

Precious metals as alternative investments

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Summary

The paper is devoted to one of the kinds of alternative investments. Precious metals futures and their risk-return profile in comparison to such stock index futures as Dow Jones and S&P are analyzed. Usually alternative investments are thought to be long-term ones. The author checks if they may be also helpful in a shorter period of time. The following research question is verified: do investments in precious metals let realize more attractive risk return profiles than in stock indexes in the medium period of time (two years)? The study was conducted with data from January 2015 to December 2016 and daily rates of return were applied.

Key words: alternative investments, precious metals, gold, silver, risk, return

JEL classification code: G2, C2

Introduction

Precious metals are one of the possibilities of making alternative investments. It means that they are thought to have weak negative correlation with traditional assets such as stocks or classical bonds. At the same time one can meet many controversies concerning these kinds of investments as far as their risk or liquidity is concerned. Generally, they are treated as long-term investments. However, the author checks if precious metals can be a good investment opportunity for medium term investors from the point of view of both rates of return and risk. The research is done on the assumption that an investor is not endangered with the American dollar currency risk.

The art of investing in alternative assets

The standard definition of alternative investments doesn't exist. There are two possible ways of understanding this term. The first one can be done by including chosen types of investments in the definition, whereas the second possibility is to exclude those investments which are not treated as alternative ones such as long positions in stocks, bank deposits or classical bonds.¹ A very negative attitude towards alternative investments is presented by L.E. Swedroe and J. Kizer. They consider some of them to be products created for selling, not buying and stress that their construction is complex because if it wasn't, clients wouldn't buy many of them.² The complexity and the lack of transparency of these kinds of investments is emphasized by B. Stein and P. DeMuth.³ At the same time almost all books or reports on alternative investments pay attention to the fact that they can potentially give higher rates of return at the same risk level.⁴

Possibilities of alternative investments grow and change continuously, which is why it is not enough to present the scientific literature point of view, but also of some investment

¹ E. Sokołowska, *The Principles of Alternative Investments Management: A Study of the Global Market*, Springer, Switzerland 2016, p. VI.

² L.E. Swedroe, J. Kizer, *The Only Guide to Alternative Investments You'll Ever Need: The Good, The Flawed, The Bad, and the Ugly*, Bloomberg Press, New York 2008, p. XXIV.

³ B. Stein, P. DeMuth, *The Little Book of Alternative Investments, Reaping Rewards by Daring to Be Different*, John Wiley & Sons, Inc., Hoboken 2011, p. XIII.

⁴ See for example: Ch.M. Johnson, I. Okounkova, *Alternative investments – Insight for individual investors*, DWS Investments, Deutsche Bank Group, 2011, p. 3, available at: <https://fundsus.deutscheam.com/EN/docs/resources/sales-ideas/ALT-WHITE.pdf>, 7.02.2017.

intermediaries which operate on this market. OppenheimerFunds divides alternative investments into two categories:⁵

- Alternative assets which let investors take positions in securities whose rates of return are slightly correlated with traditional assets such as stocks or bonds. Here the following groups are categorized: real estate, limited partnerships that are publicly traded on an exchange, commodities, precious metals or event-linked bonds whose coupons are based on special events like floods or hurricanes,
- Alternative strategies give investors the possibility of investing by qualified managers who make investments in stocks or bonds, however use special techniques to make the best of them. Such managers are employed by hedge funds or other financial intermediaries and they apply for instance the following strategies: long short equity, market neutral, global macro, manager futures, merger arbitrage, volatility or currency alpha. They aim at generating absolute rate of return irrespective of market conditions.

According to M.J.P. Anson, alternative investments should be rather treated as the way of widening the spectrum of possible kinds of investments and not as hedging techniques. They can either be bought privately (like f.ex. real estate) or on an organized exchange (like metals futures). The author names five types of alternative investments:⁶

- Hedge funds,
- Commodity and managed futures,
- Private equity,
- Credit derivatives,
- Corporate governance.

Prequin reports the following kinds of alternative investments:⁷

⁵ OppenheimerFunds, A Guide to Alternative Investments, 30 July 2015, p. 2, available at:https://www.oppenheimerfunds.com/investors/doc/A_Guide_to_Alternative_Investments.pdf?dig_asset_metrics=done, 3.02.2017; Alternative investments. Understanding their role in a portfolio, ProShares ProFunds, 2015, p. 7, available at: http://www.proshares.com/media/documents/alternative_investments.pdf, 3.02.2017.

⁶ M.J.P. Anson, Handbook of Alternative Assets, John Wiley & Sons, USA 2002, p. 1.

⁷ Prequin Investor Outlook: Alternative Assets H1 2016, p. 5; available at: <https://www.prequin.com/docs/reports/Prequin-Investor-Outlook-Alternative-Assets-H1-2016.pdf>, 3.02.2017.

- Private equity,
- Hedge funds,
- Real estate,
- Infrastructure⁸,
- Private debt,
- Natural resources.

Some classifications consider emotional assets as well.⁹ Some others include structured products like for example life insurance assets.¹⁰ As it can be seen from the above given overview, there is not one standard classification of alternative assets. What's more, their range is changing rapidly together with changes made in the world economy. Besides, some of them become more and more liquid. About ten years ago, one of the characteristic features given was the illiquidity. Nowadays, it is not always true.

The literature overview

Prices of precious metals have been a matter of scientific examinations for many years and they still are.¹¹ Risk and return concerned with precious metals are analyzed with different methods. For example S. Hammoudeh, F. Malik and M. McAleer propose the Vaue at Risk method.¹² A. A. A.Khalifa, H. Miao and S. Ramchander use different kinds of volatility and daily absolute rates of return.¹³ R. Sari, S. Hammoudeh, U. Soytaş analyse precious metal prices

⁸ See also: Investing in Infrastructure Funds, September, PROBITAS PAERTNERS, 2007, p. 1 – 40, available at: <http://probitaspartners.com/pdfs/infrastructure.pdf>, 7.02.2017.

⁹ See for example: D. Jureviciene, A. Jakavonyte, Alternative investments: valuation of wine as a means for portfolio diversification, *Business: Theory and Practice*, Vol. 16, No. 1, 2015, p. 84 – 93.

¹⁰ E.S. Adams, The Emerging Alternative Investment – Life Insurance Assets, 2013, p. 1 – 21, available at: <http://www.insurancestudies.org/wp-content/uploads/2013/08/The-Emerging-Alternative-Investment-Life-Insurance-Assets.pdf>, 7.02.2017.

¹¹ B. Adrangi, A. Chatrath, The dynamics of palladium and Platinum prices, *Computational Economics*, No. 19, p. 179 – 195; P. Draper, R.W. Faff, D. Hillier, *Financial Analysts Journal*, Vol. 62, No. 2, April 2006, p. 98 – 106; D.G. Baur, B.M. Lucey, Is Gold a Hedge or a Safe Haven? An Analysis of Stocks, Bonds and Gold, *The Financial Review*, No. 45, 2010, p. 217 – 229; F.A. O'Connor, B.M. Lucey, J.A. Batten, D.G. Baur, The financial economics of gold – A survey, *International Review of Financial Analysis*, , No. 41, 2015, p. 186 – 205.

¹² S. Hammoudeh, F. Malik, M. McAleer, Risk management of precious metals, March 2011, p. 1 – 28; available at: <http://eprints.ucm.es/12448/1/1104.pdf>.

¹³A. A. A.Khalifa, H. Miao, S. Ramchander, Return Distributions and Volatility Forecasting in Metal Futures Markets: Evidence from Gold, Silver and Copper, *The Journal of Futures Markets*, Vol. 31, No. 1, 2011, p. 55 – 80. See also: J.M. Batten, B.M. Lucey, Volatility in the gold futures market, *Applied Economics Letters*, Vol 17, No. 2, p. 187 – 190; B.T. Ewing, F. Malik, Volatility Transmission between Gold and Oil Futures under Structural

and advise them as risk diversification instruments.¹⁴ Strong interrelations among precious metals prices, oil prices and exchange rates are emphasized by A. Fernandez-Perez, B. Frijns, A. Tourani-Rad.¹⁵ The paper clearly proves that investments in alternative assets like precious metals require a deep analysis of financial markets. What's more, A. Charles, O. Darne, J.H. Kim analyze the degree of market efficiency for gold, silver and platinum and report that their rates of return change in time depending on economic and political factors.¹⁶

Precious metals can be used both as investment assets and as value storage assets. D.G. Baur and T.K. McDermott emphasize the role of gold as the mean of holding value during the financial crisis both in the EU and in the USA.¹⁷ It is advised more and more often to include precious metals in investment portfolios as a diversifying asset, both institutional and individual.¹⁸ Gold is supposed to reduce the negative skewness thanks to making the portfolio distribution closer to normal.¹⁹ Although alternative investments may be a good solution for some investors, they require using special techniques of risk management which are summarized by P. Jorion.²⁰ Countries keep their money reserves in gold, so it is thought to be special. However, if one looks at its risk and rates of return statistics data, they do not differ a lot from other kinds of precious metals.

Breaks, 2012, p. 1 – 27, available at:

http://www.efmaefm.org/OEFMAMEETINGS/EFMA%20ANNUAL%20MEETINGS/2012-Barcelona/papers/EFMA2012_0189_fullpaper.pdf.

¹⁴ R. Sari, S. Hammoudeh, U. Soytaş, Dynamics of oil price, precious metal prices, and exchange rate, *Energy Economics*, Vol. 32, No. 2, March 2010, p. 351 – 362.

¹⁵ A. Fernandez-Perez, B. Frijns, A. Tourani-Rad, Precious metals, Oil, and the Exchange rate: Contemporaneous Spillover Effects, 2015, p. 1 – 32; available at: https://acfr.aut.ac.nz/__data/assets/pdf_file/0010/29791/B-FrijnsCommodities_AUT_August-2015.pdf.

¹⁶ A. Charles, O. Darne, J.H. Kim, Will precious metals shine? A market efficiency perspective, *International Review of Financial Analysis*, Elsevier, No. 41, 2015, p.284 – 291; available at: <https://hal.archives-ouvertes.fr/hal-01238706/document>.

¹⁷ D.G. Baur, T.K. McDermott, Is gold a safe haven? International evidence, *Journal of Banking and Finance*, No. 34, p. 1886 – 1898.

¹⁸ C. Daskalaki, G. Skiadopoulos, Should investors include commodities in their portfolios after all? New evidence. *Journal of Banking and Finance*, No. 35, 2011, p. 2606-2626; M. Hood, F. Malik, Is gold the best hedge and a safe haven under changing stock market volatility?, *Review of Financial Economics*, Vol. 22, No. 2, April 2013, p. 47 – 52; J.C. Reboredo, Is gold a safe haven or a hedge for the US dollar? Implications for risk management, *Journal of Banking & Finance*, Vol. 37, No. 8, August 2013, p. 2665 – 2676; F. Capie, T.C. Mills, G. Wood, Gold as a hedge against the dollar, *Journal of International Financial Markets, Institutions, and Money*, Vol. 15, 2005, p. 343 – 352; D. Jobman (ed.), *The Handbook of Alternative Investments*, John Wiley & Sons, Inc., New York 2002, p. 132 – 135.

¹⁹ D. Jobman (ed.), *The Handbook of Alternative Investments*, John Wiley & Sons, Inc., New York 2002, p. 132 – 137.

²⁰ Risk Management for Alternative Investments, Prepared for the CAIA Supplementary Level II Book, June 18, 2012, p. 1 – 50, available at: http://merage.uci.edu/~jorion/varseminar/Jorion-CAIA-Risk_Management.pdf, 7.02.2017.

Table. The largest world official gold reserves in December 2016.

	Country or institution	Tonnes	% of reserves
1	United States	8 133,5	73,8%
2	Germany	3 377,9	67,6%
3	IMF	2 814,0	Cannot be calculated
4	Italy	2 451,8	66,8%
5	France	2 435,8	61,5%
6	China	1 842,6	2,2%
7	Russia	1 615,2	15,2%
8	Switzerland	1 040,0	5,6%
9	Japan	765,2	2,3%
10	Netherlands	612,5	62,8%
11	India	557,8	5,7%
12	ECB	504,8	25,6%
13	Taiwan	423,6	3,5%
14	Portugal	382,5	56,4%
15	Turkey	377,1	13,1%
16	Saudi Arabia	322,9	2,2%
17	UK	310,3	8,5%
18	Lebanon	286,8	19,8%
19	Spain	281,6	16,5%
20	Austria	280,0	44,4%

Source: World Gold Council, www.gold.org, 3.02.2017.

Mathematical formulas applied in the paper

Both the most typical efficiency measure, that is the Sharpe ratio was used and some maximum drawdown measures as well. Sharpe ratio requires using the standard deviation which can be applied under the assumption that the rate of return distribution is normal. It was introduced by W. Sharpe. Its first usage was the measurement of investment funds results. Mathematically it can be expressed as: ²¹

²¹ Sharpe W.F., The Sharpe ratio, Journal of Portfolio Management, Vol. 21, No. 1, 1994, p. 49 – 58.

$$\text{Sharpe Ratio} = \frac{r_i^d - r_f}{\sigma(r_i)}$$

where:

r_i^d – the average value of the rate of return on analysed assets,

r_f – risk – free interest rate,

$\sigma(r_i)$ – the standard deviation of rates of return of analysed assets.

Maximum drawdown measures let for calculation risk without using the assumption on the normal distribution. The following of them can be named here: Calmar ratio, Sterling ratio and Burke ratio. The Calmar ratio is depicted as follows:²²

$$\text{CR} = \frac{r_i^d - r_f}{-MD_i}$$

where:

r_f - risk-free interest rate,

r_i^d – the average value of the rate of return generated on analyzed assets,

MD_i – the lowest rate of return generated on analysed assets.

Contrary to the Sharpe ratio, the Calmar ratio does not include the average deviation from the mean, but takes into consideration the lowest rate of return from the examined time. It is its strong and weak side at the same time. The former applies to its safety and the latter to its sensitivity to some random low rates of return generated in the past with the low probability of being repeated in the future.²³

As far as the interpretation of the Calmar ratio is concerned, the higher its value is, the better the investment.

²² T.W. Young, Calmar ratio: A smoother tool. *Futures*, Vol. 20, Nr 1, 1991, p. 40; M. Eling, F. Schuhmacher, Does the choice of performance measure influence the evaluation of hedge funds?, *Journal of Banking and Finance*, Nr 31, 2007, p. 2635 – 2637, p. 6; M. Magdon-Ismael, A.F. Atiya, An Analysis of the Maximum Drawdown Risk Measure, p. 1, available at: <https://pdfs.semanticscholar.org/d9bc/90d36b4477dc7a7049994a0867502e7723c7.pdf>, 78.02.2017.

²³ For more about practical problems with using maximum drawdown measures please see: D. Harding, G. Nakou & A. Nejjar, The Pros and Cons of “Drawdown” as a Statistical Measure of Risk for Investments, *Winton Capital Management*, 2003, available at: <http://turtletrader.com/drawdown.pdf>, 8.02.2017.

In order to eliminate the above mentioned disadvantage and make the Calmar ratio less sensitive to some random values of rates of return one can apply the Sterling ratio. It reflects the average rate of return from the lowest of them from the given period of time. The number of the lowest rates of return can be chosen by the researcher. The Sterling ratio is defined in the way presented beneath:²⁴

$$SR = \frac{r_i^d - r_f}{\frac{1}{N} \sum_{j=1}^N (-MD_{ij})}$$

where:

N – the number of the lowest negative rates of return.

The rest of signs mean the same as in the previous formula.

Higher values of the Sterling ratio are desired, similarly to other ratios applied in the paper. The third measure used in the paper and also acknowledged as a maximum drawdown one is the Burke ratio. It is also based on the maximum excess rate of return over the risk-free interest rate, however risk is measured as the square root of the powered sum of the lowest negative rates of return which appeared during the given time.

The Burke ratio is expressed as:²⁵

$$BR = \frac{r_i^d - r_f}{\sqrt[2]{\sum_{j=1}^N MD_{ij}^2}}$$

The higher the Burke ratio, the more advantageous the investment is as far as the risk and return profile are considered.

The scope of the research

The research question is: do investments in precious metals let realize more attractive risk return profiles than in stock indexes in the medium period of time? The study was conducted using data from January 2015 to December 2016. Daily rates of return were

²⁴ L.N. Kestner, Getting a handle on true performance, *Futures*, Vol. 25, Nr 1, 1996, p. 44 – 46 and M. Eling, F. Schuhmacher, Does the choice of performance measure influence the evaluation of hedge funds?, *Journal of Banking and Finance*, Nr 31, 2007, p. 2635 – 2637, p. 6.

²⁵ G. Burke, A sharper Sharpe ratio, *Futures*, Vol. 23, No. 3, 1994, p. 56 and M. Eling, F. Schuhmacher, Does the choice of performance measure influence the evaluation of hedge funds?, *Journal of Banking and Finance*, Nr 31, 2007, p. 2635 – 2637, p. 6.

analyzed. Data were provided by www.stooq.com. Investments in precious metals can be done by futures contracts, which is why futures contracts prices were considered. Direct investing in them is not so effective because of the necessity of paying for their depositories, as well as the risk of theft or damage. It is often emphasized in the literature that alternative investments are usually illiquid assets. It is different for precious metals futures that are liquid enough to be used in everyday financial operations. This is another argument to use futures markets to invest in precious metals. The author applied futures contracts quotations for the Dow Jones and S&P 500 index as well. Direct investments in these indexes are not possible.

Table 1. Basic statistics of examined assets.

	Valid N	Mean	Median	Minimum	Maximum
Gold	515	-0,000061	-0,000430	-0,033665	0,047767
Silver	515	0,000029	0,000585	-0,070231	0,055635
Copper	515	-0,000226	-0,000382	-0,044669	0,039528
Platinum	515	-0,000552	-0,001199	-0,040230	0,038874
Palladium	515	-0,000304	-0,000120	-0,066006	0,063101
Dow Jones	515	0,000205	0,000170	-0,045964	0,033512
S&P	515	0,000169	0,000243	-0,051468	0,034507

Source: author's calculations.

Table 2. Advanced statistics of examined assets.

	Lower Quartile	Upper Quartile	Standard deviation	Skewness	Kurtosis
Gold	-0,005429	0,004751	0,009245	0,331145	2,376000
Silver	-0,007904	0,007729	0,015406	-0,202383	2,256386
Copper	-0,007767	0,006598	0,013421	0,075886	0,444691
Platinum	-0,008783	0,007906	0,013093	0,103563	0,299190
Palladium	-0,011534	0,011396	0,018113	-0,047787	0,656299
Dow Jones	-0,003668	0,004801	0,008613	-0,478125	2,952428
S&P	-0,004100	0,004821	0,009020	-0,570918	3,802331

Source: author's calculations.

According to data depicted in Table 1, the average rate of return from all analysed precious metals is lower than from stock indexes. The same rule applies to the median with the exception of gold. At the same time, as data presented in Table 2 suggest, rates of return of all precious metals have higher standard deviations than rates of return from the Dow Jones index and the S&P500 index. It means that precious metals cannot be better investments than stock indexes, but they should be rather treated as the way of portfolio diversification. If one looks at data gathered in Table 3, all precious metals rates of return have low correlation coefficients

with stock indexes, this statement is confirmed. For the majority of them (except from silver) correlations are statistically significant at $p < 0,05$.

Table 3. Pearson correlation coefficients between examined assets.²⁶

	Gold	Silver	Copper	Platinum	Palladium	Dow Jones	S&P 500
Gold	1,000000	<u>0,747051</u>	<u>0,118306</u>	<u>0,682441</u>	<u>0,306933</u>	<u>-0,213494</u>	<u>-0,197068</u>
Silver	<u>0,747051</u>	1,000000	<u>0,302050</u>	<u>0,710211</u>	<u>0,436834</u>	0,055896	0,064154
Copper	<u>0,118306</u>	<u>0,302050</u>	1,000000	<u>0,287625</u>	<u>0,336227</u>	<u>0,306195</u>	<u>0,293188</u>
Platinum	<u>0,682441</u>	<u>0,710211</u>	<u>0,287625</u>	1,000000	<u>0,561855</u>	<u>0,118370</u>	<u>0,126518</u>
Palladium	<u>0,306933</u>	<u>0,436834</u>	<u>0,336227</u>	<u>0,561855</u>	1,000000	<u>0,280646</u>	<u>0,286974</u>
Dow Jones	<u>-0,213494</u>	0,055896	<u>0,306195</u>	<u>0,118370</u>	<u>0,280646</u>	1,000000	<u>0,976136</u>
S&P	<u>-0,197068</u>	0,064154	<u>0,293188</u>	<u>0,126518</u>	<u>0,286974</u>	<u>0,976136</u>	1,000000

Source: author's calculations.

Table 4. Efficiency ratios of investments in analyzed assets.

	Sharpe	Calmar	Sterling 5	Sterling 10	Burke 5	Burke 10
Gold	-0,01385	-0,0038	-0,4498	-0,51903	-0,19927	-0,16111
Silver	-0,00247	-0,00054	-0,06599	-0,07928	-0,02927	-0,02439
Copper	-0,02183	-0,00656	-0,79919	-0,86236	-0,35524	-0,27083
Platinum	-0,04728	-0,01539	-1,73748	-1,85675	-0,77481	-0,58479
Palladium	-0,02048	-0,00562	-0,69563	-0,76107	-0,30888	-0,23828
Dow Jones	0,016022	0,003002	0,417025	0,509487	0,180637	0,15358
S&P 500	0,011308	0,001982	0,284261	0,34684	0,122109	0,103947

Source: author's calculations.

Distributions of rates of return for all analyzed assets rates of return were checked for the normal distribution. The following zero hypothesis was tested:

$$H_0: E[| G(x) - F(x) |] = 0 \text{ for } x \in (-\infty, +\infty)$$

Where:

G(x) – values of rates of return from analyzed assets (the empirical distribution)

F(x) – values of the theoretical normal distribution

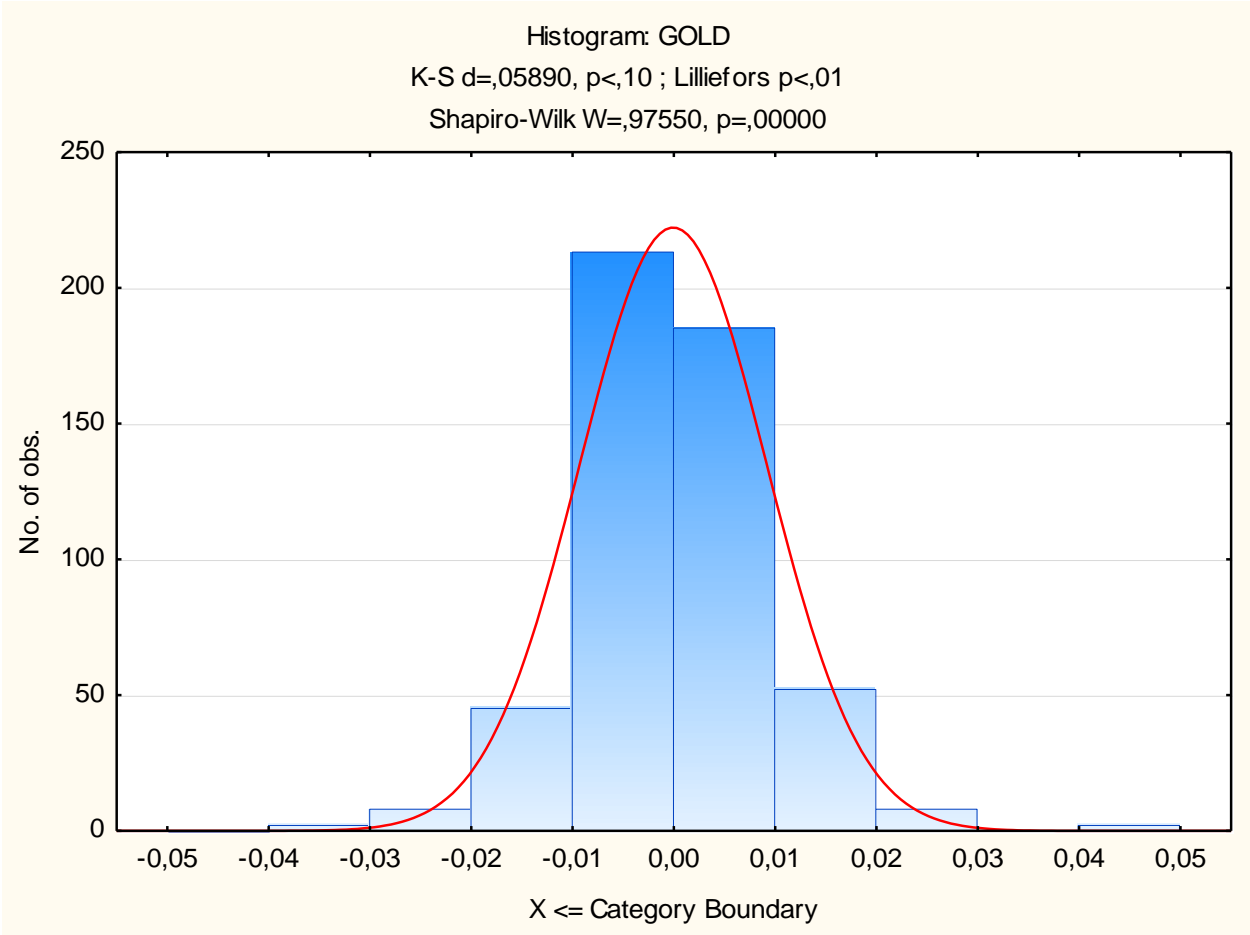
The contrary hypothesis was written as:

$$H_1: E[| G(x) - F(x) |] > 0$$

²⁶ Underlined correlations are significant at $p < 0,05$.

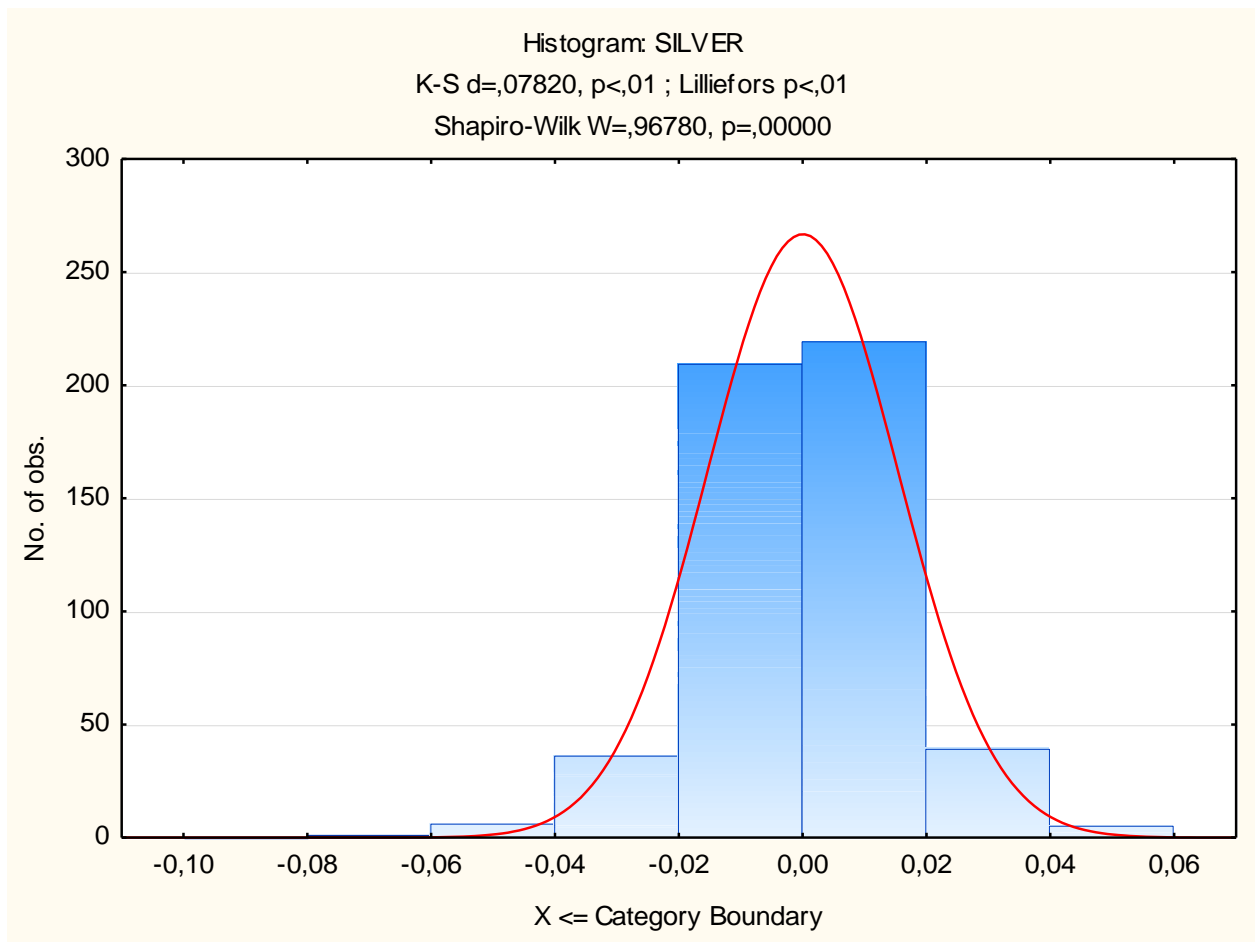
Taking into consideration the significance level of 0,05, the Shapiro – Wilk test (results presented in graphs 1 – 7) shows that rates of return from 3 precious metals (Gold, Silver, Copper), as well as from the Dow Jones index and the S&P 500 index are not normally distributed. At the same time rates of return of 2 precious metals (Platinum and Palladium) do not differ significantly from the normal distribution. Such results decided that the author examined the risk return profile of instruments not only by formulas that use the standard deviation as the risk measure, but also with some alternative measures.

Graph 1. The histogram of rates of return from gold.



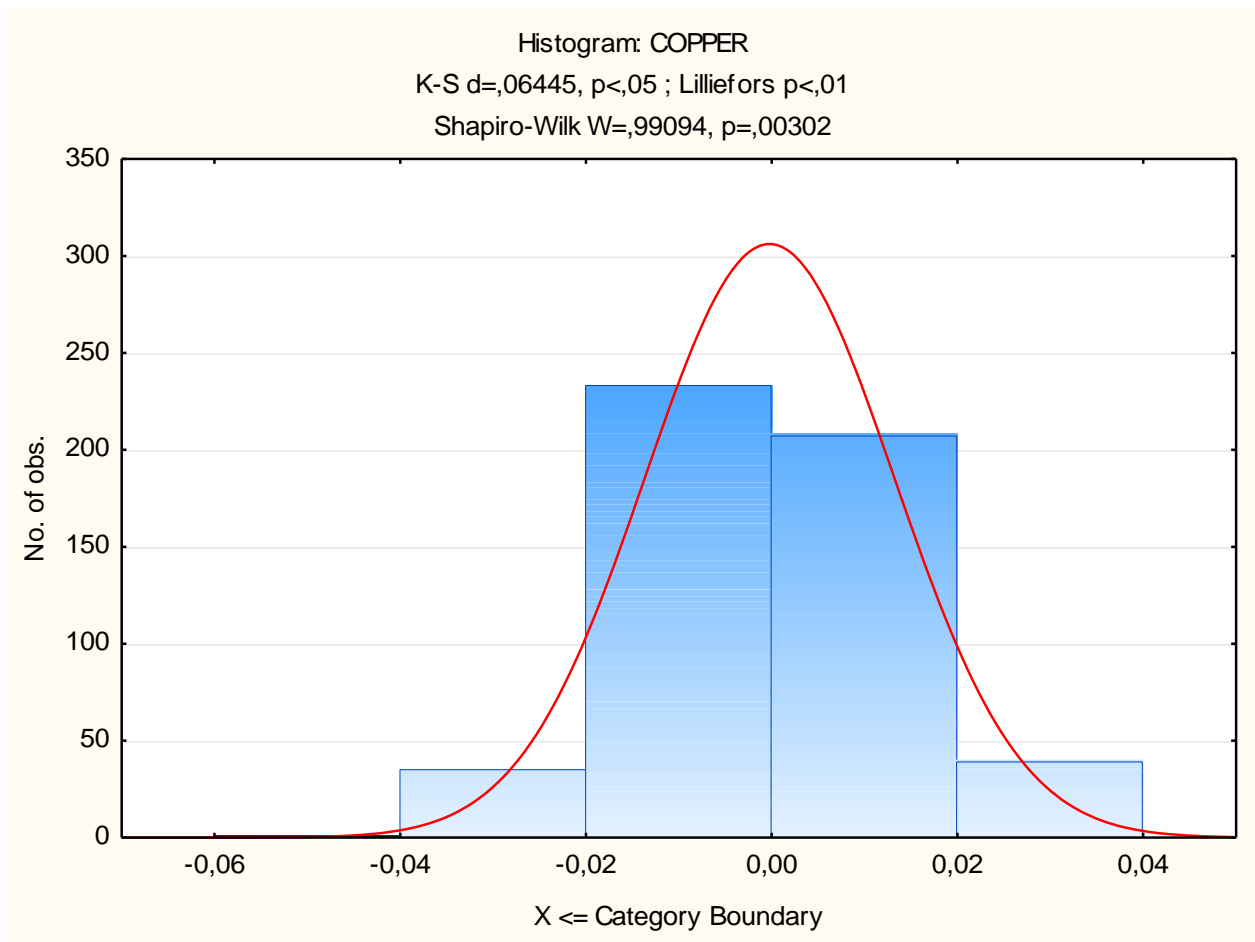
Source: author’s analysis.

Graph 2. The histogram of rates of return from silver.



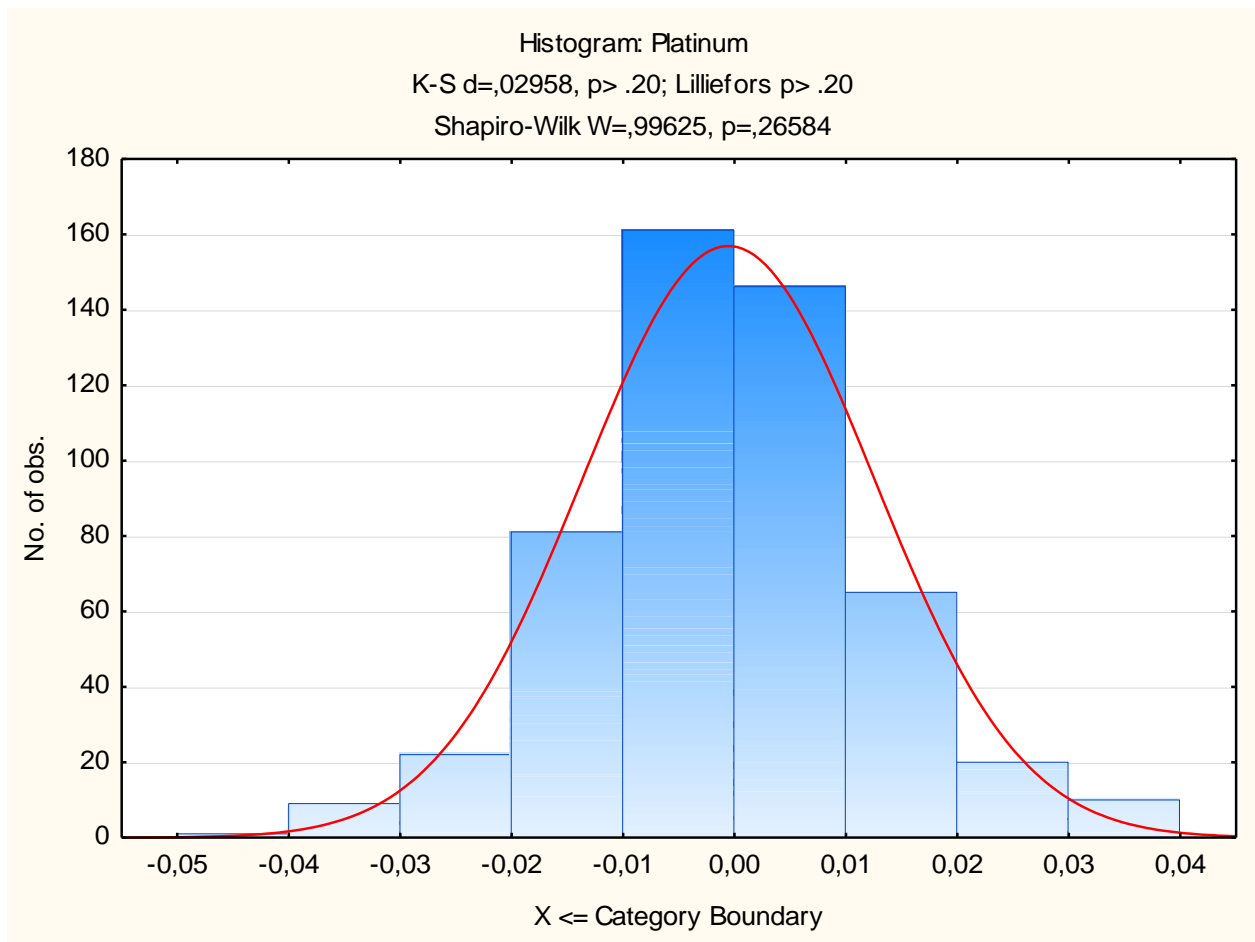
Source: author's analysis.

Graph 3. The histogram of rates of return from copper.



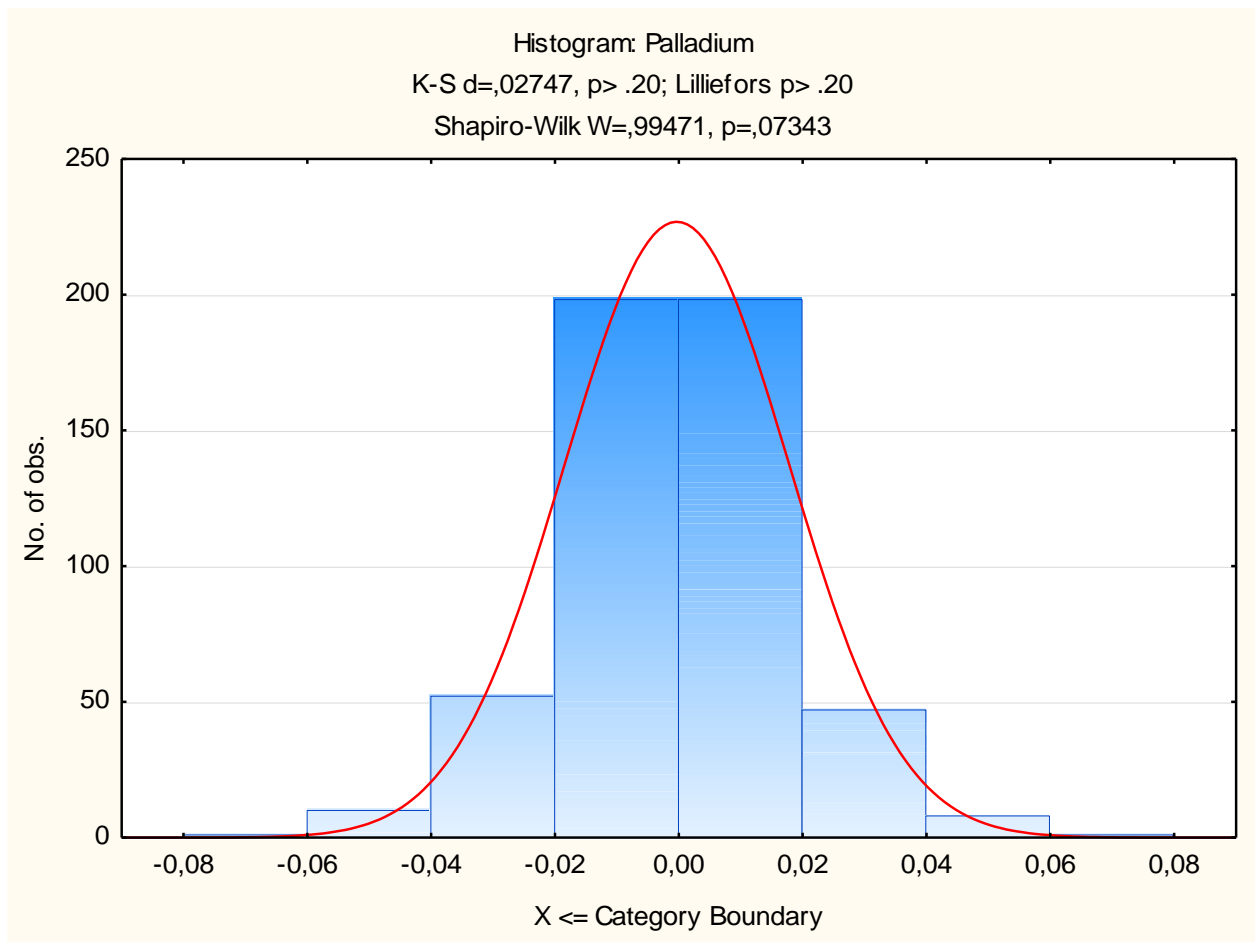
Source: author's analysis.

Graph 4. The histogram of rates of return from platinum.



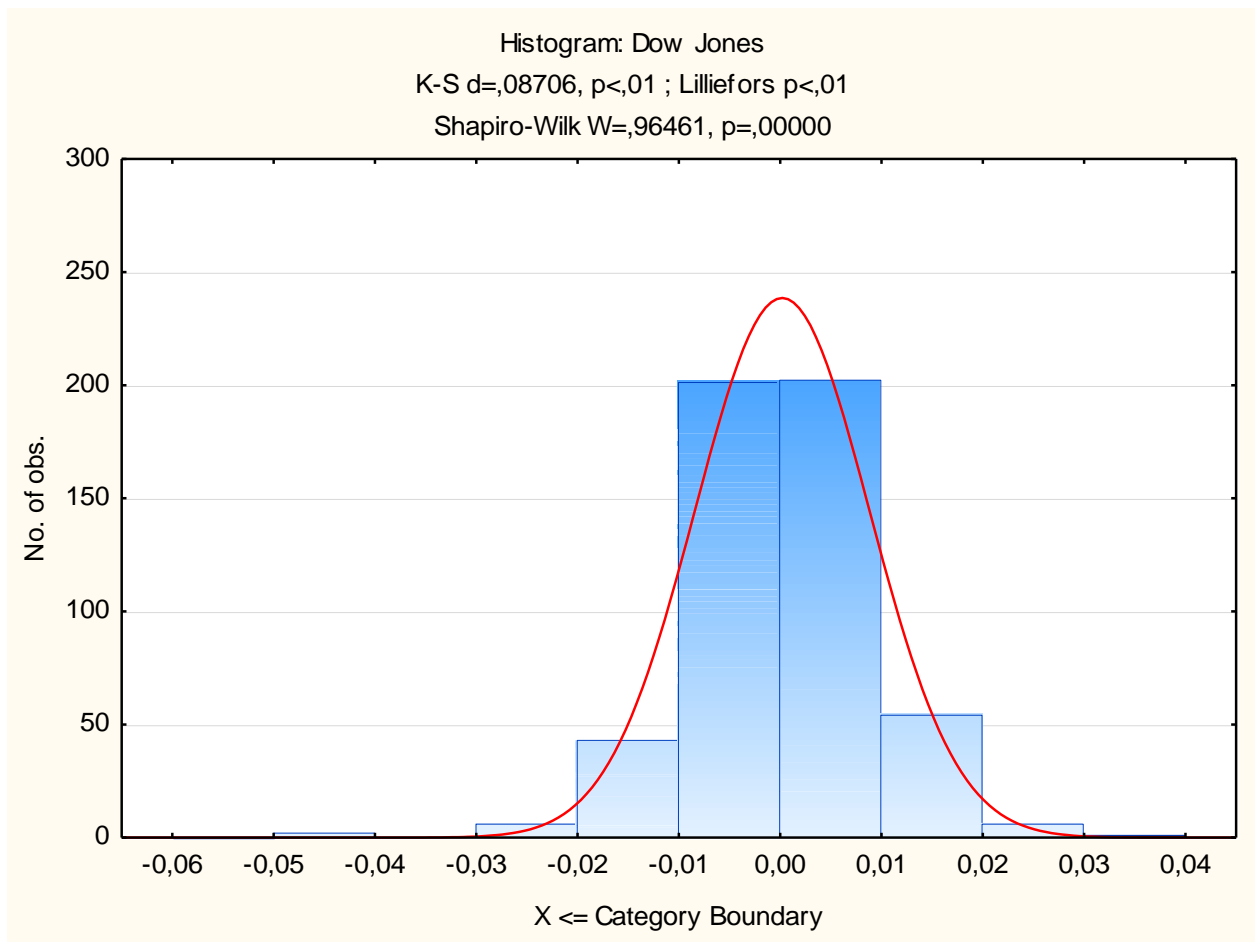
Source: author's analysis.

Graph 5. The histogram of rates of return from palladium.



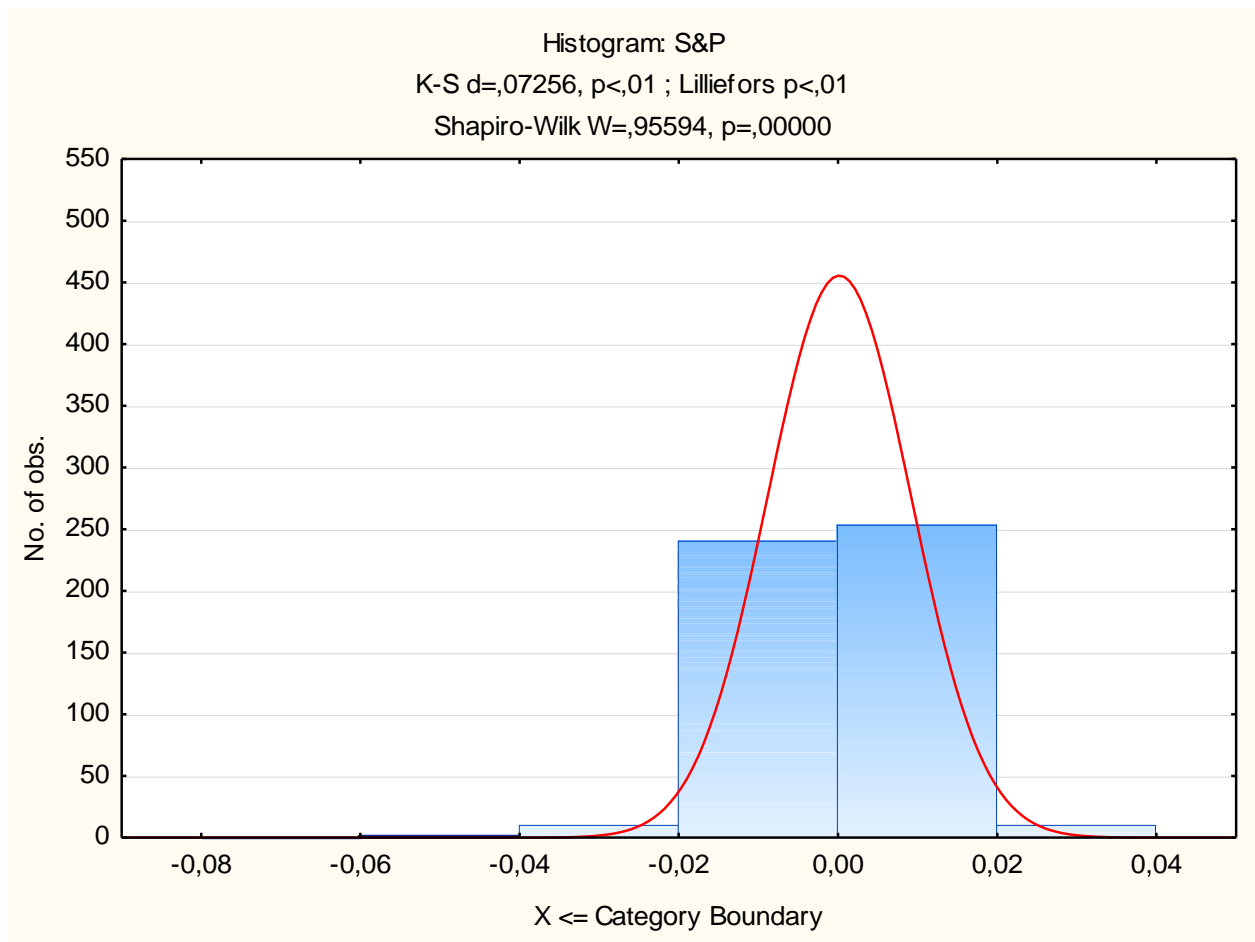
Source: author's analysis.

Graph 6. The histogram of rates of return from the Dow Jones index.



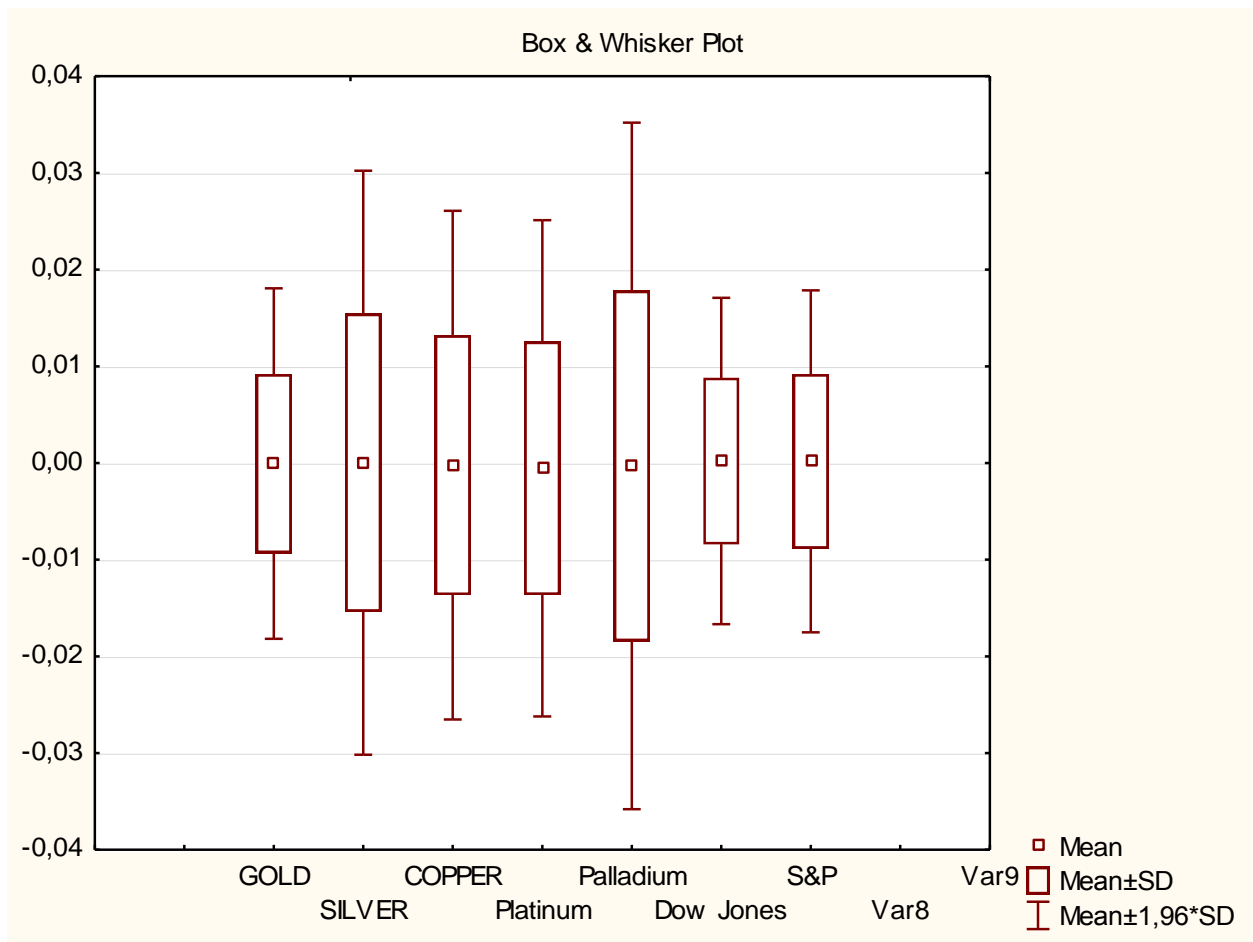
Source: author's analysis.

Graph 7. The histogram of rates of return from S & P 500 index.



Source: author's analysis.

Graph 8. Box & Whisker Plot for examined assets rates of return.



Source: author's analysis.

Final remarks:

As it was shown, the majority of precious metals rates of returns are not normally distributed. It means that risk-return measures based on standard deviation may not be adequate. That is why, apart from them, the author used maximum drawdown measures as well. However, results obtained are similar no matter what kind of measure is used. Precious metals give a worse risk return profile in the medium period of time (two years) than such stock indexes as Dow Jones and S&P index.

The research proves that precious metals should not be used as investment assets themselves in moderate periods of time, however in certain cases they can be treated as portfolio diversification instruments because of weak and negative correlation coefficients of their rates of return with indexes rates of return. Thanks to such a portfolio construction, during the financial crisis, when indexes fall down, losses may not be as substantial as in the case of investing in stocks only. Of course, this matter requires further studies concerning the

proportion of precious metals instruments used in the portfolio in comparison to stocks. The author will try to solve this problem in the future research.

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