

ANALYSIS OF FACTORS AFFECTING PRICE MOVEMENTS INDONESIA STOCK EXCHANGE INDUSTRIAL CLASSIFICATION

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Article Info: Received: December 21, 2022; Revised: February 16, 2023; Accepted: February 25, 2023.

Abstract: The objective of this study is to examine the impact of currency exchange rate variations, global gold and crude oil prices, and the prevalence of Covid-19 cases on the Indonesia Stock Exchange Industrial Classification (IDX-IC). The study used a Vector Autoregression/Vector Error Correction Model, employing daily data spanning from January 26, 2021, to April 28, 2022. The findings indicate that variations in exchange rates have a favorable effect on the industrial and transportation and logistics sectors. In contrast, it can be argued that the impact of global gold prices is adverse for various sectors, encompassing energy, industry, health, and finance. Furthermore, the transportation and logistics industry is negatively impacted by the presence of Covid-19 cases. Moreover, the findings of the forecast error variance decomposition analysis reveal that the sectoral stock price index exhibits the highest degree of self-influence, followed by global gold prices, exchange rates, Covid-19 cases, and global crude oil prices.

Keywords: IDX-IC, Exchange Rate, World Gold Price, World Crude Oil Price, Covid-19 Cases

Abstrak: Tujuan dari penelitian ini adalah untuk menguji dampak variasi nilai tukar mata uang, harga emas dan minyak mentah dunia, serta prevalensi kasus Covid-19 terhadap Klasifikasi Industri Bursa Efek Indonesia (BEI-IC). Penelitian ini menggunakan Vector Autoregression/Vector Error Correction Model, dengan menggunakan data harian mulai dari 26 Januari 2021 hingga 28 April 2022. Temuan menunjukkan bahwa variasi nilai tukar memiliki pengaruh yang baik terhadap sektor industri, transportasi, dan logistik. Sebaliknya, dapat dikatakan bahwa dampak harga emas global berdampak buruk pada berbagai sektor, yang meliputi energi, industri, kesehatan, dan keuangan. Lebih lanjut, industri transportasi dan logistik terkena dampak negatif dari adanya kasus Covid-19. Selain itu, temuan dari analisis dekomposisi varians kesalahan ramalan menunjukkan bahwa indeks harga saham sektoral menunjukkan tingkat pengaruh mandiri yang paling tinggi, diikuti oleh harga emas global, nilai tukar, kasus Covid-19, dan harga minyak mentah global.

Kata Kunci: IDX-IC, Nilai Tukar, Harga Emas Dunia, Harga Minyak Mentah Dunia, Kasus Covid-19

INTRODUCTION

The Indonesia Stock Exchange (IDX) is a platform for domestic and foreign investors that can stimulate economic growth in a country. To make it easier to choose the ideal stock investment, IDX has aggregated firm shares into an index. One such index is the Composite Stock Price Index, which provides information on all stock exchange issuers. Even with the Covid-19 condition and the recovery in the economy, the Composite Stock Price Index grew in 2021. The Composite Stock Price Index closed at \$5,979.07 per share at the end of 2020, with a total transaction of 14 trillion rupiahs. The stock price index has reached 6,500 per share in 2021, and there were 437 trillion rupiahs worth of trades in a single month (BEI, 2021a).

The stock price index by sector, or IDX-IC (Indonesia Stock Exchange Industrial Classification) which includes eleven sectoral indices and was launched on January 25, 2021, is the index with the most recent classification advancement (BEI, 2021b). Stock price index data for each sector during 2021 revealed a favorable trend for the energy, industrial, cyclical consumer goods, health, finance, technology, infrastructure, transportation, and logistics sectors. Basic materials, non-cyclical consumer products, and real estate, on the other hand, are on the decline in 2021.

Exchange rate fluctuations are one of several factors that might cause share prices to rise and fall. This is due to the fact that the exchange rate or exchange rate of the country's currency can be a source of risk while investing (Harutyunyan & Li, 2016). According to Pahlevi (2019), when businesses utilize imported raw materials for production, an increase in the exchange rate enables them to lower production input costs. According to Demir (2019), the instability of the return on investment will have an impact on investors' desire to make investments in the capital market if a country's exchange rate cannot be stabilized. According to research by Tangjitprom (2012) and Lee and Brahasrene (2018), the depreciation of the currency rate enhanced the value of exports due to the high sales of the company to maintain the value of the company in the investors' side. Investments in the stock market have a tendency to drop due to the ambiguous economic climate during the economic recovery era and the Covid-19 epidemic. Given that gold is far more resilient than stocks, investors' expectations and decisions to acquire safe haven assets are undoubtedly influenced by the upheaval in the stock market (Suryanto, 2017). Gokmenoglu (2015) states, the rise in gold prices is a sign that the stock market is in a state of upheaval, and investors are turning to gold to preserve its value and low risk. Bams et

al. (2017) added, when market uncertainty hinders corporate operations, many industries may delay output, which will cause stock market investment to shift to instruments that can preserve the value of assets such gold. Additionally, companies that use crude oil or its derivative products as their primary product or simply as a source of energy to manufacture goods and run business operations would be impacted by the rise in global crude oil prices. Because there are no equivalent inputs for crude oil, an increase in global crude oil prices could result in higher production costs in countries that import oil (An et.al., 2018). According to Raza et al. (2016), the dominance of companies that still use crude oil or its derivative products in production and distribution activities lowers company profits, which has a negative impact on stock prices. Shabir et al. (2020) explained that capital market conditions in developing countries tend to fluctuate easily if they get information about movements in world crude oil prices.

Then, it is undeniable that Covid-19 has a detrimental impact on all areas, particularly on the state of the Indonesian economy, one of which is concern coupled with panic attacks felt by the general public, the business community, and investors (Neufeld et al., 2020). As per Ryandono et al. (2021), the Covid-19 announcement was terrible news for the capital market and caused investors to decide to sell shares. Sugandi (2021) said that the market's reaction happened after the Indonesian large-scale social restrictions was put into place in the nation, not during the Covid-19 case. Karavias et al. (2021) explained, Covid-19 information caused a disruption in the stock market in the early stages of the pandemic due to the unfavorable information that caused investors to pull money out of the highly sensitive stock market. This study aims to investigate how changes in exchange rates, global gold and crude oil prices, and the Covid-19 cases affect sectoral stock indices. This can assist the government create policies to encourage stock market investment, which will have an effect on economic growth.

METHOD

Types and Sources of Data

The secondary time series used in this study spans the daily period of January 26, 2021, through April 28, 2022. The information used in this study was gathered from a number of relevant institutions, including the London Metal Exchange (LME), Bank Indonesia (BI), Indonesia Stock Exchange (IDX), Yahoo Finance, <https://covid19.go.id>, and various research publications.

Data Analysis Vector Autoregression (VAR)/ Vector Error Correction Model (VECM)

In answering the research objective to determine the impact of exchange rate movements, world gold prices, world crude oil prices and Covid-19 cases, the VAR/VECM method is used. The use of the VAR/VECM method was adjusted to the stationarity of the research data used. The VAR method is used if the research data used is stationary at the level. If the research data used is not stationary at the level and is cointegrated, the method used is the VECM method. If the research data is not stationary at the level and is not cointegrated, the method used is the VAR in First Difference.

Pre-Estimated

Test of Data Stationarity

The assessment of stationarity in this research was conducted through both levels and first differences, as described by Firdaus (2020). Stationarity was evaluated using the Augmented Dickey-Fuller (ADF) test, a unit root test. A data series is considered stationary when the ADF test statistic is significantly below the 5% threshold.

VAR Stability

The VAR stability test necessitates the computation of the roots of the polynomial function, commonly referred to as the characteristic polynomial. The VAR model is deemed stable when all of its roots are located within the unit circle or possess absolute values that are smaller than 1. The importance of this stability is in its potential to confirm the validity of the Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) findings, as elucidated by Firdaus (2020).

Test The Lag Optimum

The optimal lag function reveals the responsiveness of a variable to others and plays a crucial role in addressing autocorrelation issues within the VAR system. In the context of the optimal lag test, choosing an excessively long lag can render the model insignificant due to the inefficient allocation of degrees of freedom.

Cointegration Test

In accordance with Firdaus (2020), the presence of a cointegration relationship within a set of equations indicates the existence of a corresponding cointegration relationship within the error correction model. This observation consistently describes the presence of a short-term equilibrium alongside the long-term relationship.

VAR/VECM Research Model

In order to evaluate how factor variables influence the variations in the stock price index of IDX-IC sectors, the research utilized either the Vector Autoregression (VAR) model or the Vector Error Correction Model (VECM), with the assistance of the R software. If the data demonstrates stationarity at the base level, the VAR equation model employed in this study is outlined as follows:

$$LnIDXIC_t = \alpha + \sum_{i=1}^{k-1} r_i LnIDX - IC_{t-i} + \sum_{i=1}^{k-1} r_i LnER_{t-i} + \sum_{i=1}^{k-1} r_i LnGP_{t-i} + \sum_{i=1}^{k-1} r_i COP_{t-i} + \sum_{i=1}^{k-1} r_i LnCV_{t-i} + \varepsilon_{it}$$

Description

Ln	Natural Logarithmic
IDXIC _t	: Closing price of 11 sectoral stock price indexes at time t (Rupiah)
ER _t	: Rupiah exchange rate against US Dollar at time t (Rupiah)
GP _t	: Price world gold at time t (USD)
COP _t	: World crude oil prices at time t (USD)
CV _t	: Number of National Covid-19 confirmed cases at time t (Souls)
α	: Intercept
r	: Variable Coefficient
i	: Length Lag (order) (i = 1,2,3,...)
ε_{it}	: Term

If the research data used is not stationary at the level and is cointegrated, then the model used is the VECM method. The VECM equation model in this study is as follows:

$$\Delta y_t = \mu_{0x} + \mu_{1x}t + \Pi_x y_{t-1} + \sum_{i=1}^{k-1} \Gamma_k \Delta y_{t-i} + \varepsilon_t$$

Description

y _t	: Vector containing the variables analyzed in the study
μ_{0x}	: Vector Intercept
μ_{1x}	: Regression coefficient vector
t	: Time trend
Π_x ×	$\alpha \times \beta'$ where β' contains long-term cointegration equation
y _(t-1)	: Variable In-level
Γ_k	: Regression coefficient matrix
k-1	: VECM order of VAR

ε_t : Error term

Impulse Response Function (IRF)

The Impulse Response Function (IRF) analysis examines the effects of a one standard deviation shock experienced by a single system variable on the values of all other system variables, both immediately and over subsequent time periods, as discussed by Firdaus (2020). This analysis serves the purpose of ascertaining how a variable responds to a shock, whether originating from its own variable or other endogenous variables. Furthermore, it helps in understanding the anticipated behavior of each of these variables over multiple future periods.

Forecast Error Variance Decomposition (FEVD)

The Forecast Error Variance Decomposition (FEVD) analysis is used to predict the portion of variance that each variable contributes to specific variables within the VAR system. Unlike the previous Impulse Response Function (IRF) analysis, which concentrated on evaluating how shocks from one variable impacted others, FEVD analysis aims to clarify the relative importance of each variable in the VAR system in relation to these shocks.

RESULTS AND DISCUSSION

Respondents' Characteristics

Stationarity Test

The dataset employed in this investigation comprises time series data, which typically exhibit a trend or lack stationarity. Non-stationary data often contain a unit root, and the presence of such unit roots in variables can lead to spurious regression, thus posing challenges in model estimation and introducing bias. To assess the stationarity and degree of stationarity in the dataset, a stationarity test was administered utilizing the Augmented Dickey-Fuller (ADF) test.

Table 1 Stationarity test results

Variable	Critical Value 5%	ADF Statistics	Stasionary Test Result on Level	ADF Statistics	Stasionary Test Result on First Difference
IDXENERGY	1.95	-0.106	Not Stasionary	-18.002	Stasionary
IDXBASIC	1.95	-0.303	Not Stasionary	-17.671	Stasionary
IDXINDUST	1.95	-0.076	Not Stasionary	-20.570	Stasionary
IDXNONCYCLIC	1.95	-0.244	Not Stasionary	-17.658	Stasionary
IDXCYCLIC	1.95	-0.091	Not Stasionary	-16.615	Stasionary
IDXHEALTH	1.95	-0.206	Not Stasionary	-17.974	Stasionary
IDXFINANCE	1.95	-0.232	Not Stasionary	-18.464	Stasionary

IDXPROPERT	1.95	-0.101	Not Stasionary	-17.220	Stasionary
IDXTECHNO	1.95	-0.010	Not Stasionary	-16.663	Stasionary
IDXINFRA	1.95	-0.158	Not Stasionary	-18.194	Stasionary
IDXTRANS	1.95	-0.127	Not Stasionary	-17.499	Stasionary
ER	1.95	-0.005	Not Stasionary	-17.835	Stasionary
GP	1.95	0.052	Not Stasionary	-17.032	Stasionary
COP	1.95	-0.102	Not Stasionary	-17.888	Stasionary
CV	1.95	-0.298	Not Stasionary	-23.919	Stasionary

ADF statistic > Critical Value = Stationary

The unit root test results presented in Table 1 indicate that none of the variables exhibit stationarity at the base level. However, they do display stationarity when examined at the first difference, as evidenced by the ADF statistic surpassing the critical value of 5%. The presence of non-stationary data at the base level suggests a long-term relationship between these variables.

VAR Stability Test

The VAR stability test holds a crucial role in ascertaining the stability of the VAR model, as it directly affects the reliability of subsequent assessments such as the Impulse Response Function (IRF) and the Forecast Error Variance Decomposition (FEVD). This evaluation entails the computation of the roots of the polynomial function. A system is classified as stable when all of its roots exhibit smaller absolute values, with the stipulation that one or more of these variables fall within the unit circle. If all absolute values are less than 1, the VAR model is considered stable, thereby confirming the validity of the ensuing IRF and FEVD tests, as detailed by Firdaus (2011). The results of the VAR stability test conducted in this study can be seen in Table 2.

Table 2 The VAR stability test results

Variable	Modulus Value
IDXENERGY	0.06 - 0.98
IDXBASIC	0.08 - 0.99
IDXINDUST	0.13 - 0.99
IDXNONCYCLIC	0.47 - 0.99
IDXCYCLIC	0.03 - 0.99
IDXHEALTH	0.02 - 0.99
IDXFINANCE	0.05 - 0.99
IDXPROPERT	0.04 - 0.99
IDXTECHNO	0.32 - 0.99

IDXINFRA	0.06 - 0.98
IDXTRANS	0.07 - 0.99

Test Lag Optimum

"The subsequent phase involves identifying the optimal lag duration. This determination of lag in the VAR system holds utmost importance, given that the cointegration testing phase is highly dependent on the lag parameter. Lag selection is necessary to encompass the time frame over which each variable's influence on others is accounted for. Additionally, it plays a pivotal role in mitigating autocorrelation issues within the VAR system, in accordance with Firdaus (2020). The findings of the optimal lag test for this study are detailed in Table 3."

Table 3 Optimum lag test results

Variable	AIC(n)	HQ(n)	SC(n)	FPE(n)
IDXENERGY	2	1	1	2
IDXBASIC	2	1	1	2
IDXINDUST	2	1	1	2
IDXNONCYCLIC	2	1	1	2
IDXCYCLIC	2	1	1	2
IDXHEALTH	2	1	1	2
IDXFİNANCE	2	1	1	2
IDXPROPERT	2	1	1	2
IDXTECHNO	2	2	1	2
IDXINFRA	2	1	1	2
IDXTRANS	2	1	1	2

Cointegration test

Cointegration within an equation signifies the existence of a stable, long-term equilibrium relationship. When cointegration is observed in a set of equations, it implies the presence of an error correction model within those equations, elucidating the short-term dynamics converging consistently towards the long term. The examination for cointegration is performed through the Johansen Cointegration test, which involves comparing the trace statistic to a critical value at the 5 percent significance level. If the trace statistic exceeds the critical value at the 5 percent significance level, it indicates that the system of equations is cointegrated, thereby allowing for the utilization of the VECM model.

Table 4 Cointegration test results

IDXENERGY			test	5pct	IDXFİNANCE			test	5pct
r	<=	4	1.59	9.24	r	<=	4	1.61	9.24
r	<=	3	6.15	19.96	r	<=	3	3.81	19.96
r	<=	2	19.7	34.91	r	<=	2	14.95	34.91

r	<=	1	36.42	53.12	r	<=	1	31.24	53.12
r	=	0	62.45	76.07	r	=	0	51.35	76.07
IDXBASIC			test	5pct	IDXPROPERT			test	5pct
r	<=	4	1.46	9.24	r	<=	4	2.04	9.24
r	<=	3	6.06	19.96	r	<=	3	7.24	19.96
r	<=	2	13.65	34.91	r	<=	2	19.7	34.91
r	<=	1	28.79	53.12	r	<=	1	35.32	53.12
r	=	0	46.69	76.07	r	=	0	58.87	76.07
IDXINDUST			test	5pct	IDXTECHNO			test	5pct
r	<=	4	2.36	9.24	r	<=	4	1.51	9.24
r	<=	3	6.77	19.96	r	<=	3	3.74	19.96
r	<=	2	18.11	34.91	r	<=	2	8.5	34.91
r	<=	1	36.33	53.12	r	<=	1	25.52	53.12
r	=	0	64	76.07	r	=	0	57.42	76.07
IDXNONCYC			test	5pct	IDXINFRA			test	5pct
r	<=	4	1.51	9.24	r	<=	4	2.33	9.24
r	<=	3	4.67	19.96	r	<=	3	5.48	19.96
r	<=	2	12.25	34.91	r	<=	2	17.67	34.91
r	<=	1	27.23	53.12	r	<=	1	32.81	53.12
r	=	0	49.01	76.07	r	=	0	69.93	76.07
IDXCYCLIC			test	5pct	IDXTRANS			test	5pct
r	<=	4	1.55	9.24	r	<=	4	1.87	9.24
r	<=	3	4.58	19.96	r	<=	3	7.89	19.96
r	<=	2	16.42	34.91	r	<=	2	19.35	34.91
r	<=	1	31.04	53.12	r	<=	1	35.56	53.12
r	=	0	53.05	76.07	r	=	0	54.58	76.07
IDXHEALTH			test	5pct					
r	<=	4	1.55	9.24					
r	<=	3	4.82	19.96					
r	<=	2	16.98	34.91					
r	<=	1	33.66	53.12					
r	=	0	52.82	76.07					

Table 4 presents evidence that the trace statistic for each IDX-IC sector falls below the critical threshold, indicating an absence of a short-term relationship converging towards the long term. These findings preclude the continuation of VECM estimation, necessitating the estimation of the VAR in first difference (VARFD).

Test Lag VARFD Optimum

As the VECM model cannot be pursued due to the absence of cointegration within the model, it becomes essential to perform the optimal lag test in order to determine the lag duration for

the VAR in Difference model. The findings of the optimal lag test for VARFD are presented in Table 5, revealing a lag length of one.

Table 5 VARFD optimum lag test results

Variable	AIC(n)	HQ(n)	SC(n)	FPE(n)
IDXENERGY	1	1	1	1
IDXBASIC	1	1	1	1
IDXINDUST	1	1	1	1
IDXNONCYCLIC	1	1	1	1
IDXCYCLIC	1	1	1	1
IDXHEALTH	1	1	1	1
IDXFINANCE	1	1	1	1
IDXPROPERT	1	1	1	1
IDXTECHNO	1	1	1	1
IDXINFRA	1	1	1	1
IDXTRANS	1	1	1	1

VARFD Stability Test

Testing for stability in VARFD is of utmost significance, as unstable estimation outcomes can render the Impulse Response Function (IRF) and Forecast Error Variance Decomposition (FEVD) analyses unreliable. In the VAR system, stability is confirmed when the absolute values are less than one. According to the VARFD stability test presented in Table 6, the results suggest that the estimations have achieved stability, thereby affirming the reliability of the IRF and FEVD analyses due to the modulus falling below one.

Table 6 VARFD stability test results

Variabel	Modulus Value
IDXENERGY	0.08 - 0.32
IDXBASIC	0.08 - 0.32
IDXINDUST	0.00 - 0.30
IDXNONCYCLIC	0.02 - 0.32
IDXCYCLIC	0.06 - 0.32
IDXHEALTH	0.02 - 0.31
IDXFINANCE	0.03 - 0.31
IDXPROPERT	0.05 - 0.32
IDXTECHNO	0.06 - 0.44
IDXINFRA	0.04 - 0.32
IDXTRANS	0.05 - 0.31

Results Vector Autoregressive in First Difference (VARFD) Estimation

The results of the cointegration test indicate that there is no presence of cointegration in the model. As a result, it is necessary to employ the VARFD approach for estimate. This study

using VARFD estimate to analyze the impact of exchange rates, worldwide gold prices, and global crude oil prices on stock prices in the IDX-IC sectors. A significance level of five percent was adopted for this research, with a critical t-value of 1.95 obtained from the t-table. Hence, the test outcomes are considered significant if the t-statistic exceeds this threshold of 1.95 or if the p-value falls below 5%. The results of the VARFD estimation can be found in Table 7.

Table 7 VARFD estimation results

Variable	Description	const	IDX-IC _{t-1}	ER	GP	COP	CV
IDXENERGY	Coefficient	0.0019	0.1660	0.0251	-0.1871	0.0367	-0.0009
	<i>p-value</i>	[0.0156]	[0.0046]***	[0.9389]	[0.0345]**	[0.2424]	[0.7180]
IDXBASIC	Coefficient	0.0001	-0.0308	-0.1499	-0.0493	-0.0031	-0.0023
	<i>p-value</i>	[0.8740]	[0.6060]	[0.6360]	[0.5530]	[0.9140]	[0.3580]
IDXINDUST	Coefficient	0.00091	-0.1419	0.6405	-0.1631	0.0186	0.0029
	<i>p-value</i>	[0.2110]	[0.0144]**	[0.0317]**	[0.0411]**	[0.5062]	[0.2399]
IDXNONCYCLIC	Coefficient	-0.0004	0.0069	-0.1081	0.0148	0.0036	0.0001
	<i>p-value</i>	[0.3520]	[0.905]	[0.5970]	[0.7870]	[0.8490]	[0.9180]
IDXCYCLIC	Coefficient	0.0006	0.2131	0.1652	-0.0885	0.0044	0.0014
	<i>p-value</i>	[0.2197]	[0.0002]***	[0.4585]	[0.1378]	[0.8317]	[0.4299]
IDXHEALTH	Coefficient	0.0004	-0.0793	0.0457	-0.2003	0.0234	0.0001
	<i>p-value</i>	[0.4546]	[0.1614]	[0.8523]	[0.0029]***	[0.3201]	[0.9306]
IDXFINANCE	Coefficient	0.0007	-0.1042	0.0826	-0.1448	-0.0078	0.0014
	<i>p-value</i>	[0.2243]	[0.0744]*	[0.7288]	[0.0229]**	[0.7242]	[0.4721]
IDXPROPERT	Coefficient	-0.0006	0.0500	0.3318	-0.0468	-0.0044	0.0002
	<i>p-value</i>	[0.2600]	[0.4040]	[0.1650]	[0.4560]	[0.8430]	[0.9180]
IDXTECHNO	Coefficient	0.0028	0.4513	0.8783	-0.0120	-0.0423	0.0028
	<i>p-value</i>	[0.0720]	[0.0000]***	[0.1550]	[0.9430]	[0.4770]	[0.5870]
IDXINFRA	Coefficient	0.0005	-0.1278	-0.0582	-0.0961	-0.0164	0.0002
	<i>p-value</i>	[0.4327]	[0.0256]**	[0.4138]	[0.2762]	[0.5129]	[0.9077]
IDXTRANS	Coefficient	0.0025	0.0145	0.6615	-0.0770	-0.0382	-0.0052
	<i>p-value</i>	[0.0062]	[0.8003]	[0.0757]*	[0.4446]	[0.2862]	[0.0922]*

(*) Significance 5%

The estimation results show that the energy sector stock price index (IDXENERGY), cyclical consumer goods (IDXCYCLIC) and the technology sector (IDXTECHNO) in the previous period had a positive and significant impact on the movement of the stock price index in the current period. If the stock price index of the energy sector increases by one standard deviation in the previous period, it will increase the current stock price index of the energy sector by 0.1660. Then the increase in the stock price index of the cyclical consumer goods sector by one standard deviation in the previous period will increase the current stock price index of the cyclical consumer goods sector by 0.0069. Furthermore, an increase in the stock price of the technology sector in the previous period will increase the current stock price index of the technology sector by 0.4153. The estimation outcomes also reveal that the stock price indices of the industrial sector (IDXINDUST), finance sector (IDXFINANCE), and infrastructure

sector (IDXINFRA) in the prior period had a notable negative influence on the movements of the stock price index in the current period. Specifically, an increase in the industrial sector's stock price index in the previous period by one standard deviation led to a corresponding decrease of 0.1419 in the stock price for the current period. Similarly, an increase in the finance sector's stock price index by one standard deviation resulted in a reduction of 0.1042 in the current period's stock price index. Furthermore, an increase in the infrastructure sector's stock price index in the previous period by one standard deviation led to a decrease of 0.1278 in the stock price index of that sector for the current period. According to Thuy and Thuy (2019), the appreciation of the exchange rate helps increase the productivity of the company because the input decrease and the company's profit increases. The increase in company profits ultimately encourages investor demand in the stock market because they know the condition of the company and reduce the risk of investing in the company's shares.

Additionally, the estimation results indicate that the exchange rate has a positive and statistically significant impact on the stock price index of the industrial sector (IDXINDUST) and the transportation and logistics sector (IDXTRANS). Specifically, an increase in the exchange rate by one standard deviation resulted in an increase of 0.6405 in the industrial sector's stock price index and 0.6615 in the transportation and logistics sector's stock price index for the current period. These findings align with the research conducted by Demir (2019), which suggests that a strengthening exchange rate leads to heightened investor demand for shares. Increased investor demand, prompted by a stronger exchange rate, serves as a signal to investors regarding future returns.

Moreover, the estimation findings indicate that global gold prices have a notable and adverse impact on various sectoral stock price indices. For instance, in the energy sector (IDXENERGY), a one-standard-deviation increase in global gold prices resulted in a decrease of 0.18715 in the stock price index of the energy sector. Furthermore, in the industrial sector (IDXINDUST), an increase in the price of gold by one standard deviation will reduce the stock price index of the industrial sector by 0.16314. The health sector (IDXHEALTH) shows that an increase in world gold prices by one standard deviation will reduce the health stock price index by 0.20034. The financial sector (IDXFINANCE) also showed a decrease of 0.14482 when world gold prices increased by the standard deviation. The results of this study are in line with Gokmenoglu's research (2015) which states that investment in gold is a substitute for

investments made by investors when the stock market is considered unstable. Bams et al. (2017) also state that investors' decisions to minimize risk and diversify their portfolios when there is stock market uncertainty are to invest in gold and reduce investment in the stock market in order to protect asset values. Meanwhile, world crude oil prices during the estimation period did not significantly affect the movement of sectoral stock price indexes. The results of this study are not in line with the research conducted by Raza et al. (2016) regarding the increase in world crude oil prices will reduce stock prices due to the increasing input of companies to carry out production, especially companies that use derivative products from crude oil. However, according to Mahendra et al. (2022) an increase in world crude oil prices when the economic recovery due to the pandemic is good news for investors because it is a sign of increasing global demand. That way, if world crude oil prices increase, expectations of improving company performance will also increase so that investors have a positive sentiment for future returns.

Subsequently, the estimation outcomes reveal that the count of confirmed Covid-19 cases throughout the estimation period has a substantial and adverse impact on the dynamics of the stock price index within the transportation and logistics sector (IDXTRANS). If there is an increase in Covid-19 cases by one standard deviation, it will reduce the stock price index of the transportation and logistics sector by 0.0052. This result is in line with Halisa and Annisa's (2020) research which states that the increase in Covid-19 cases in Indonesia has caused stock prices to decline due to the social restrictions policy set by the government. President Joko Widodo when opening the Indonesia Stock Exchange (IDX) 2022 trading stated that the government has tried to accelerate the national economic recovery during 2021 with a series of policies such as vaccination and community activity restriction (PPKM) in the hope of suppressing the spread of the Covid-19 virus so that capital market volatility can be controlled and restoring normalcy to people's mobility in Indonesia (OJK 2022).

Impulse Response Function (IRF)

The Impulse Response Function (IRF) analysis is a method used to ascertain how endogenous variables respond when subjected to shocks of one standard deviation in a VARFD system of equations. This analysis provides insights into how the primary variable reacts to shocks originating from other variables in subsequent periods. In essence, the IRF quantifies the

impact of a shock at a specific time on the innovation of endogenous variables at that time and into the future, as well as the duration of its influence, as explained by Firdaus (2020).

IDX-IC's Response to Exchange Rate Shocks, World Gold Prices, World Crude Oil Prices and Covid-19 Cases

The findings in this investigation reveal variations in how sectoral stock price indices respond to shocks in exchange rates, global gold prices, global crude oil prices, and Covid-19 cases over the subsequent ten periods. As illustrated in Figures 1, 2, 3, and 4, all sectors exhibited a response to these shocks in the second period but subsequently reverted to equilibrium in the fourth period, maintaining stability throughout the following ten periods.

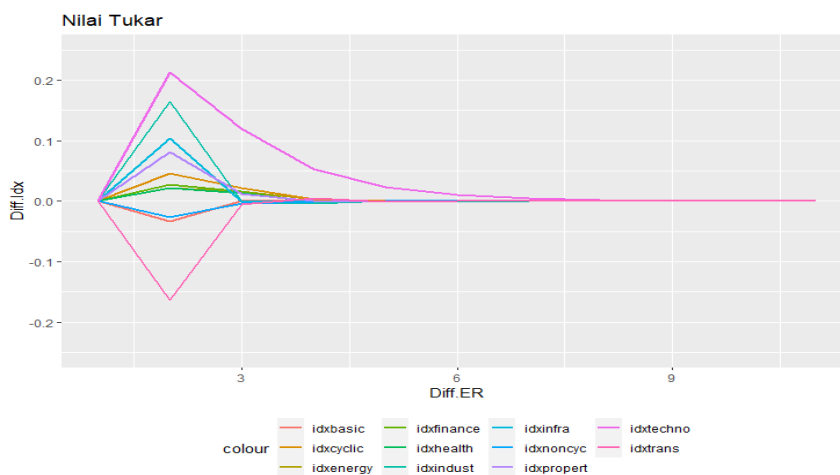


Figure 1 IDX-IC's response to exchange rate shocks

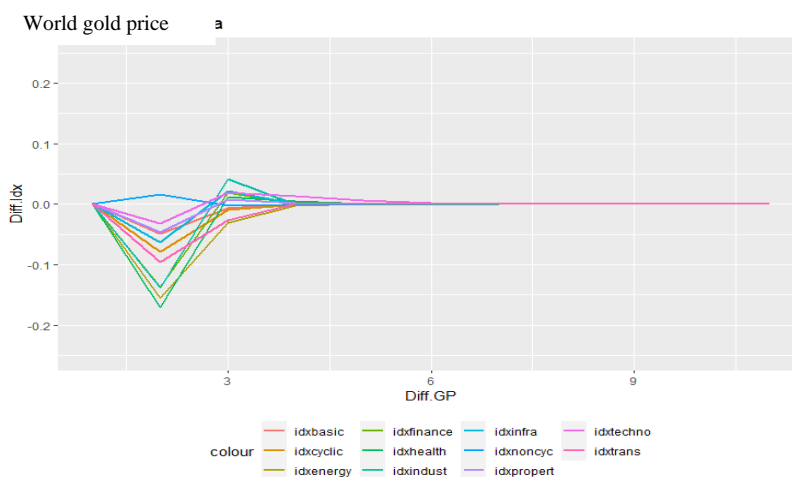


Figure 2 IDX-IC's response to world gold price shocks

World crude oil price

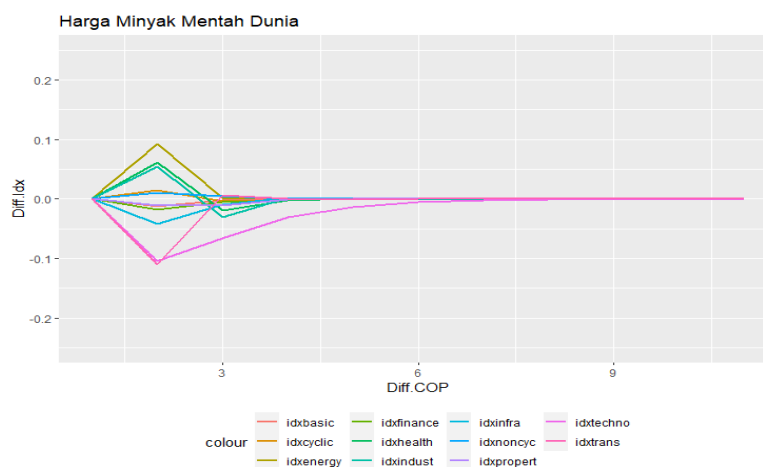


Figure 3 IDX-IC's response to world crude oil price shocks

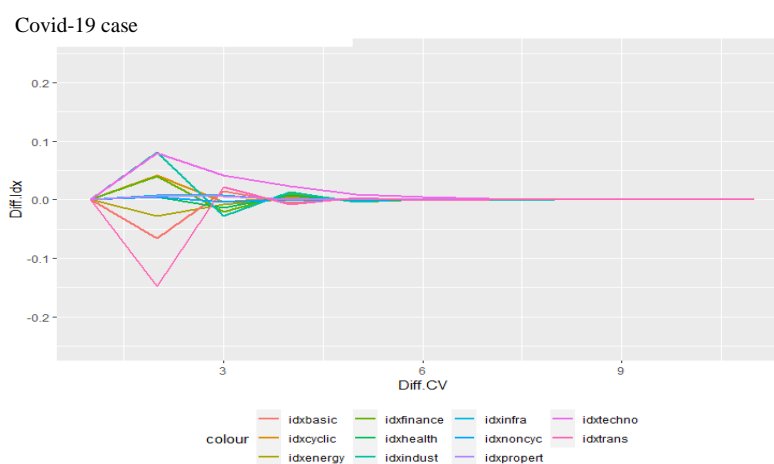


Figure 4 IDX-IC's response to Covid-19 shocks

The biggest stock price indexes in responding to exchange rate shock in the second period was the technology sector (IDXTECHNO) with a positive response of 0.213%, followed by the industrial sector (IDXINDUST) at 0.165% and the infrastructure sector (IDXINFRA) at 0.103%. Meanwhile, the transportation and logistics sector (IDXTRANS) responded negatively to exchange rate shocks of 0.164% and the rest responded to shocks below 0.1%. The health sector (IDXHEALTH) responded negatively to the biggest shock in world gold prices at 0.171%, followed by the energy sector (IDXENERGY) at 0.155%, followed by the industrial sector (IDXINDUST) at 0.139% and the financial sector (IDXFİNANCE) at 0.137%. Meanwhile, the only sector that responded positively to shocks in world gold prices was the non-cyclical consumer goods sector (IDXNONCYC) of 0.01%. The energy sector (IDXENERGY) responded positively to shocks in world crude oil prices at 0.092%.

Meanwhile, the sector that responded negatively was transportation and logistics (IDXTRANS) at 0.110%, followed by the infrastructure sector (IDXINFRA) at 0.104%. The shock of the Covid-19 case was responded negatively by the transportation and logistics sector (IDXTRANS) at 0.148% and followed by the raw goods sector (IDXBASIC) at 0.067%. While the sectors that responded positively to the shocks of the Covid-19 case were the industrial sector (IDXINDUST) at 0.082% and the technology sector (IDXTECHNO) at 0.079% and the raw goods sector (IDXBASIC) at 0.067%.

Forecast Error Variance Decomposition (FEVD)

Forecast Error Variance Decomposition (FEVD) analysis is employed to assess how the impacts of each variable affect other variables in subsequent periods. FEVD offers insights into the proportion of future fluctuations attributed to both the shock itself and other variables. In this study, the analysis spans the next ten periods. Figure 5 displays the outcomes of the FEVD test, indicating that the factors influencing the movements of the IDX-IC sectoral stock price index begin to contribute from the second period onward. On average, the primary contributor is the index of each sector to itself, followed by the contributions of global gold prices, exchange rates, Covid-19 cases, with world crude oil prices having the smallest impact.

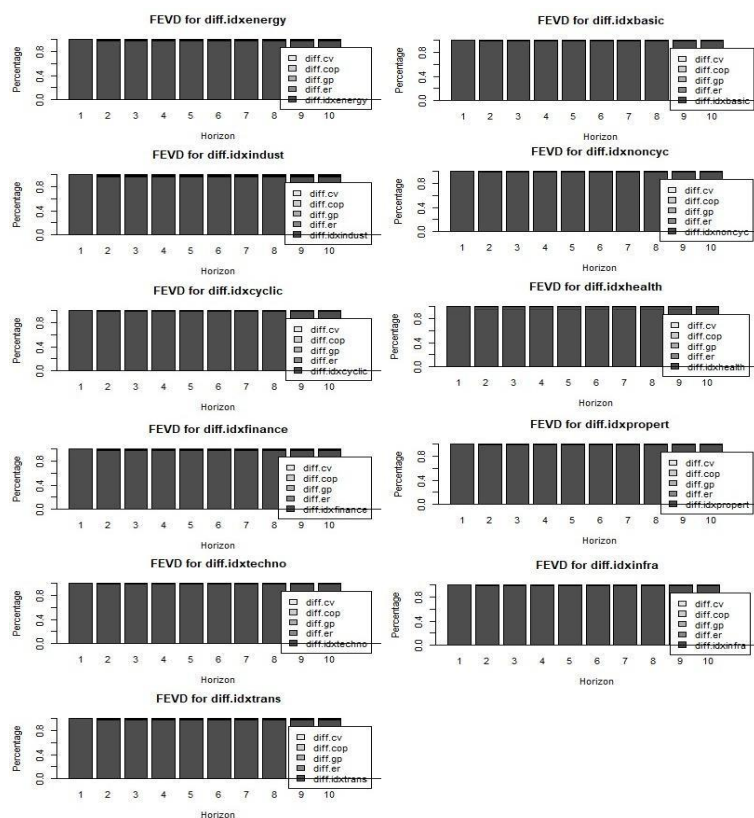


Figure 5 Contribution of factors to IDX-IC

CONCLUSION

Stock price indexes in the manufacturing, shipping, and logistics sectors react to changes in the exchange rate. However, the energy, industrial, health, and financial sectors' stock price indexes are negatively impacted by the global movement of gold prices. The stock price indices for the transportation and logistics industries were negatively affected by COVID-19. Exchange rates, crude oil prices, gold prices, and the COVID-19 pandemic all prompted varied reactions from these industries. Nonetheless, the effects of the modifications began to show up by the second period, reached equilibrium again by the fourth period, and stayed put by the tenth period. Sector stock price fluctuations are driven primarily by internal factors. After these variables are things like the COVID-19 cases, the global crude oil price, the global gold price, and the currency rate.

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AGREGAT: Jurnal Ekonomi dan Bisnis
Volume 7 (No 1), 2023
<http://journal.uhamka.ac.id/index.php/agregat/>
p-ISSN: 2549-5658 e-ISSN: 2549-7243
DOI: 10.22236/agregat_vol7/is1pp10-28
Pp 10-28

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