

THE EFFECTIVENESS OF ALTERNATIVE INVESTMENTS IN THE ERA OF GEOPOLITICAL CHANGES

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Purpose: The purpose of the article is to identify the volatility of the rates of return, as well as the profitability of investments in precious metals in relation to traditional investments during the unstable epidemic and geopolitical situation, including the identification of the impact of the method of calculating the simple rate of return on investment decisions.

Design/methodology/approach: The article uses literature analysis and a statistical research method as research methods. A review of the world literature on the changes taking place on investment markets in the context of the COVID-19 pandemic and the war in Ukraine was carried out. The empirical part of the article presents the results of the analysis of the level of return on metals, compared to traditional investments, in the period 20.03.2018-21.03.2023.

Findings: The level of annual rates of return differed from the level of average annual rates of return. Therefore, the conclusions about the profitability of individual investments depend on the chosen method of calculating simple rates of return.

Research limitations/implications: This article does not exhaust the examined issue. In subsequent studies, it is worth reviewing the literature not only of the most recent publications, but also of older ones. It is also worth analyzing other types of alternative investments. In future analyses, it is also worth considering the use of statistical tests.

Practical implications: Identifying changes in ores markets compared to traditional investment markets and indicating the impact of the simple rate of return calculation method on its value may be useful in making and evaluating investment decisions, as well as in better understanding of the changes taking place in these markets.

Originality/value: The paper compares two methods of calculating the rate of return during an uncertain economic situation. The choice of the method of calculating the rate of return affects the results obtained, which translates into investment recommendations.

Keywords: rate of return, alternative investments, precious metals, COVID-19 pandemic, war in Ukraine.

Category of the paper: Research paper.

1. Introduction

In the times of risk and uncertainty, investors change their behavior. In such periods, risk aversion increases among investors, while expectations regarding the amount of return on investment decrease. Investors take actions to reduce the risk of their portfolio (Juras, 2021). The uncertainty caused by the COVID-19 pandemic, followed by the war situation beyond Poland's eastern border, prompted some entities to change the way they save and invest. Investing capital in precious metals has been seen for centuries as a way to invest, but also to secure savings (Lejman-Gąska, 2021). Although investments in ores are popular regardless of the economic situation, they are more in demand in the times of uncertainty. During these periods, investors pay more attention to their investments aimed at securing their savings. They can invest capital through traditional investments, which include equity instruments, such as shares and debt instruments – bonds. They can also choose alternative investments, in other words, investments that are alternative to traditional ones. The most common are hedge funds, private equity investments, real estate and commodities, including metals (Tomaszewski, 2013). In the times of uncertainty, the portfolio is diversified with alternative investments because their rates of return are negatively correlated with the rate of return on traditional investments (Juras, 2021).

Due to the greater uncertainty caused by the epidemic and geopolitical situation, some investors are leaning towards investments considered safer than investments in company shares. At such times, they may consider both other traditional investments and alternative investments – including investments in precious metals such as gold, silver, platinum or palladium. In Poland, investments in ores are still often chosen form of investment, primarily in gold or silver, but also in other precious metals (Lejman-Gąska, 2021).

The years 2020-2023 can be considered a time that was characterized by greater uncertainty. In 2020-2022, the COVID-19 pandemic contributed to this, while in 2022-2023 – the ongoing war in Ukraine. This may be particularly important in emerging markets, as COVID-19 has had the greatest negative impact on these markets (Harjoto et al., 2021). These events may have changed the way people save and invest, as well as encourage investors to make investments considered safer.

The aim of the article is to identify the volatility of the level of rate of returns, as well as the profitability of investments in ores in relation to traditional investments during the unstable epidemic and geopolitical situation, including the identification of the impact of the method of calculating the simple rate of return on investment decisions. Identifying changes in ores markets compared to traditional investment markets and indicating the impact of the simple rate of return calculation method on its value may be useful in making and evaluating investment decisions, as well as in better understanding of the changes taking place in these markets.

The structure of the article was subordinated to the implementation of the above aim. The first part of the article reviews the world literature on the changes taking place on investment markets in the context of the COVID-19 pandemic and the war in Ukraine. Next, the applied statistical research method and issues related to the calculation of a simple rate of return are described. In the next part of the article, the results of the empirical analysis of the level of return on metals and traditional investments in the period between 20.03.2018 and 21.03.2023 are presented.

2. Literature review

Both the COVID-19 pandemic and the war in Ukraine have caused sharp changes in stock and commodity prices, exchange rates and an increase in inflation. These events have a significant impact on, among others, stock, gold and oil prices (Shaik et al., 2023).

The first of these events, that is the COVID-19 pandemic, had a negative impact on the economy, by increasing difficulties in the transport of goods, or negatively affecting stock and indices prices on the stock exchange (Harjoto et al., 2021). The pandemic has caused negative shocks on stock markets around the world (Harjoto, Rossi, Paglia, 2021). It also had a negative impact on the five main European equity markets surveyed: French, German, Italian, English and Spanish (Espinosa-Méndez, Arias, 2021). The relationship between the COVID-19 pandemic and stock returns was greater the worse the epidemic situation was (Harjoto et al., 2021). The COVID-19 pandemic has also affected the situation on commodity markets, which include bullion markets. As an example of such a market, Harjoto, Rossi, Lee and Sergi (2021) cite the oil market, which was affected by information on the number of deaths from COVID-19.

The pandemic has had a negative impact on the economies of both developed and emerging countries. The problem is therefore global, but it has hit the economies of emerging countries harder. This may be due to the fact that emerging economies have less developed payment system infrastructure and lower liquidity, as well as greater information asymmetry (Harjoto, Rossi, Paglia, 2021). As such, the tightening of pandemic restrictions has had a negative impact on emerging markets in particular (Harjoto et al., 2021). Due to the lack of a single, consistent definition of emerging markets, there are various classifications of markets belonging to this group (Rubaj, 2020). For this reason, there is also no consensus on the qualification of Poland to this group of markets. Białkowski and Sławik (2021) point out that Poland belonged to emerging markets until September 2018. Also according to the FTSE Global Equity Index (FTSE Classification of Equity Markets, 2023) of March 2023, Poland is classified as a developed market. However, according to the Standard Poor's index (S&P Dow Jones Indices' 2022 Country Classification, 2022) from June 2022, Poland is classified as an emerging market.

Due to the lack of a clear assignment, the COVID-19 pandemic could also have had a greater impact on the Polish market. Information on the number of COVID-19 cases and deaths affected the rates of return of instruments listed on stock exchanges in developing countries. However, they did not have a significant impact in developed markets, despite the fact that in developed markets the worsening epidemic situation also caused uncertainty among investors (Harjoto et al., 2021).

Moreover, the response to new COVID-19 cases also depended on the stage of the pandemic. Reactions to new cases and deaths at the stage of pandemic development were different than at the stage of its stabilization or decline (Harjoto et al., 2021). Ashraf (2020) points out, however, that the reactions on the stock exchanges were primarily related to the increase in the number of confirmed cases of COVID-19, and not to the number of deaths due to COVID-19. The author explains this by the fact that experienced investors pay more attention to early signals – which may be the number of COVID-19 cases – rather than to late signals – such as the number of deaths that result from the disease.

The situation on the markets was also affected by the war in Ukraine. This event increased the uncertainty that was already present due to the COVID-19 pandemic. The war also had a negative impact on the economy, through the interruption of some supply chains or problems with transport. This situation has also affected the global economy due to the fact that Russia is one of the largest crude oil producers, as well as an important exporter of gas and metals. As a result, prices on stock and commodity exchanges increased (Shaik et al., 2023). Shaik (2023) points out that historically, stock, gold and oil prices have reacted strongly to geopolitical changes in the world, including during the COVID-19 pandemic.

Precious metals are seen as an appropriate hedge, especially in conditions of uncertainty, in a period when inflation rises and the local currency depreciates (Lejman-Gąska, 2021). Tran and Nguyen (2022) point out that in Europe, stock market prices, gold prices and exchange rates are interrelated, so a change in one market causes changes in the others. Therefore, when stock prices fall, investors should withdraw their capital from the stock market and reinvest it in gold and cash, with a particular focus on US dollars, due to the lower risk associated with these investments. When the situation is more stable and investors are more willing to risk, they should reduce their investments in gold and currencies and increase their investments in equities. During the pandemic, investors were therefore more cautious when choosing the investment market.

During the pandemic, the situation on the gold market looked different than on the stock market. When stock indices fell, gold appreciated. The COVID-19 pandemic has therefore had a positive impact on gold price volatility. Gold prices have typically risen as COVID-19 cases and deaths have increased. This was the result of the search for safer investments during the fear of the consequences of the pandemic, which caused investors to withdraw their funds from exchanges and invest in safer investments, including gold (Tran, Nguyen, 2022), which is

widely considered to be the safest mean of investing capital (Przyłuska-Schmitt, Jegorow, Bučková, 2022).

During the COVID-19 pandemic and the war in Ukraine, gold remained a safe way to invest and diversify the investment portfolio (Shaik et al., 2023). This is confirmed by Juras (2021), noting that in the years 2000-2019 there was no Pearson linear correlation between the value of the WIG20 index and the value of gold ($r = 0.24$), while in 2020 a negative linear correlation between these prices was recorded ($r = -0.52$), so an increase in the value of WIG20 is accompanied by a decrease in the average value of gold. Gold was therefore perceived as a safe component of long-term investments, which effectively diversifies and reduces the risk of the investment portfolio. It was used as an alternative investment because it was perceived as risk-free and not subject to inflationary pressures (Tran, Nguyen, 2022).

For this reason, during the pandemic, investments in gold began to be considered more often as a form of safe capital investment. Investors, reducing the share of riskier investments in the portfolio and increasing the share of investments with a lower level of risk, were more likely to choose investments in gold and US treasury bonds (Bentes et al., 2022). Siemaszkiewicz (2023) mentions that gold can be used as a universal, safe investment. On the other hand, ores such as silver, palladium or platinum can be seen as safe investments only in the short term. She also points out that gold and silver during the COVID-19 pandemic could have been successfully used for diversification purposes (Siemaszkiewicz, 2023). Lejman-Gąska (2021) notes that during the pandemic, interest in investments in ores, primarily gold, silver, platinum and palladium, grew on the Polish market.

3. Research methods

In order to identify the profitability of investments in ores, their rates of return were checked and compared with other possibilities of investing capital. For this purpose, data were analyzed on:

- alternative investments – in gold, silver, platinum and palladium,
- traditional investments:
 - in shares – on the example of the WIG20 index,
 - in bonds – on the example of Polish 10-year bonds sold on the secondary market,
 - deposits – based on the average interest rate on deposits lasting from 6 months to 1 year.

The profitability of these investments in three periods was checked: the core period, the COVID-19 pandemic and the war in Ukraine. The base period was set at 2 years back from the date of commencement of the state of epidemic in the territory of Poland. The epidemic period was set at two years from the date of commencement of the state of epidemic. The time of war

was set as one year after the end of two years after the introduction of the state of epidemic. One year from 24.02.2022, that is from the date of the outbreak of the war, was also examined. These periods are as follows:

- base: March 20, 2018 - March 19, 2020,
- COVID-19 pandemic: March 20, 2020 - March 21, 2022 – the state of epidemic in Poland began on March 20, 2020 (Regulation of the Minister of Health from 20.03.2020),
- war in Ukraine: March 22, 2022 - March 21, 2023, the period February 24, 2022 - February 23, 2023 was also analyzed.

In order to assess the profitability of alternative investments in selected ores in relation to traditional investments, the rates of return of these investments in the analyzed period were compared. The rate of return is a measure of efficiency. It expresses the level of investment income that the investor will achieve in a given period in exchange for resigning from allocating the invested capital for current consumption, in relation to the expenditures incurred for a given investment. The rate of return is a percentage measure and determines the income per unit of invested capital (Pera et al., 2014).

Simple rates of return were used, which are considered the basic measure of investment income. A simple rate of return is the ratio of income earned to expenditures incurred. It is comparable only for investments with the same time horizon (Pera et al., 2014). Simple rates of return were calculated using the formula (Bednarz-Okrzyńska, 2019):

$$R_t = \frac{P_t - P_{t-1}}{P_{t-1}}, \quad (1)$$

where:

R_t – simple rate of return in period t ,

P_t – price in period t .

Nominal rates of return were used, so rates of return that do not take inflation into account (Pera et al., 2014).

As Stankiewicz (2013) notes, two ways of calculating rates of return on investment can be distinguished. The first of them, called "New Year's Eve", consists in calculating rates of return based on the exchange rates from the last day of each year or the last day of the selected period. This way of calculating the rate of return is considered the simplest. It is used in calculations on the Warsaw Stock Exchange. It reflects the actual achieved rate of return on an investment purchased at one moment and sold at another. Therefore, it is used to calculate the actual, historical rate of return on a given investment. According to the second method, the rate of return on investment is the arithmetic average of the daily rates of return. This rate can be calculated using the formula (Stankiewicz, 2013):

$$\bar{R} = \sum_{t=1}^n \frac{R_t}{n}, \quad (2)$$

where:

\bar{R} – arithmetic mean of rates of return,

n – number of quotations.

This method is more often used in scientific research and capital market analysis. It is used to present a hypothetical situation, that is what would happen if an investor for a given period of time sold and bought a given instrument every day at the closing price. The rate of return obtained in this way is a hypothetical average rate of return for a given period.

Calculating rates of return in individual ways usually leads to divergent results of the rate of return (Stankiewicz, 2013). The first method can be used to calculate the actual, historical rate of return, but only on the basis of two moments – buying and selling. Therefore, this method determines the real rate of return on investment, but does not take into account fluctuations in the price of the instrument over the life of the investment. The second method shows the average rate of return on investment, including fluctuations in the prices of equity instruments, but does not reflect the real rate of return on investment. Due to possible discrepancies in the results obtained in the level of return depending on the chosen method, the levels of return on investment calculated by both methods were analyzed.

4. Results and discussion

In order to check the profitability of individual investments in the examined period, simple annual rates of return (the first method) and simple average annual rates of return (the second method) were calculated. Daily data on the closing prices of ores, the WIG20 index and 10-year Polish treasury bonds available on the secondary market were downloaded from the stooq.pl website. Due to the fact that ores prices are quoted in US dollars per troy ounce, which is a measure usually used when reporting the weight of metals, before calculating the rates of return, the prices of metals were converted into Polish zlotys. For this purpose, the average exchange rate published by the National Bank of Poland was used. Thanks to this, the impact of fluctuations in the PLN/USD currency pair on the profitability of investments in individual ores was taken into account. This may be important because there is a negative correlation between the price of gold and the US dollar (Anasiewicz, 2021). Data on the average interest rate on bank deposits concluded for a period from 6 months to 1 year were downloaded from the website of the National Bank of Poland. The price evolution of individual instruments during the period under review is shown in figures 1 to 6. Metals prices per troy ounce (figures 3-6) are presented in both Polish zlotys and US dollars.

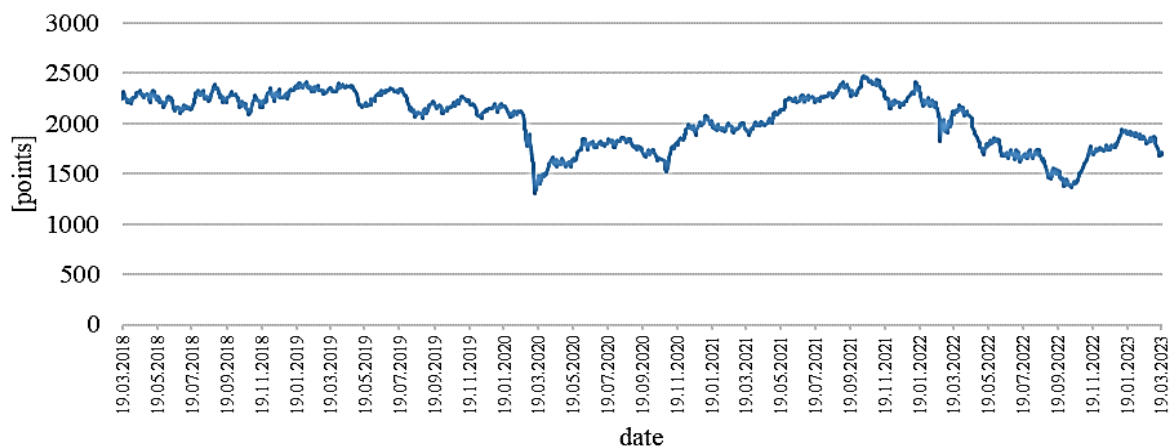


Figure 1. WIG20 index in the period between 19.03.2018 and 21.03.2023.

Source: Own study based on: <https://stooq.pl/>

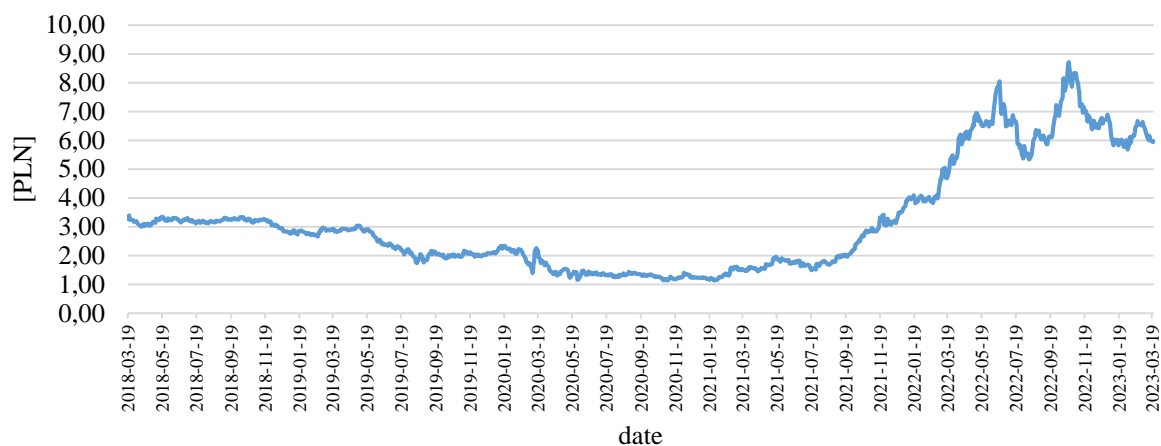


Figure 2. Bond prices in the period between 19.03.2018 and 21.03.2023.

Source: Own study based on: <https://stooq.pl/>

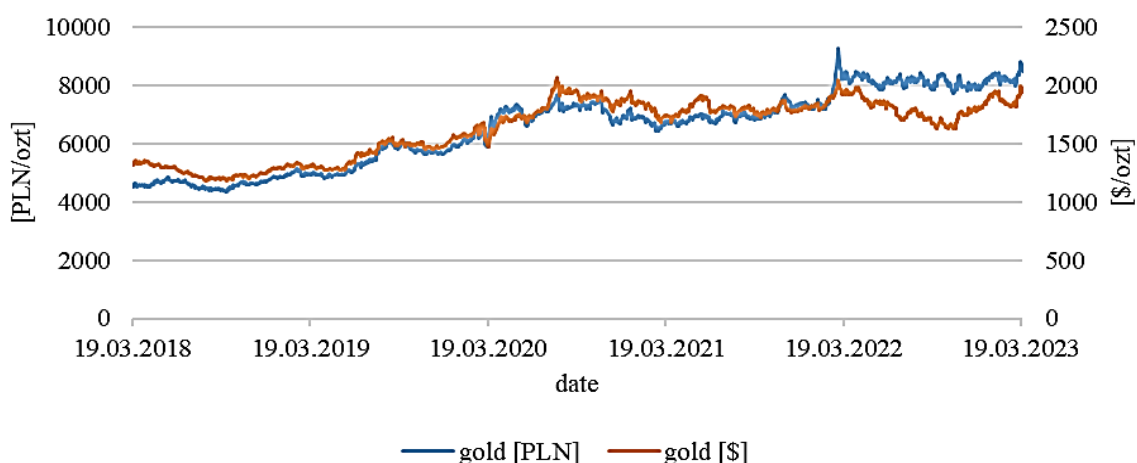


Figure 3. Gold prices in the period between 19.03.2018 and 21.03.2023.

Source: Own study based on: <https://stooq.pl/>, <https://nbp.pl/statystyka-i-sprawozdawczosc/kursy/archiwum-tabela-a-csv-xls/>

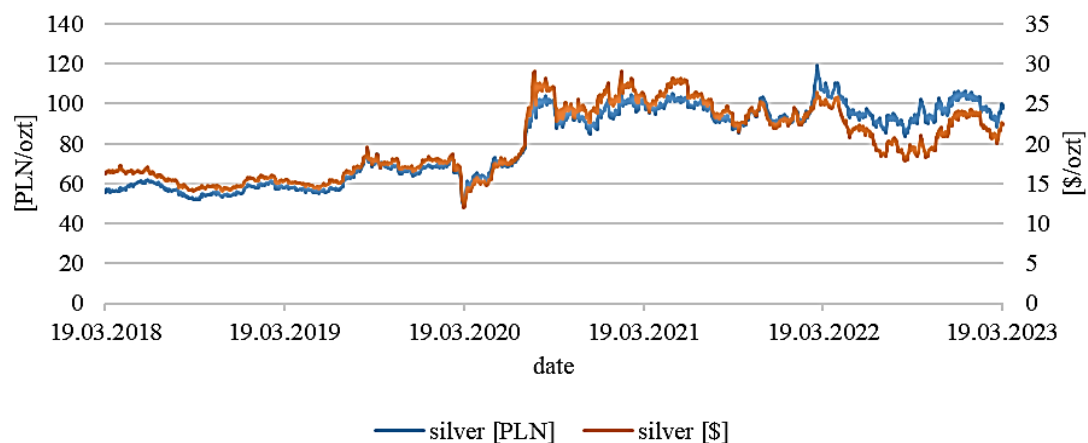


Figure 4. Silver prices in the period between 19.03.2018 and 21.03.2023.

Source: Own study based on: <https://stooq.pl/>, <https://nbp.pl/statystyka-i-sprawozdawczosc/kursy/archiwum-tabela-a-csv-xls/>

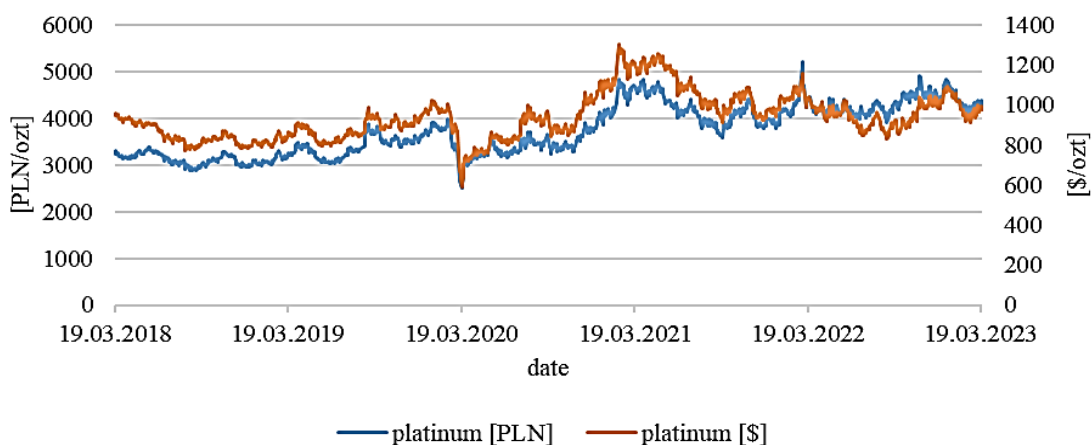


Figure 5. Platinum prices in the period between 19.03.2018 and 21.03.2023.

Source: Own study based on: <https://stooq.pl/>, <https://nbp.pl/statystyka-i-sprawozdawczosc/kursy/archiwum-tabela-a-csv-xls/>

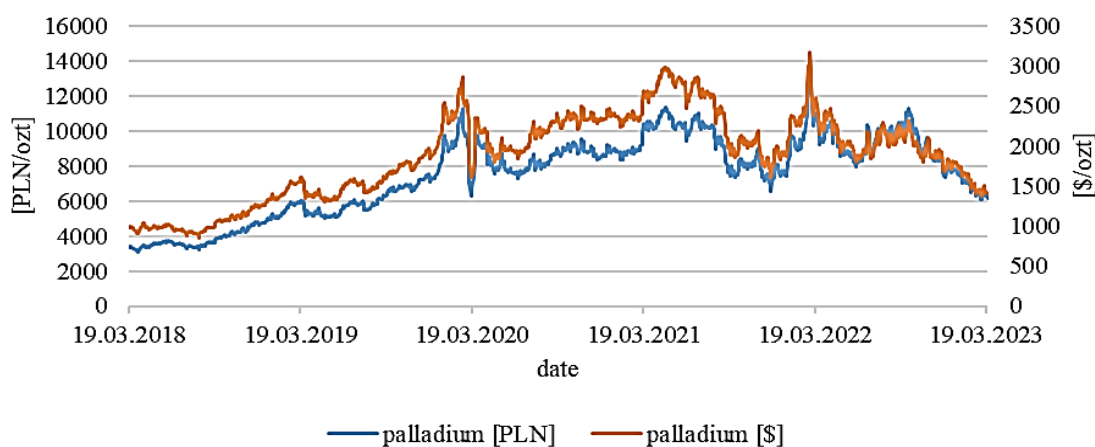


Figure 6. Palladium prices in the period between 19.03.2018 and 21.03.2023.

Source: Own study based on: <https://stooq.pl/>, <https://nbp.pl/statystyka-i-sprawozdawczosc/kursy/archiwum-tabela-a-csv-xls/>

As can be seen, the WIG20 index was sensitive to epidemic and geopolitical changes. In these periods, declines in the WIG20 index can be observed. The event to which bond prices reacted more strongly was the war in Ukraine. With the start of the war, bond prices began to rise. Both the pandemic and the war have increased the volatility of the prices of the tested ores. The level and volatility of metals prices expressed in Polish zlotys is slightly different from those expressed in US dollars.

Table 1 and Table 2, as well as Figure 7 and Figure 8, contain data on the level rates of return on an annual basis in individual periods, starting from March 20, 2018. The last period is presented in two variants: according to the next period, so from March 22, 2022, as well as according to the date of the beginning of the invasion of Ukraine, that is from February 24, 2022. Due to the days when there were no quotations, in 2021 one period ends on 19.03, and the next begins on 22.03.

Table 1.
Simple annual rates of return

date	gold	silver	platinum	palladium	WIG20	bonds	deposits
20.03.2018-19.03.2019	9.8508%	4.5656%	-0.4345%	78.9515%	3.5095%	-12.3494%	1.7200%
20.03.2019-19.03.2020	25.7886%	-12.1707%	-22.7926%	17.8147%	-37.5354%	-25.6849%	1.6200%
20.03.2020-19.03.2021	6.8223%	90.8913%	79.3527%	46.4946%	29.5038%	-23.3503%	1.2400%
22.03.2021-21.03.2022	21.8506%	7.1048%	-4.0966%	8.3977%	8.4971%	229.7297%	0.1400%
22.03.2022-21.03.2023	3.4111%	-7.5817%	-2.5870%	-42.3682%	-18.9656%	19.1235%	1.8500%
24.02.2022-23.02.2023	4.0355%	-4.3141%	-2.5246%	-34.6724%	0.4022%	62.8713%	1.8500%

Source: Own study based on: <https://stooq.pl/>, <https://nbp.pl/statystyka-i-sprawozdawczosc/statystyka-monetarna-i-finansowa/statystyka-stop-procentowych/>, <https://nbp.pl/statystyka-i-sprawozdawczosc/kursy/archiwum-tabela-a-csv-xls/>

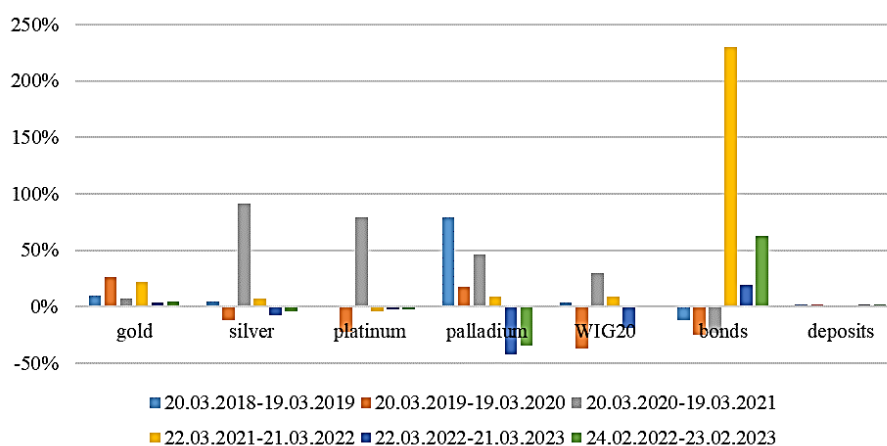


Figure 7. Simple annual rates of return.

Source: Own study based on: <https://stooq.pl/>, <https://nbp.pl/statystyka-i-sprawozdawczosc/statystyka-monetarna-i-finansowa/statystyka-stop-procentowych/>, <https://nbp.pl/statystyka-i-sprawozdawczosc/kursy/archiwum-tabela-a-csv-xls/>

Based on the values of simple annual rates of return of individual assets, in other words calculated using the first method, it can be seen how profitable individual annual investments were, taking into account the moment of buying and selling.

In the base period, the most profitable investments were investments in palladium and gold. Palladium's rate of return was 78.95% after the first year and 17.81% after the second year, while gold was 9.85% and 25.79% respectively. During this period, the rates of return of gold and palladium were much higher than the rates of return on traditional investments. Moreover, investments in the WIG20 index after the second year brought a loss, while investments in bonds on the secondary market brought a loss after both the first and second year.

During the COVID-19 pandemic, investments in ores were the most profitable. During this time, both gold, silver and palladium brought a positive rate of return. Of the analyzed metals in the years of the pandemic, only platinum recorded a negative rate of return of -4.10% in the second year of the pandemic. This is consistent with the theory that ores are safer investments that can bring a positive rate of return also in conditions of uncertainty. At that time, the investment in the WIG20 index on the stock exchange was also profitable. After the first year of the pandemic, the rate of return on the index was 29.50%, and after the second it was equal to 8.50%. Investments in bonds became particularly profitable in the second year of the pandemic, after which the rate of return was 229.73%.

However, during the war in Ukraine, the profitability of individual investments changed again. At that time, only those considered the safest – investments in gold, bonds and investing capital on a bank deposit turned out to be profitable investments. Of all the analyzed ores, only the rate of return of gold showed a positive value. This rate was higher than the rate of return on bank deposits, but lower than the rate of return on treasury bonds purchased on the secondary market.

Table 2.

Simple average annual rates of return

date	gold	silver	platinum	palladium	WIG20	bonds	deposits
20.03.2018-19.03.2019	0.0370%	0.0199%	0.0011%	0.2322%	0.0248%	-0.0387%	0.1411%
20.03.2019-19.03.2020	0.0958%	-0.0313%	-0.0786%	0.0974%	-0.1754%	-0.0770%	0.1291%
20.03.2020-19.03.2021	0.0411%	0.3018%	0.2603%	0.1774%	0.1211%	-0.0996%	0.0276%
22.03.2021-21.03.2022	0.0809%	0.0322%	0.0023%	0.0777%	0.0449%	0.5002%	0.0478%
22.03.2022-21.03.2023	0.0203%	-0.0131%	0.0053%	-0.1745%	-0.0652%	0.1094%	0.4307%
24.02.2022-23.02.2023	0.0361%	0.0115%	0.0106%	-0.1016%	-0.0260%	0.2339%	0.4013%

Source: Own study based on: <https://stoq.pl/>, <https://nbp.pl/statystyka-i-sprawozdawczosc/statystyka-monetarna-i-finansowa/statystyka-stop-procentowych/>, <https://nbp.pl/statystyka-i-sprawozdawczosc/kursy/archiwum-tabela-a-csv-xls/>

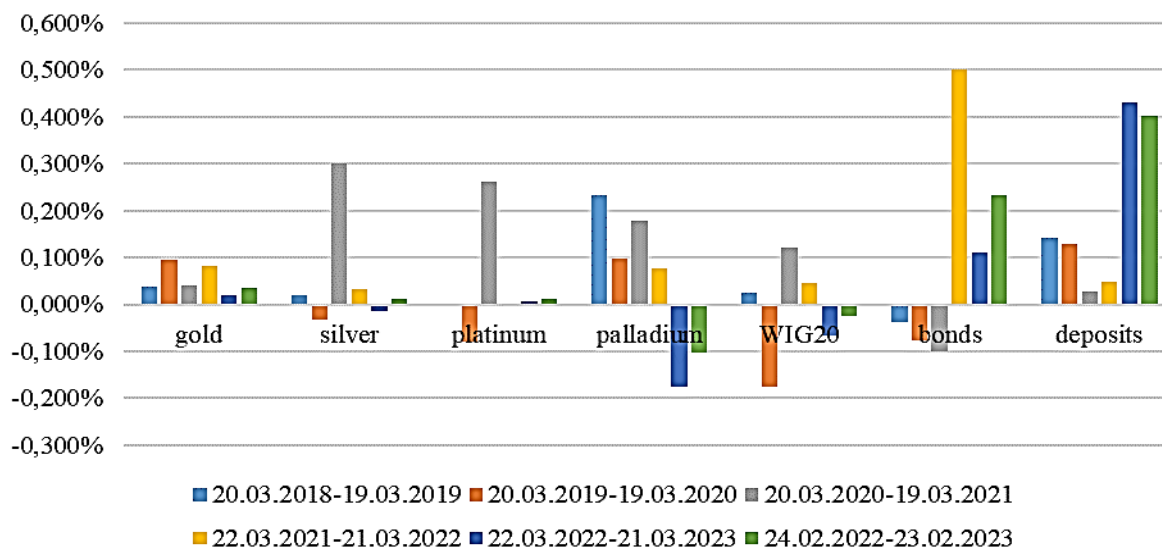


Figure 8. Simple average annual rates of return.

Source: Own study based on: <https://stooq.pl/>, <https://nbp.pl/statystyka-i-sprawozdawczosc/statystyka-monetarna-i-finansowa/statystyka-stop-procentowych/>, <https://nbp.pl/statystyka-i-sprawozdawczosc/kursy/archiwum-tabela-a-csv-xls/>

On the basis of simple average annual rates of return, in the base period, palladium turned out to be the most profitable form of investing capital. Its rate of return is at the level of 0.10-0.23%. After palladium, the most profitable was to invest capital in bank deposits, whose rate of return was at the level of 0.13-0.14%. At that time, a positive rate of return could also be achieved from investing in gold. On the other hand, investing in bonds on the secondary market was not profitable.

Despite the negative rate of return in the first year of the COVID-19 pandemic, investing in government bonds on the secondary market proved to be the most profitable during its duration. All other investments were also profitable, although some brought a loss in one of the two years of the pandemic. The profitability of deposits decreased significantly, as the level of return on them was at the level of 0.03-0.05%.

During the war in Ukraine, the level of rate of return on deposits increased to the level of 0.40-0.43%. At that time, it was the most profitable form of investing capital. Profitable investments also included bonds, gold and platinum. Investments in silver made in February were still profitable, but investments made a month later brought an average negative rate of return. The investment in WIG20 was unprofitable during the war. The profitability of individual investments is therefore consistent with the theory according to which investments in ores and bonds are safer investments in the times of geopolitical turmoil than investments in stock markets.

The level of rates of return calculated by the second method differs from the level of rates of return calculated by the first method, because it also takes into account changes in rates of return during the year. The level of average annual rates of return is lower than the level of annual rates of return calculated using the "New Year's Eve" method. Conclusions on the profitability of individual investments are also slightly different.

The rates of return on individual investments in the analyzed periods showed different characteristics (Table 3).

Table 3.
Rates of return statistics

statistics/date		gold	silver	platinum	palladium	WIG20	bonds	deposits
mean	20.03.2018-19.03.2019	0.0370%	0.0199%	0.0011%	0.2322%	0.0248%	-0.0387%	0.1411%
	20.03.2019-19.03.2020	0.0958%	-0.0313%	-0.0786%	0.0974%	-0.1754%	-0.0770%	0.1291%
	20.03.2020-19.03.2021	0.0411%	0.3018%	0.2603%	0.1774%	0.1211%	-0.0996%	0.0276%
	22.03.2021-21.03.2022	0.0809%	0.0322%	0.0023%	0.0777%	0.0449%	0.5002%	0.0478%
	22.03.2022-21.03.2023	0.0203%	-0.0131%	0.0053%	-0.1745%	-0.0652%	0.1094%	0.4307%
	24.02.2022-23.02.2023	0.0361%	0.0115%	0.0106%	-0.1016%	-0.0260%	0.2339%	0.4013%
standard deviation	20.03.2018-19.03.2019	0.0076	0.0111	0.0120	0.0151	0.0115	0.0118	0.0000
	20.03.2019-19.03.2020	0.0105	0.0176	0.0184	0.0251	0.0167	0.0295	0.0001
	20.03.2020-19.03.2021	0.0133	0.0268	0.0207	0.0272	0.0161	0.0299	0.0003
	22.03.2021-21.03.2022	0.0116	0.0163	0.0215	0.0314	0.0155	0.0260	0.0006
	22.03.2022-21.03.2023	0.0126	0.0210	0.0195	0.0325	0.0163	0.0239	0.0014
	24.02.2022-23.02.2023	0.0134	0.0206	0.0202	0.0350	0.0191	0.0251	0.0016
kurtosis	20.03.2018-19.03.2019	0.2214	1.2230	0.3778	1.7498	-0.3153	2.5992	-0.8280
	20.03.2019-19.03.2020	3.3674	10.9579	10.4838	14.1745	18.3866	10.7251	-0.3472
	20.03.2020-19.03.2021	3.2970	4.8464	1.5662	15.1109	0.9677	2.5292	4.5340
	22.03.2021-21.03.2022	3.4019	1.3730	1.9905	3.1710	12.4356	2.3258	-0.0465
	22.03.2022-21.03.2023	1.0324	0.8002	0.1589	3.6325	-0.2601	-0.0022	-0.1462
	24.02.2022-23.02.2023	2.0685	0.6441	1.1929	3.6988	4.5958	-0.0050	-1.2798
skewness	20.03.2018-19.03.2019	0.2872	0.2253	-0.1967	0.0938	-0.1256	0.6498	-0.3239
	20.03.2019-19.03.2020	0.3188	-1.7336	-1.6719	-2.0576	-2.1202	1.2101	0.2410
	20.03.2020-19.03.2021	-0.4129	-0.4114	0.2655	1.6964	0.1212	-0.2244	2.2128
	22.03.2021-21.03.2022	0.0715	-0.1643	-0.1118	-0.3204	-0.8403	0.0360	1.2544
	22.03.2022-21.03.2023	0.0041	0.3996	0.2229	0.4431	0.1683	-0.1573	-1.0800
	24.02.2022-23.02.2023	0.1283	0.4274	-0.0373	0.0063	-0.2626	-0.1013	-0.6580

Cont. table 3.

min	20.03.2018-19.03.2019	-1.8065%	-4.0532%	-4.0708%	-6.1136%	-3.3372%	-4.4248%	0.1350%
	20.03.2019-19.03.2020	-4.4938%	12.4230%	12.0862%	18.7848%	13.2774%	14.7239%	0.1175%
	20.03.2020-19.03.2021	-5.7064%	14.8712%	-5.6188%	10.4250%	-5.5744%	14.7059%	0.0117%
	22.03.2021-21.03.2022	-4.9161%	-6.7808%	-8.7642%	15.4013%	10.8652%	-9.9707%	0.0100%
	22.03.2022-21.03.2023	-4.6976%	-6.3172%	-5.2877%	13.3222%	-4.2945%	-6.5359%	0.1542%
	24.02.2022-23.02.2023	-4.9161%	-5.1053%	-8.7642%	15.4013%	10.8652%	-6.5359%	0.1542%
max	20.03.2018-19.03.2019	2.4249%	3.3479%	2.8711%	6.0831%	2.7331%	5.0909%	0.1458%
	20.03.2019-19.03.2020	5.1514%	5.5977%	6.6517%	8.5646%	6.5402%	19.3370%	0.1425%
	20.03.2020-19.03.2021	5.3082%	9.3631%	10.0929%	21.1551%	5.1499%	9.3750%	0.1033%
	22.03.2021-21.03.2022	5.7271%	4.5187%	6.3027%	10.4346%	8.4365%	10.5960%	0.1575%
	22.03.2022-21.03.2023	3.9660%	8.1688%	5.9088%	16.9850%	4.5315%	6.4246%	0.5650%
	24.02.2022-23.02.2023	5.7271%	8.1688%	5.9088%	16.9850%	8.4365%	7.6037%	0.5650%

Source: Own study based on: <https://stooq.pl/>, <https://nbp.pl/statystyka-i-sprawozdawczosc/statystyka-monetarna-i-finansowa/statystyka-stop-procentowych/>, <https://nbp.pl/statystyka-i-sprawozdawczosc/kursy/archiwum-tabela-a-csv-xls/>

In the entire period under review, the interest rate on deposits was characterized by the lowest level of volatility (from 0.01% in the period between 20.03.2018 and 19.03.2019 to 0.41% in the period between 22.03.2022 and 21.03.2023). However, it should be borne in mind that deposits are the only over-the-counter investment under consideration. The highest level of volatility was characterized by palladium rates of return, which ranged from -18.78% in the period between 20.03.2019 and 19.03.2020 to 21.16% in the period between 20.03.2020 and 19.03.2021. Due to such a large range of rates of return, in most periods, palladium recorded both the lowest (except for the period 20.03.2020-19.03.2021, in which silver reached the lowest level of rates of return) and the highest levels of return (except for the period 20.03.2019-19.03.2020, in which the highest level was reached by bond returns). Apart from deposits, only gold showed positive average annual rates of return throughout the period under review. They ranged from 0.04% to 0.10%.

In the base period, gold, palladium and deposits had a positive rate of return, while bonds – negative. At that time, the smallest average deviations of individual values of rates of return from the average were shown by deposits. Generally, they deviated from the average by +/- 0.0001. Only the rates of return of gold and bonds were right-sided asymmetrical, while platinum and the WIG20 index were left-sided asymmetrical. Therefore, the rates of return of gold and bonds were usually higher than their average rate, and platinum and WIG20 – usually lower. During this period, almost all distributions of returns were leptocuric, so their values were concentrated relatively close to the average. Only the rates of return on deposits

during this period were platocuric, which means that their values were more distant from the average.

During the pandemic, a positive rate of return could be obtained from investments in all analyzed ores, deposits, as well as in the WIG20 index. During this period, the smallest average deviations of individual rates of return from the average were also shown by deposits. Generally, they deviated from the average from ± 0.0003 to ± 0.0006 . The period 20.03.2020-19.03.2021 was the only one in which gold showed left-sided asymmetry, so its rates of return were usually lower than average. During the pandemic, the right-sided asymmetry was shown by the rates of return on deposits, which usually brought a profit higher than the average, while the left-sided one – silver. During the pandemic, all distributions were leptocuric, which means that the rates of return on these investments were concentrated relatively close to the averages. Only the rates of return on deposits in the second year of the pandemic showed a slight platokurtivity.

During the war (taking into account the period 22.03.2022-21.03.2023), gold and platinum, as well as bonds and deposits, showed a positive rate of return. Investments in other metals and the WIG20 index had a negative rate of return. During this period, the lowest deviation was shown by deposits, which deviated from the average by an average of only ± 0.0014 . At that time, the highest average level of deviation from the average was characterized by palladium rates of return (± 0.0325). The right-sided asymmetry was shown by the rates of return of ores and the WIG20 index, so these investments usually brought a higher rate of return than the average, while the left-sided asymmetry – bonds and deposits. At that time, the rates of return of ores and the WIG20 index were leptocuric, so they were concentrated relatively close to the average, and bonds and deposits – platokurtic.

However, the analysis of the last period from 24.02.2022 to 23.02.2023 indicates that at that time the investment in silver was also still profitable. During this period, deposits were also characterized by the lowest level of deviation (by ± 0.0016), and palladium rates of return – the highest (by ± 0.0350). In contrast to the war time counted from March, platinum and the WIG20 index showed left-sided asymmetry, so their rates of return were usually lower than average. Also in contrast to that period, the WIG20 index was characterized by leptokurtivity.

5. Summary

To sum up, the epidemic and geopolitical situation from 2020 to 2023 had an impact on the rates of return on raw materials, as well as on shares, bonds and interest rates on deposits. The pandemic has affected all countries' stock markets, but Harjoto, Rossi, Lee and Sergi (2021) point out that it has had a greater impact in emerging markets. However, Ashraf (2020) points out that investors' decisions were much more influenced by information about the number of

new cases of COVID-19 than deaths due to this disease. The war in Ukraine has contributed to the deepening of panic in the markets. It has contributed to problems with transport and ensuring the continuity of supply chains, which has affected commodity and equity prices (Shaik et al., 2023).

The analysis shows that only the average annual rate of return on deposits and gold throughout the period considered was positive. The lowest volatility was characterized by the rates of return on deposits, and the highest – palladium. Due to the high volatility of palladium rates of return, in the period under review they usually recorded minimum and maximum rates of return compared to other investments.

The profitability of individual investments changed during the period under review. Measuring the profitability of investments using the rate of return gave different results due to the chosen method of calculating the rate of return. The level of simple, nominal, annual rates of return differed from the level of simple, nominal, average annual rates of return. In this case, the level of average annual rates of return was lower than the level of annual rates of return. Therefore, the conclusions on the profitability of individual investments are slightly different. This means that the choice of the method of calculating the rate of return affects the results obtained, which translates into investment recommendations.

This article presents issues related to the profitability of particular types of investments and the impact of the selected method of calculating the simple rate of return on investment decisions, but it does not exhaust the examined issue. In subsequent studies, it is worth reviewing the literature not only of the most recent publications, but also of older ones, in order to identify changes in the approach to safe investments over the years, as well as the impact of crisis situations on the perception of the security of particular types of investments. It is also worth analysing other types of alternative investments, including cryptocurrencies. In future analyses, it is also worth considering the use of statistical tests.

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