



The Price of Shelter – Downside Risk Reduction with Precious Metals

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This article examines the potential to reduce downside risk by adding precious metals to a portfolio consisting of traditional assets. It shows that gold, silver and platinum contribute to downside risk reduction at short horizons, but diversification into silver and platinum may result in increased long horizon portfolio risk. The price of sheltering an equity portfolio from downside risk using precious metals is a relative reduction in portfolio risk-adjusted returns. The key message is that gold is an effective but costly hedge against negative portfolio returns while silver and platinum provide only short-run relief against downside risk.

Introduction

Fearing losses from declines in asset prices, investors may allocate a proportion of their wealth to alternative assets, in the hope of limiting portfolio exposures during bear markets. In the context of traditional assets, especially equity portfolios, gold is frequently proposed as a hedge (due to its low correlation with them) and safe-haven (negative correlation during downturns); see e.g. Bredin *et al.* (2015), Baur and Lucey (2010), and Baur and McDermott (2010). The allure of gold as an investment asset also relates to its potential as a hedge against inflation (Conlon *et al.*, 2018b; Gorton and Rouwenhorst, 2006) and as a currency safe-haven (Reboredo, 2013). Little is known, however, about the price an investor must pay to diversify a traditional portfolio using gold. The authors investigate the latter question and measure the downside risk protection offered not only by gold but also silver and platinum.

To quantify hedge and safe-haven properties, the authors gauge the extent to which S&P 500 downside risk at various investment horizons can be reduced by allocating a proportion of total capital to precious metals. Downside risk, the maximum expected loss for a portfolio over a given horizon, is measured through the Cornish-Fisher expansion. To measure the costs of hedging, the authors estimate the change in risk-adjusted returns (Sharpe ratio) resulting from the allocation to precious metals.

The paper contributes to the literature in several ways. This is among the first papers to examine the downside risk reduction properties of silver and platinum. The analysis provides an accurate assessment

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of portfolio downside risk by incorporating higher-order distributional moments. A central theme of the paper is the importance of the investor's horizon in estimating downside risk benefits of precious metals. Finally, the paper investigates the tradeoff between downside risk benefits from diversifying the S&P 500 portfolio with precious metals and expected portfolio returns, which are eroded by the costs of hedging.

Relevance of the Research Question

Aversion to acute losses may motivate investors to seek a risk premium for bearing downside risk (Bali *et al.*, 2009) and can impact their optimal allocation strategy (Jarrow and Zhao, 2006). This dislike for extreme negative outcomes may lead investors to seek out asset classes which provide diversification benefits during downturns. Gold has long been considered a store of value, a unit of exchange and an investment asset. The late 2000s global financial crisis renewed gold's role as an investment asset.

This paper aims to provide a new perspective on precious metals as a safe-haven asset. By investigating the performance of silver and platinum as downside risk diversifiers, the paper assesses alternatives to gold. As well documented in the literature, important financial characteristic such as risk and correlation are heavily dependent upon the horizon at which they are estimated (Conlon *et al.*, 2018a). This, in turn, impacts the hedging effectiveness which can be achieved at different horizons, especially for gold (Bredin *et al.*, 2015). This paper seeks to identify the specific range of horizons at which precious metals act to reduce downside risk for equity investors. Finally, while diversification has been proclaimed as the only "free lunch" in finance, we determine whether this holds for investment into precious metals. Can equity investors reduce their downside risk exposures in a costless manner using any of gold, silver or platinum?

Data and Downside Risk Estimation

The paper gathers daily data on gold and silver (London Bullion Market Association) and platinum (London Platinum Free Market) in addition to closing prices on the S&P 500 index from 1980 through 2014. All data is obtained from Thomson Reuters Datastream. Logarithmic returns are calculated at a daily level and aggregated for longer horizons of up to 60 days. Downside risk is estimated as follows:

$$MVaR_p(1 - \alpha, \tau) = \mu - \sigma \hat{Z}(\alpha, S, K),$$

where $MVaR_p$ denotes the modified four-moment value-at-risk (VaR) of the portfolio, α is the quantile of interest set to 99% in this study. $\hat{Z}(\alpha, S, K)$ is the quantile obtained through the Cornish-Fisher expansion, with S and K the skewness and excess kurtosis of the distribution of returns, respectively.

Relative risk reduction is estimated using the proportion of equity portfolio VaR that remains after diversifying with precious metals and is given by:

$$RR_{VaR} = \frac{MVaR_p(1-\alpha, \tau)}{MVaR_e(1-\alpha, \tau)}$$



where $MVaR_e$ is the modified VaR associated with an equities-only portfolio and $MVaR_p$ is the modified VaR of the diversified portfolio. The price of shelter is estimated with the relative Sharpe ratio (RSR) as:

$$RSR = \frac{SR_p}{SR_e},$$

that measures the Sharpe ratio of an equity portfolio diversified with precious metals relative to the Sharpe ratio of the equities-only portfolio. Accordingly, an $RSR < 1$ implies that diversification with precious metals is costly as borne out by a reduction in risk-adjusted returns.

Results

The main empirical findings are highlighted in Table 1 for a 10% allocation to precious metals. Concentrating on a 1-day interval, the analysis reveals that gold, silver, and platinum each provide downside risk reduction benefits. Silver provides the strongest short-run benefits, with a 10% allocation resulting in a 20% reduction in downside risk. This reduction comes with a cost, however, with a reduction in the Sharpe ratio of 0.77 relative to holding a portfolio containing only the S&P 500. The implication is that using silver, an investor must sacrifice 23% of the risk-adjusted returns associated with investing in the S&P 500 in order to secure a 20% reduction in downside risk.

Table 1
Downside Risk Reduction (RR) and Relative Sharpe Ratio (RSR) for a Portfolio with a 10% Allocation to Precious Metals over the Period, 1980-2014

Horizon	Gold		Silver		Platinum	
	RR	RSR	RR	RSR	RR	RSR
1	0.85	0.91	0.80	0.77	0.86	0.98
5	0.87	0.90	0.88	0.74	0.89	0.96
10	0.89	0.89	0.91	0.73	0.91	0.96
30	0.91	0.88	0.97	0.71	1.00	0.95
60	0.91	0.89	0.99	0.71	1.03	0.94

Gold provides a somewhat smaller downside risk-reduction at a 1-day horizon, by about 15%, but the price paid is lower than for silver, with a Sharpe ratio equal to 0.91 times that of the equity-only portfolio. The results suggest that at increasing horizons, the risk reduction potential of the three precious metals decrease. Specifically, while a 10% allocation to gold removes 15% of downside risk at a 1-day horizon, at a 60-day horizon the reduction is only 9%. Considering the cost of hedging downside risk with gold, the relative Sharpe ratio decreases by a modest amount from 0.91 to 0.89 as the investment horizon increases from 1 day to 60 days.

The long-horizon risk reduction available to an investor employing silver or platinum to hedge equity portfolio downside risk is much weaker. While both reduce risk at a 1-day horizon, any benefits are largely



expunged at a 60-day horizon. In fact, for platinum, an investor with a horizon of 60 days will experience an increase in downside risk. The cost of including either silver or platinum in the portfolio is substantial, particularly at long horizons. For the longest horizon examined, an investor with a 10% allocation to gold only reduces downside risk by 1% but surrenders 29% of the equity-only risk adjusted returns. The analogous results for platinum suggest an increase in downside risk and a decrease in Sharpe ratio.

The paper considers alternative proportional allocations and shows that they provide analogous findings. Time variation in risk-reduction benefits is notable, with the cost of diversification proving especially high during the 1980s, perhaps relating to an increased interest in gold as an investment asset during this period of high inflationary pressures. Furthermore, precious metal-specific exchange-traded funds and futures contracts are shown to provide an interesting and viable diversification alternative to physical metals. The risk reduction benefits found in the paper are attributed to the variance and kurtosis characteristics of precious metals.

Conclusions

This paper examines the downside risk reduction benefits of investing in precious metals. The empirical findings indicate that gold provides the most consistent risk reduction benefits across all horizons, but that investors must surrender a proportion of their risk-adjusted returns to obtain these benefits. The investment case for silver and platinum is weaker, with limited long-horizon risk reduction and higher costs, as borne out by lower risk-adjusted portfolio returns. While previous research has advocated gold as a costless way to reduce risk, the finding of a reduced Sharpe ratio highlights that investors may have to forego performance to diversify away downside risk. Further research is warranted to identify the downside risk benefits of precious metals across an optimized portfolio containing a larger investment opportunity set.

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Keywords

Precious metals, gold, downside risk, risk-adjusted returns.