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Investment potential and risk hedging characteristics of platinum group metals

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ABSTRACT

We examine the investment potential and risk-hedging characteristics of platinum, palladium, and rhodium by analyzing returns on their spot prices and comparing them with gold, crude oil, and stocks. The three characteristics that we examine that may be of the most importance to investors are the correlation with inflation, the correlation with foreign exchange rates, and the systematic risk of the investments. We find platinum is useful as a hedge against all three factors, and is also useful as a safe haven in periods of extreme stock market declines. Palladium and rhodium do not show the same extensive hedging capabilities.

1. Introduction

The platinum group metals include platinum, palladium, rhodium, iridium, ruthenium, and osmium. They are grouped together because they tend to occur in the same mineral deposits and because they have similar chemical properties. Platinum, palladium, and rhodium have extensive industrial demand for use in automobile catalytic converters. There are numerous other industrial and scientific uses for all six metals.[2]

In recent years, there has been strong investor interest in platinum and palladium and a small interest in rhodium. Platinum bullion coins made by the United States Mint and by the mints of other countries are available in various sizes ranging from 1/10 troy ounce to 1 ounce.[3] Palladium coins have been made by the Royal Canadian Mint. Both metals have long been available for purchase in ingot form.

Exchange-traded funds that invest in physical platinum or palladium were launched in Europe in 2007 and in North America in 2010. The ETFs have become popular with investors, with each of the North American funds having approximately US$ 1 billion worth of metal under management. The funds trade on NYSE Arca and have management fees of 0.60% per year.[4] Futures contracts on the metals are traded on the Chicago Mercantile Exchange and the New York Mercantile Exchange, as well as many foreign derivative exchanges. The platinum and palladium futures are the oldest contracts trading on the NYMEX, having been started in 1956 and 1968, respectively.[5]

Numerous studies have examined the feasibility of investments in gold and silver, including McCown and Zimmerman (2010), Rubbaniy, Lee, and Verschoor (2011), Hillier, Draper, and Faff (2006), and Baur and Lucey (2010). Fewer papers have evaluated investments in the platinum group metals. In the next section, we review the findings of the studies that have examined the investment performance of platinum group metals.

We are primarily interested in risk and return issues. First, we are interested in how the historical returns on the platinum group

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[2] See Johnson Matthey "PGM Market Report May 2015" http://www.platinum.matthey.com/services/market-research/pgm-market-reports.
[3] https://www.usmint.gov/mint_programs/american_eagles/?Action=american_eagle_platinum.
[4] See for example http://etfdb.com/type/commodity/precious-metals/platinum/.
[5] https://www.cmegroup.com/trading/metals/files/platinum-and-palladium-futures-and-options.pdf.

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metals compare with gold, stocks, and crude oil. Second we are interested in their ability to act as hedges or safe havens against stock market risk, and also their ability to hedge other sources of risk including inflation and foreign exchange fluctuations. We examine these relations over a number of time horizons. This research is limited to an examination of platinum, palladium, and rhodium. We omit the more obscure platinum group metals (iridium, ruthenium, and osmium) from the research because they are thinly traded and have little investor interest.

The empirical techniques we use include simple correlations between the metals and macroeconomic variables. We use linear regressions for the market model and multifactor models, dummy variable regression for safe haven tests, and GARCH model estimation for the market model with time-varying betas.

We find the basic market model regressions and multifactor model regressions very useful for studying returns on the metals. It is important to examine a wide variety of investment horizons because results differ considerably with the horizon. Like many financial variables, ARCH model estimation is fruitful for modelling volatility and also time-varying betas. Dummy variable regressions for tests of the metals' suitability as safe havens also appear useful. Vector autoregression models have not been fruitful except for rhodium.

We find the relation between the platinum group metal prices and the price of oil to be of particular interest because both are raw materials used as inputs to the automobile/transportation industry. And since oil prices are important to the macroeconomy, we are interested in its effect on the metal prices. Sari, Hammoudeh, and Soytas (2010) found "shocks in the precious metals and oil markets have mutual but small positive impact on each other [including platinum and palladium]".

To briefly summarize the results, returns on platinum have been in the same range as gold and oil over the period from 1992 to 2015 (around 5% per year). They are greater than the change in the CPI, but less than the returns on stocks. Returns on palladium have been similar to stocks, but returns on rhodium have been negative. The price movements of the platinum-group metals have been much more in tune with the US business cycle than gold prices. Platinum (and possibly palladium) have shown a better ability to track both US consumer and wholesale prices than has gold, and thus are better choices for investors seeking an inflation hedge. The time series of price movements of platinum are very similar to those of crude oil.

Examining the metals' ability to hedge foreign exchange risk from the perspective of a US investor, we find that platinum is better than gold at hedging foreign exchange risk arising from the British pound, Canadian dollar, or the euro. However, gold is superior to platinum at hedging risk arising from the Japanese yen or the Swiss franc. Platinum is a superior foreign exchange hedge than palladium or rhodium in almost all cases, and has hedging ability very similar to that of oil.

Estimates of the market model for platinum show betas statistically indifferent from zero at one to two-year investment horizons, indicating it can be a good choice to diversify a stock portfolio for investors with long-term investment objectives, but not as effective a hedge as gold for shorter time horizons. And again, platinum shows results very similar to oil. Palladium and rhodium do not show the stock-hedging ability that platinum possesses. Both platinum and gold show promise as safe havens during days with sharp drops of US stock prices. Multifactor model regressions at the quarterly horizon show that both gold and platinum provide positive, significant betas for inflation and foreign exchange risk factors.

Section 2 details the previous finance literature related to platinum group metals and details the gaps in the research that currently exist. Section 3 describes the sources of data. Section 4 discusses the empirical tests. Section 5 offers conclusions.

2. Background

In one of the earliest studies, Chang, Chen, and Chen (1990) test returns on platinum futures prices (along with copper and silver) using monthly data from 1964 to 1983. They find that platinum had a mean monthly return of 0.59% with a monthly standard deviation of 9.43% over the entire 1964–1983 period. There was a significant shift in the distribution of returns beginning in the period from 1978 to 1983, with higher returns (1.04% monthly) and volatility (12.49%) during that latter period. They estimated the CAPM for platinum and found for the entire 1964–1983 period the returns on the metal had betas ranging from 0.359 to 0.397 that were statistically significant at 95% confidence or better. However, the *R*-squares were only 0.024 to 0.029. They also estimated the CAPM for platinum for the 1964–1977 subperiod and found betas statistically indifferent from zero. For the 1978–1983 subperiod, betas ranged from 0.821 to 0.874 and were statistically significant at 99% confidence. *R*-squares ranged from 0.091 to 0.101.

Hillier et al. (2006) analyze daily data for gold, silver, and platinum from 1976 to 2004. They include platinum to allow comparison of the investment properties of gold and silver with those of a precious metal used primarily for industrial purposes. They add that platinum prices should be positively correlated with industrial activity, but do not test this hypothesis. They find that during their sample period, platinum has the highest mean daily return of the three metals at 0.04% (9% annualized). Their daily platinum returns have correlations with returns on both the S&P 500 and the MSCI EAFE dollar-denominated portfolio that are near zero.

Hillier et al. (2006) also estimate the CAPM for the three metals. They find platinum has negative and statistically significant betas using the S&P 500 as the market proxy, but positive, significant betas using the MSCI EAFE as the market proxy. Since the version of the EAFE index they used is dollar-denominated, it includes foreign exchange fluctuations against the US dollar. Using a high volatility dummy variable as a proxy for periods of high market risk, they find negative and significant coefficients for all three metals, using both market proxies. These results indicate that the metals show an enhanced ability to hedge stock portfolios in times of high risk.

Hammoudeh, Yuan, McAleer, and Thompson (2010) examine spot prices of platinum, palladium, gold, and silver from 1999 to 2007. They use a VARMA-GARCH model to examine the interdependencies between the metals' prices and also compute optimal portfolio weights for a portfolio composed of those metals. They show how the volatilities compare across the metals.

Chng (2009) examines daily futures prices of palladium, natural rubber, and gasoline as traded on the Tokyo Commodity Exchange from July, 2000 to March, 2008. Since all three commodities are involved with automobiles, he examines the spillovers of volume and volatility. He also looks at their relations with silver futures prices and a general commodity index to determine if there is some common factor moving commodity markets. Chng finds no evidence that palladium exerts an influence on natural rubber or gasoline prices, but that rubber volume spills over into palladium volume. He finds no support for a general commodity market factor. He does find cross-market interactions between palladium and silver, probably due to silver-palladium alloys used often in dentistry and electronics.

Rubbaniy et al. (2011), analyze monthly spot price data for platinum along with gold and silver for 1985–2010. Using a CAPM model and Deutschmark-Euro metal prices, they find the beta for platinum to be statistically indifferent from zero whereas they find the betas for gold and silver to be positive and significant. Using an APT/Multifactor model, they find platinum does not act as an inflation hedge, unlike gold, but that the returns on platinum are significant for the US$/DM exchange rate and for the German

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