a positive effect on the JCI in the period August 2016 to October 2022. This result is in line with the research hypothesis. This is due to Indonesia's geographical location which is quite close to Singapore, making it easier for the two countries to establish cooperation and integrate economic activities in the ASEAN region today which has led to uniformity in economic trends. The results of this study are in accordance with previous studies by Majeed and Masih (2016) which state that the Singapore stock index has a positive effect on the JCI. In addition, this study also supports the contagion effect theory of Eichengreen, Rose, and Wyplosz (1996) which states that the contagion effect originates from economic interdependence between markets caused by macroeconomic similarities, trade relations and loans from banks.

V. CONCLUSION AND SUGGESTION

A. Conclusion

Based on the research results, the following are the conclusions obtained in this study:

- Interest rates have a positive effect on the JCI.
- The exchange rate has a negative effect on the JCI.
- The money supply has a positive effect on the JCI.
- World oil prices have no effect on the JCI.
- The Singapore stock index has a positive effect on the JCI.

B. Suggestion

Based on the research and conclusions that have been drawn, there are several practical suggestions that researchers can give, including:

- For investor, the result of research can use as a decision support tool for investing. Stock investors in Indonesia can sell or buy shares on the Indonesia Stock Exchange by paying attention to the movement of the Singapore stock index.
- For regulator, when deciding policies, especially variables on this research that have a high significant impact, always consider stock market's trend.
- Further research can use other macroeconomic variables which are the authority of central bank, such as the position of the trade balance and foreign direct investment.

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