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Effect of Trading Days on Precious Metals and Stock Returns During COVID-19 and the Russia-Ukraine War

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Abstract: This study was conducted to determine the returns generated during trading days in the commodity market and the stock market. The efficient market theory says that the return generated is the same every day. However, some studies have found positive and negative returns that occur on different days for each research period. The COVID-19 pandemic has affected the economic condition of a country. In addition, geopolitical conditions will also affect trade cooperation between countries. The method used in this study is GARCH (1,1) with data taken during the COVID-19 pandemic and the Russia-Ukraine war. The samples used in this study are the Jakarta Composite Index (JCI) and precious metal commodities. Precious metals are represented by gold, silver, platinum, and palladium. The results show that during the COVID-19 pandemic, the JCI, Platinum, and Palladium were proven to have a day-of-the-week effect. During the Russia-Ukraine War, there was no day-of-the-week effect.

Keywords: COVID-19, precious metals, Russia-Ukraine war, stocks

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INTRODUCTION

The capital market has an extremely important role in a country's economic development. The capital market functions dually as a forum to support business funding and as a place for people to make investments (Sambuari et al., 2020). This makes it a place where parties who need funds can meet with parties who provide funds to carry out transactions related to securities or shares (Suciati, 2018). Trading days on the capital market itself are carried out from Monday to Friday every week. In addition, trading

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activities will be closed on national holidays and in other unforeseen situations and conditions in the country. Therefore, financial markets will experience unexpected patterns such as market anomalies.

Market anomalies refer to events that cannot be predicted at certain times. So, it provides an opportunity to get unusual returns for investors. This is contrary to efficient market theory, which states that the daily return value will remain constant every day within the trading period. Currently, a lot of anomalies have been found in capital markets, such as the monthly effect, turn of the month effect, Ramadhan effect, Santa Claus effect, even the lunar calendar effect. However, one of the prominent market anomalies is the day-of-the-week effect. This seasonal pattern is also evidence that the stock market is not efficient in its weak form and proves that aspects of investor behavior also play an important role in shaping the decision-making process in investment activities by investors in the stock market. This anomaly creates special interest for investors regarding the complexity of the dynamics that occur in financial markets. This anomaly highlights different stock movement or return patterns on certain days of the week. The existence of this phenomenon raises questions about whether market players can exploit this pattern to gain profits beyond expectations from the efficient market concept, especially in terms of weak-form market efficiency.

One of the main theories in behavioral finance is the efficient market hypothesis (EMH). According to Fama (1970), an efficient capital market is one in which stock prices always fully reflect readily available information. According to Fama (1970), capital market efficiency testing can be broken down to three forms of efficiency: the weak form efficiency test, in this form, capital market is declared efficient if the movements of stock price are unpredictable/walking randomly (random walk); the semi-strong form efficiency test, in this form, capital market will be declared efficient if all publicly available information reflected in stock prices; and the strong form efficiency test, in this form, capital market will be declared efficient, if all available information reflected in stock price (both public information or private information).

Several studies related to capital market efficiency, particularly studies of weak form efficiency, often conclude that there are contradictions with the concept of efficient capital markets, such as the discovery of certain seasonal patterns that are not actually caused by reactions to available information (both public information and private information). When the stock market reacts to things that are not categorized as efficient markets, this condition is considered an anomaly or disturbance. Anomalies that are often encountered

in the capital market are anomalies such as the day-of-the-week effect, the monthly effect, the religious days effect, the year-end effect, and the turn of the month effect.

Some studies regarding the day of the week effect have been conducted in Indonesia by Robiyanto (2000) and Kusno et al. (2021). Robiyanto (2000) used sectoral stock price indices, JCI, and LQ45 Index in his analysis and found that seasonality, such as the day of the week effect, exists, and concluded that the market is not efficient in weak-form. Newer research conducted by Kusno et al. (2021). Kusno et al. (2021) show the impact of market anomalies on stock returns on the Indonesia Stock Exchange during the 2018-2020 period, and have a significant negative influence on stock returns when viewed from the day of the week variable. Focused on the influence of trading days or the January effect on stock returns on IDX30. Therefore, this research is different from previous research because it will test the impact of the day of the week effect on Jakarta Composite Index (JCI) returns during the COVID-19 pandemic and the Russia-Ukraine war.

Along with the development of the capital market, commodity products have experienced significant progress, one example of which is precious metal commodities. These commodity products can be grouped as an asset class (Robiyanto et al., 2017). The precious metal commodity market is an important part of the world of finance, involving the trading of precious metals such as gold, silver, platinum, and palladium. Precious metals not only have high commercial value but are also attractive as a form of investment and hedging tool amidst economic and geopolitical uncertainty. Returns from investments in precious metal commodities are influenced by various factors, including inflation rates, interest rates, currency exchange rates, demand and supply in global markets, and global political conditions. However, investment returns in precious metal commodities do not always experience positive increases due to price fluctuations that are quite large and difficult to predict accurately.

The emergence of the COVID-19 pandemic in early 2020 had a significant impact on various aspects of the global economy, including trade in the commodity market. This incident poses serious challenges for the commodities sector because it causes economic turmoil, changes in demand and supply patterns, and overall changes in market dynamics. This situation was triggered by rapidly growing negative sentiment regarding the coronavirus spreading in China. China, as a country with a large economy, has a significant impact on the global economy (Kusnandar & Bintari, 2020). Apart from the COVID-19 pandemic, other events such as war have also influenced changes in market patterns. According to Kusuma et al. (2022), the initial events of the Russia-Ukraine war and the

imposition of sanctions against Russia did not show significance in the abnormal returns for most of the days surrounding the event. Furthermore, the average abnormal return also did not differ significantly between the periods before and after the event occurred. Previous research conducted by Meek & Hoelscher (2023) has evaluated the impact of the trading day effect or day of the week effect on returns on petroleum commodities. The results of this research stated that the day of the week effect was proven to occur, especially on Fridays. In addition, there is a positive influence that can be observed on Wednesday when using the GARCH (1,1) model, although it is not significant when using other models.

This research is a development of research conducted by Meek & Hoelscher (2023), which examined the day of the week effect on petroleum. What differentiates Meek & Hoelscher's (2023) research is that this research will focus on precious metal commodities and stocks. Thus, this research will examine whether there is an impact of the trading day effect on precious metal commodity returns during the COVID-19 pandemic period and the Russia-Ukraine war, which is still interesting to research. In the framework of this research, precious metal commodities are represented by gold, silver, platinum, and palladium. Apart from that, another aspect that will be investigated is the influence of trading day effects on stock returns. It is hoped that the results of this research can provide investors with a deeper understanding of identifying, analyzing, and making investment decisions, especially on certain days of the week when precious metal commodity trading occurs.

Research on seasonal patterns conducted in Indonesia, particularly those examining the impact of trading days (day of the week effect), is frequently conducted by employing several analytical tools that are inappropriate (not suitable) for the characteristics of the daily return of stock market data. The usage of these inappropriate analytical tools could produce inconsistencies in research conclusions, which may mislead both academics and investment managers. Statistical tools such as the ordinary least squares (OLS) technique are one of the popular analytical tools of choice in seasonal pattern research in Indonesia, even though this analytical tool is based on the assumption of data normality and homoscedasticity.

METHOD

This research uses a quantitative approach with the aim of analyzing the impact of trading days in one week on returns on precious metal commodities, such as gold, silver,

platinum, and palladium. The type of data used is secondary and time series, with an observation period covering the COVID-19 pandemic and the Russia-Ukraine conflict. The time span of the COVID-19 pandemic involves the period from March 2020 to June 2023, while the Russia-Ukraine conflict occurred from February 2022 to June 2023. Data regarding gold, silver, platinum, and palladium commodity prices were obtained from www.investing.com, while share price (JCI) data was taken from www.yahoofinance.com.

Data was analyzed by using Generalized Autoregressive Conditional Heteroscedasticity (GARCH), specifically using the GARCH (1,1) model. This method was first discovered by Engle in 1982. The GARCH model introduced by Bollerslev (1986) is a development of the ARCH model. Day-of-the-week effect equation as follows:

$$R_{it} = \beta_1 Mon + \beta_2 Tue + \beta_3 Wed + \beta_4 Thu + \beta_5 Fri + \varepsilon_t$$

Where:

R_{it}	=	Return of instrument i in period t
ε_t	=	Residual
Mon	=	Dummy variable, 1 if Monday, 0 if other days.
Tue	=	Dummy variable, 1 if Tuesday, 0 if other days.
Wed	=	Dummy variable, 1 if Wednesday, 0 if other days.
Thu	=	Dummy variable, 1 if Thursday, 0 if other days.
Fri	=	Dummy variable, 1 if Friday, 0 if other days.

Prior to GARCH (1,1) analysis, several preliminary analyses will be conducted, such as a data normality test by using the Jarque-Bera test, a data stationarity test by using the Augmented Dickey-Fuller test. These analyses are indispensable to check the data characteristics.

RESULTS

Descriptive Statistics

Based on Table 1, during the COVID-19 pandemic, the highest average daily return was recorded for silver, with a return of 0.07%, while the lowest average return was recorded for palladium, with a return of -0.04%. The risk level for each precious metal is measured by its standard deviation. Gold had the lowest standard deviation at 1.10%, while palladium recorded the highest at 3.02%. Therefore, palladium's daily return carries the highest risk,

while gold's daily return carries the lowest risk.

Table 1 Descriptive Statistics (COVID-19 Pandemic Period)

Description	JCI	Gold	Silver	Platinum	Palladium
Mean	0.03%	0.03%	0.07%	0.03%	-0.04%
Maximum	10.19%	5.95%	9.30%	10.44%	18.05%
Minimum	-6.58%	-4.99%	-11.61%	-12.73%	-20.48%
Std. Dev	1.14%	1.10%	2.33%	2.23%	3.02%
Observation	807	806	791	806	807

Table 2 shows that during the Russia-Ukraine war, the highest average daily return was recorded for gold, with a return of 0.031%, while the lowest average return was for palladium, with a return of -0.124%. The risk level for these precious metals is measured by their standard deviation. Gold displayed the lowest standard deviation at 0.939%, while palladium recorded the highest at 3.061%. Therefore, palladium's daily return indicates the highest level of risk, while gold's daily return has the lowest.

Table 2 Descriptive Statistics (Russia-Ukraine War Period)

Description	JCI	Gold	Silver	Platinum	Palladium
Mean	0.006%	0.031%	0.029%	-0.002%	-0.124%
Maximum	2.243%	3.133%	8.141%	6.192%	12.575%
Minimum	-4.413%	-2.766%	-5.867%	-5.763%	-15.593%
Std. Dev	0.725%	0.939%	1.909%	1.877%	3.061%
Observation	422	422	417	422	422

Data Normality Test

Table 3 Normality Test Results (COVID-19 Pandemic Period)

No.	Variables	Jarque-Bera	Probability
1	JCI	4627.443	0.00000
2	GOLD	433.7774	0.00000
3	SILVER	473.1406	0.00000
4	PLATINUM	305.877	0.00000
5	PALLADIUM	1207.822	0.00000

Data normality test in this study was conducted by using Jarque-Bera statistics with a significance level of 5%. A probability value smaller than alpha 0.05 indicates that the data is normally distributed. So, it can be concluded that the data in Table 1 for the COVID-19

period is all data not normally distributed. In the test, generalized error (GED) will be used in the error distribution. Meanwhile, Table 3 for the Russia-Ukraine war period shows that platinum data is normally distributed, and other data is not normally distributed. So, the test will use a normal (Gaussian) error distribution.

Table 4 Normality Test Results (Russia-Ukraine War Period)

No.	Variables	Jarque-Bera	Probability
1	JCI	331.8619	0.00000
2	GOLD	22.18304	0.00002
3	SILVER	84.19876	0.00000
4	PLATINUM	3.332382	0.18897
5	PALLADIUM	118.1072	0.00000

Augmented Dicky Fuller Test Results

Table 5 Augmented Dicky Fuller Test Results (COVID-19 Pandemic Period)

No.	Variables	t-Statistic	Probability	Conclusion
1	JCI	-28.223	0.000	Stationary
2	GOLD	-28.775	0.000	Stationary
3	SILVER	-29.101	0.000	Stationary
4	PLATINUM	-27.469	0.000	Stationary
5	PALLADIUM	-26.161	0.000	Stationary

In this research, data stationarity testing was carried out using the Augmented Dickey Fuller test with a significance level of 5 percent. The test results, as shown in Table 5 during the COVID-19 pandemic and Table 6 during the Russia-Ukraine War period, show that the probability value for each variable, including JCI, Gold, Silver, Platinum, and Palladium, is lower than the 5% significance level. Therefore, it can be concluded that all data used in this research can be considered stationary data.

Table 6 Augmented Dicky Fuller Test Results (Russia-Ukraine War Period)

No.	Variables	t-Statistic	Probability	Conclusion
1	JCI	-22.240	0.000	Stationary
2	GOLD	-22.333	0.000	Stationary
3	SILVER	-20.328	0,000	Stationary
4	PLATINUM	-20.368	0.000	Stationary
5	PALLADIUM	-21.603	0.000	Stationary

GARCH (1,1) Results

After testing stationarity on stock returns, gold, silver, platinum, and palladium, the next research involved the GARCH test. The GARCH model applied in this research is GARCH (1,1). The results of the GARCH test (1,1) can be found in Tables 7 and 8. The z-statistic test results show that at the 10% or 5% significance level, there is a significant z-statistic value on trading days during the COVID-19 pandemic in commodity markets.

Table 7 GARCH (1,1) Results (COVID-19 Pandemic Period)

Days	JCI	Gold	Silver	Platinum	Palladium
Monday	-0.840675	0.237556	0.379916	1.654166*	1.980857**
Prob.	(0.4005)	(0.8122)	(0.7040)	(0.0981)	(0.0476)
Tuesday	0.938999	1.244985	0.074485	-0.202725	-1.764422*
Prob.	(0.3477)	(0.2131)	(0.9406)	(0.8394)	(0.0777)
Wednesday	0.720446	0.242638	-0.039193	0.036385	-0.320711
Prob.	(0.4713)	(0.8083)	(0.9687)	(0.9710)	(0.7484)
Thursday	2.40423**	0.800978	0.60934	-0.130782	0.654767
Prob.	(0.0162)	(0.4231)	(0.5423)	(0.8959)	(0.5126)
Friday	0.576397	0.163299	0.758869	-0.887442	-0.014342
Prob.	(0.5643)	(0.8703)	(0.4479)	(0.3748)	(0.9886)
RESID (-1)^2	0.106074	0.0000**	0.0027**	0.0148**	0.0006**
GARCH (-1)	0.840027	0.0000**	0.0000**	0.0000**	0.0000**

Notes: *10% level of significance, **5% level of significance, ***1% level of significance

Table 7 shows that Thursday significantly influences the JCI return with a value of 0.01, which is smaller than the significance level of 0.05. In the platinum context, the probability of a value on Monday of 0.09 is greater than the 10% significance level, indicating the influence of the day on platinum returns. For palladium, the probability values on Monday (0.04) and Tuesday (0.07) are smaller than the 10 percent significance level. So, there is a significant influence on these two days on palladium returns. In Table 8,

the probability value has exceeded the significance level of 1%, 5% or 10%. So that during the Russia-Ukraine war period, there was no evidence of any influence of trading days on the JCI and precious metal commodities.

Table 8 GARCH (1,1) Results (Russia-Ukraine War Period)

Days	JCI	Gold	Silver	Platinum	Palladium
Monday	-0.049705	-1.13499	-0.664784	1.514035	-0.504315
Prob.	(0.9604)	(0.2564)	(0.5062)	(0.1300)	(0.6140)
Tuesday	0.817802	0.660234	-0.479734	-0.942102	-0.541763
Prob.	(0.4135)	(0.5091)	(0.6314)	(0.3461)	(0.5880)
Wednesday	0.573777	-0.022596	-0.843529	-0.972223	-0.514974
Prob.	(0.5661)	(0.9820)	(0.3989)	(0.3309)	(0.6066)
Thursday	0.303997	-0.682609	-0.740077	-0.09145	0.132844
Prob.	(0.7611)	(0.4949)	(0.4593)	(0.9271)	(0.8943)
Friday	0.034176	0.406554	1.238999	0.137287	-1.380095
Prob.	(0.9727)	(0.6843)	(0.2153)	(0.8908)	(0.1676)
RESID (-1)^2	0.0490**	0.1142	0.6092	0.1636	0.0039**
GARCH (-1)	0.0000**	0.0000**	0.8488	0.0000**	0.0000**

Notes: *10% level of significance, **5% level of significance, ***1% level of significance

DISCUSSION

Table 7 shows that in the GARCH test (1,1), there is a significant day-of-the-week effect on JCI, Platinum, and Palladium. This is in line with Rahmawati & Setiyawan (2022); Lutfi & Khairunnisa (2023), which proves the influence of trading days in this period. The z-statistic value on the JCI shows that only Thursday has a significant effect, with Thursday having the highest positive return. Meanwhile, negative returns occurred on Monday. This finding supports Sias & Starks (1995), Pearce (1996), Robiyanto (2000), and Iramani & Mahdi (2006). Especially for the finding regarding the positive effect of Thursday on stock return, this finding is consistent with Robiyanto (2000). This finding also shows that the Indonesian capital market does not walk randomly, thus it is not efficient in weak-form terms during the COVID-19 pandemic.

Platinum shows that only Monday has a significant effect with a significance level of 10 percent, with the highest positive returns on Monday and followed by Wednesday. Meanwhile, negative returns occur on Tuesday, Thursday, and Friday. This is different from Palladium, which shows that there is a significant influence on Monday with a significance level of 5 percent and Tuesday with a significance level of 10 percent. Meanwhile, the

highest positive returns were on Monday and followed by Thursday. Negative returns themselves are on Tuesdays, Wednesdays, and Fridays. In addition, the precious metal variable in this study follows the GARCH model as evidenced by the GARCH (-1) result of less than 5 percent. These findings show that the day of the week effect is also found in the commodities market, both in the industrial and precious metals markets; thus, the industrial and precious metals markets aren't efficient in weak-form terms during the COVID-19 pandemic.

Surprisingly, based on Table 8 it shows that the GARCH test (1,1) significantly proves that there was no day-of-the-week effect on JCI, Gold, Silver, Platinum, and Palladium returns during the Russia-Ukraine war. So, the hypothesis is not proven that there is an influence of trading days on precious metal commodity returns and JCI. This is in line with research by Kusuma et al. (2022), which proves that there was no influence of trading days during the Russia-Ukraine war. Apart from that, in this research, only the silver variable did not follow the GARCH model, with a GARCH (-1) result of more than 5 percent. Variables other than silver have been shown to follow a GARCH pattern with a GARCH (-1) result of less than 5 percent. These findings show that all markets are efficient in weak-form terms during the Russia-Ukraine War.

This can have happened because during the COVID-19 pandemic, especially after 5 months, the emergence of the COVID-19 pandemic in Indonesia, the Indonesian stock market surprisingly awoke despite severe heavy sell-off in the early stages of the pandemic. The rising number of investors who actively traded and the increase in trading volume alongside trading frequency, boosted by new economy stock (digital bank and start-up initial public offerings (IPO)), amidst increasing optimism. This condition is also supported by stock market influencers through social media, which creates a trading frenzy. In this kind of situation, investors tend to neglect rationality in investing and tend to follow the stock market influencers. However, this condition did not last forever, as the bubble burst and some digital banks and start-up IPOs plummeted. While in the platinum and palladium market, some news coming out regularly could affect their prices.

In the early period of the Russian-Ukraine war, the market became calmer, and the trading frequency alongside the trading volume decreased. So, during the Russia-Ukraine war, the Indonesian stock market became less volatile and did not show any sign of regularity. While the precious metals market tends to be volatile and some investors converted their assets to safe-haven assets such as gold because they flee for safety rather than actively trading. This led to irregularity of this action; hence, no anomalies occurred in this

market during the war.

Conclusion, Limitations, and Suggestions

Based on the results of the research that has been carried out, it can be concluded that the GARCH (1,1) analysis produces evidence that the day of the week effect phenomenon on stock, platinum, and palladium returns existed during the COVID-19 pandemic, starting from March 2020 to June 2023. However, no day-of-the-week effect was found on gold and silver returns in the same period. Meanwhile, during the conflict period from February 2022 to October 2023, the results of the GARCH test (1,1) show that there is no day-of-the-week effect on stock returns and precious metal commodities. This study concludes that during the COVID-19 pandemic, stock, platinum, and palladium markets do not walk randomly and are not efficient in the weak-form. However, during the Russia-Ukraine war, all markets walk randomly and efficiently in weak-form. This finding shows that investors should consider some important events to apply trading strategies on a regular basis, especially for short-term trading, because each important event has different characteristics.

This research has several limitations, one of which is time, as, up to the time limit of this research, there were still attacks carried out between Russia and Ukraine. Therefore, further research can use a longer time period during the Russia-Ukraine War. Apart from that, future research can further examine other types of commodities besides precious metals. Therefore, investors need to further understand the current situation and conditions regarding price changes in shares and certain commodities.

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