

Precious metals market in the new millennium

Peter Badura*, Faculty of Business Management, University of Economics in Bratislava, Bratislava 851 04, Slovakia.

Lenka Kalusova, Faculty of Business Management, University of Economics in Bratislava, Bratislava 851 04, Slovakia.

Miroslav Kmetko, Faculty of Business Management, University of Economics in Bratislava, Bratislava 851 04, Slovakia.

Mariana Sedliacikova, Faculty of Wood Sciences and Technology, Technical University in Zvolen, Zvolen 960 53, Slovakia.

Katarina Vavrova, Faculty of Business Management, University of Economics in Bratislava, Bratislava 851 04, Slovakia.

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Abstract

In the ever-changing investment environment, it is not easy to find a relatively safe investment option. That is the reason why a large part of investors is increasingly concerned with the benefits and risks of investing in precious metals. The aim of this paper was to find out how the prices of selected precious metals, their cross-correlation and their volatility have been behaving in the last millennium as well as their relation to S&P 500 index values have been analysed. The method of correlation analysis has been used as the main research method. Our findings showed that despite the fact that some of the precious metals seemed to be a good choice as a profitable investment none of them have been a good choice for investment diversification, neither with each other nor with the S&P 500 index. The precious metals (especially gold) are financial instruments that are liquid in any part of the world.

Keywords: Precious metals, S&P 500 index, price correlations, standard deviation, new millennium.

* ADDRESS FOR CORRESPONDENCE: **Peter Badura**, Faculty of Business Management, University of Economics in Bratislava, Bratislava 851 04, Slovakia. **E-mail address:** p.bandura@gmail.com / Tel.: +421 2/672 953 56

1. Introduction

In the radically altered investment environment, it is not easy to find relatively safe investment options, so a large part of investors are dealing increasingly with the possibilities, benefits and risks of purchasing precious metals, especially gold, as an investment tool. Gold and other precious metals can always be used as one of the forms of a company's financial investments, especially as part of a well-diversified portfolio. Gold and other precious metals are often also included in the portfolios of pension funds for the sake of risk diversification (Skriniar, 2011). Additionally, precious metals and gold, in particular, are financial instruments that are liquid in any part of the world. The aim of our article is to produce an analysis based on the price developments of precious metals in the new millennium (from January 2001 to December 2015), examining the volatility of these prices and measuring their correlation with the equity index S&P 500, verifying the argument that precious metals are a good form of profitable investment and how it is also suitable for risk diversification in investing. Only gold, silver, platinum and palladium are used almost exclusively for investment purposes, which is the central focus of our article.

The relationship between gold, silver and the consumer price index in the UK and the US is dealt with in a study by the authors Bampinas and Panagiotidis (2015). The research results of these authors point to the fact that over the long term (authors studied the period 1791–2010), gold can serve as a means to hedge against inflation, particularly in the US. The effects of silver as a hedging instrument in the United States were also confirmed, but only minor effects were observed in the UK. The possibility of using gold as a protection against inflation was observed by Shafiee and Topal (2010). They concluded that there is no significant relationship between the price of gold and the inflation rate. They also concluded that gold can hardly be used to protect an investor against the measure of inflation. The same results were also reached by Erb and Harvey (2013).

The interlinkages between the equity index S&P 500 and the evolution of prices of gold, energy, food and drinks in the timeframe of 2000–2011 were studied by Smaller et al. (2013). The authors found that the volatility of the equity index S&P 500 closely correlates with the evolution of prices of gold and oil. Bhunia and Pakira (2014) stated that gold prices and a stock market move in the opposite direction. Different results of the examination of the cross-correlation between gold prices and the S&P 500 were reached by Dobardzic and Rakic (2012). The authors examine this dependence over three periods—in the years of 2008–2011, e.g., during the period of the global financial crisis, then, in the years when the crisis broke out, namely 2008–2009, and finally in 2011, when gold prices reached historical highs. As the results of the research show, the correlation coefficient between the S&P 500 and gold prices is not statistically significant, not even in one of the monitored periods.

2. Material and methods

The information required to compile this paper were received from multiple sources. Price information on precious metals was acquired from London Bullion Market Association and the London Platinum and Palladium Market. The values of the S&P 500 were obtained from the website Yahoo Finance.

Depending on the detection (leak relationship) between price developments in individual pairs of precious metals and precious metals and the equity index S&P 500, we used the method of correlation analysis. The value of the correlation coefficient between two variables is determined by the following relationship Eqs. (1) and (2):

$$r_{xy} = \frac{\text{COV } xy}{\sigma'_x \cdot \sigma'_y} \quad (1)$$

$$r_{xy} = \frac{\overline{x \cdot y} - \bar{x} \cdot \bar{y}}{\sqrt{\overline{x^2} - \bar{x}^2} \sqrt{\overline{y^2} - \bar{y}^2}} \quad (2)$$

If the correlation coefficient between the variables oscillates around 0 or is exactly equal to 0, we consider these variables as independent. If the value of the correlation coefficient is near to +1, there is a positive dependency. Values close to -1 are interpreted as negative, indirect dependency.

The volatility of precious metals and the stock index S&P 500 during the reporting period from 2001 to 2015 is detected by the coefficient of variation (Eq. (3)), which is based on standard deviation (Eq. (4))

$$v_x = \frac{s_x}{\bar{x}} \cdot 100 \quad (3)$$

$$s_x = \sqrt{\frac{1}{n} \sum_{i=1}^k (x_i - \bar{x})^2 \cdot n_i} \quad (4)$$

3. Results and discussion

Below we see the relationship of the price of gold, silver, platinum and palladium (as representatives of the bullion market) and the value of the S&P 500 (as a representative of the stock market) in a single chart spreading across the past 15 years (January 2001–December 2015).

Figure 1 shows the growth and decline in precious metal prices during the period. The price of bullion reached on the London stock market on 2 January 2001 is the core value at 100%, and all its subsequent increases and decreases are compared with that basic value. Because of the range of policy options and their plotting to the graph, they are not drawn daily but at monthly values. Since the beginning of the millennium (January 2001) until the present (December 2015), exactly 15 years have passed, meaning the graph displays 180 values (always on the first trading day of the particular month). The same applies to the S&P 500.

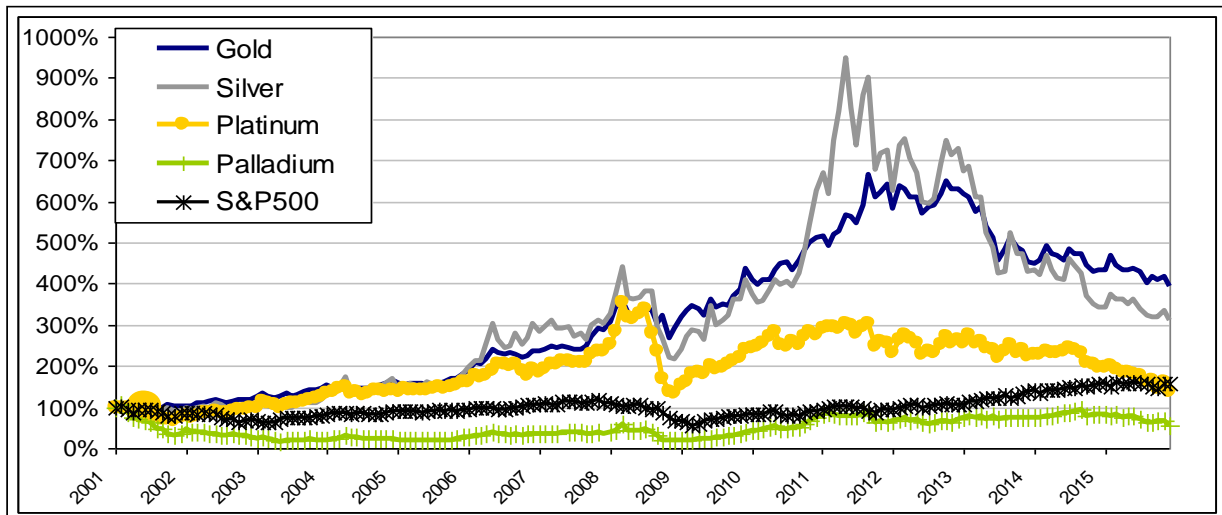


Figure 1. Prices of precious metals and the S&P 500 index in the period from January 2001 to December 2015.

The price of gold saw its peak in 2011 and has since gradually decreased. Since the beginning of the millennium, it was able to rise to 6.66 times its initial price. The price in December 2015 was 3.92 times higher than the initial price, which is at 1.00 (or 100%).

Extra higher growth rates than gold were seen in silver. Significant growth occurred mainly in 2011. Silver was able to rise up to 9.50 times the initial price but has since steadily declined, even more significantly than gold. The December 2015 price of silver was 3.10 times its initial value.

The price of platinum appears to be relatively stable. The price rose particularly at the beginning of the economic crisis in 2008, hitting 3.54-fold. At present (December 2015), the price of platinum is 1.38 times its initial value, which means it is now a worse investment than an investment in the S&P 500.

For the past 15 years, palladium has also very interesting results (although in this case more in a negative sense). Since the beginning of the millennium, the price fell sharply—by a multiple of just 0.16 and is currently holding only 0.57 times its initial value. That makes it the worst investment of all compared precious metals, as well as compared to the S&P 500 index.

The actual value of the S&P 500 fell notably during the last crisis. The lowest level since the beginning of the millennium was recorded in 2009 and only at 0.55 times the initial value. From that moment, however, the stock market recovered and the value of the index started to grow. In December 2015, it was at 1.58 times its initial value.

Some interesting facts can be picked out even during the economic crisis, especially in 2008 and beyond (Bikar, 2007; 2012). Based on the above chart, we can conclude that at the beginning of the fall of the stock markets, there was a selection of investments from stock markets and their move to safe assets—in this case, precious metals. It is seen at the very beginning of the chart when there was a sharp increase in the prices of all precious metals.

The following Table 1 shows the cross-correlation between the different metals with each other and correlation with the S&P 500 as a representative of the stock market. The correlations are again based on analysis of the monthly 180 prices (compared to the correlation based on the daily price deviation, the maximum deviation was 0.01 of a point, which means the results were almost identical).

Table 1. Correlation of prices of precious metals and the S&P 500 index (January 2001–December 2015)

	Gold	Silver	Platinum	Palladium	S&P 500
Gold	1.00				
Silver	0.95	1.00			
Platinum	0.82	0.85	1.00		
Palladium	0.68	0.65	0.49	1.00	
S&P 500	0.46	0.34	0.34	0.68	1.00

As for the cross-correlation, in the new millennium, gold and silver saw a highly similar trend and the correlation between their prices was at a very high level (0.95). Both of these precious metals also have no significant correlation with equity markets. For gold, the correlation with equity markets is at 0.46 points and at 0.34 points for silver. Platinum also correlated with equity markets at an insignificant 0.34 points while the prices fairly significantly correlated with the prices of gold and silver (0.82 points and 0.85 points, respectively). Palladium correlates with equity markets at 0.68 points and its correlation with other precious metal is at a lower level.

Table 2 shows the coefficients of variation in prices of individual precious metals and the S&P 500 for each year of the reference period. Each listed value of the coefficient of variation was calculated as a standard deviation of the daily rates of all assets in a given year and then, divided by the average of all prices in a given year.

Table 2. Coefficient of variation in prices of precious metals and the S&P 500 (January 2001–December 2015)

Year/asset	Gold (%)	Silver (%)	Platinum (%)	Palladium (%)	S&P 500 (%)
2015	4.92	6.74	11.47	13.18	2.66
2014	3.98	9.09	7.06	6.09	4.12
2013	10.49	16.96	6.86	3.72	6.02
2012	3.83	8.03	6.05	6.44	3.37
2011	9.51	12.85	7.23	9.82	4.92
2010	8.04	19.84	4.93	19.10	4.92
2009	8.84	14.56	11.98	22.14	12.17
2008	7.73	22.39	31.04	33.02	15.66
2007	8.40	5.58	7.53	4.14	3.03
2006	6.55	12.56	7.53	8.31	3.91
2005	6.10	7.31	4.52	13.03	2.45
2004	4.45	9.29	3.86	12.78	2.80
2003	6.05	6.91	7.64	15.48	8.16
2002	4.63	4.04	7.34	13.08	11.43
2001	3.11	3.91	14.27	38.13	7.25
Annual average	6.44	10.67	9.29	14.56	6.19
Whole time coefficient	53.12%	62.19%	35.30%	48.35%	25.04%

Based on the coefficient of variation, you can read some interesting facts. The most interesting is probably that although gold has a low variation in prices (measured as annual averages of variability), the coefficient of variation for the 15-year period as a whole is very high. In other words, while in the individual years, gold prices do not fluctuate more than silver, platinum or palladium prices, it is also true that gold has a significant variation in prices in the long term—in this case for the last 15 years (which can also be seen in Figure 1). Silver and palladium show a high variability in prices, on both—an annual basis and over the long term. Of all the compared precious metals, platinum appears in the long term as the most stable asset.

4. Conclusion

For investors or financial managers of a company, our paper shows some very interesting findings. All precious metals have observed some slightly positive correlation with equity markets. As to profitability, the most profitable investment in the period turned out to be gold, which is still about four times its initial value. Then, silver hit three times its initial value. Platinum, although its price is approximately 1.5 times the initial value, is shown to be slightly worse than the investment in the stock S&P 500. Palladium was the worst possible investment of all when its price since the beginning of the millennium only declined and even now is below its initial value. The most volatile asset turned out to be just palladium, making it the worst investment ever. Significant volatility was also seen with silver and platinum. Gold price volatility, perhaps somewhat surprisingly, is roughly at the level of volatility of the value of the S&P 500—in terms of average annual volatility. In the long term, however, gold as well as other precious metals are significantly more volatile than the S&P 500 index.

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