**Abstract**

**Introduction**

Gold has long been a popular topic in the investment world.

In 2013 $31 billion (22 million ounces) of gold was cleared daily (LBMA), compared to $6 billion (14.9 million ounces) in 2004, it was a whopping 516% surge in merely 9 years.

More people have come to the realization of the value of precious metals, not only as jewelry, but also as assets that preserves their value.

Historically gold prices seem to fluctuate negatively against the market. In response to downgrading of US's credit ratings (2011), the price of gold skyrocketed to approximately $1900 an ounce while the US market experienced a 16.7% drop. An reverse situation occurred recently, where gold saw a largest decline in price in 32 years as investors shy away (), as a vast contrast the market continued its course of rising.

A number of previous studies have examined the particular role of gold among investments, more specifically, whether it is a hedge or a safe haven. McCown and Zimmerman (2006) demonstrate gold's zero-beta property by estimating capital asset pricing model, with evidence shown for its inflation-hedging ability.

With regard to stock markets, Baur and Lucey (2010), Baur and McDermott (2010) found that gold acted as a safe haven against stock markets, although conditions varied for different markets. The results were further verified by Joy (2013), where the conclusion was made that in times of market stress, no evidence was discovered to suggest that the safe haven status were effective. According to the research by Pullen et al. (2014), the hedging ability exhibited by gold bullion is clear and strong.

By analysing both data from US and UK market, Ciner et al. (2012) suggest the hedging role of gold against exchange rate fluctuations. Evidence found by Reboredo (2013), Joy (2011), Capie et al. (2005) support the result that gold can act as a hedge against movements in USD. Pukthuanthong and Roll (2011) extend the research to other currencies and find that US dollars is not the only currency that gold is negatively associated to, the same relationship also applies to Euro, Yen and Pound.

Apart from gold, other precious metals including platinum and silver have also been found to possess the ability to play the role as diversifiers in portfolios and exhibit hedging capability especially during periods of high market volatility. Among all three metals being studied, gold proved to be the optimal choice for a hybrid portfolio, offering the most efficiency gains (Hillier et al., 2006). Conover et al. (2009) conclude that improvements in portfolio performance can be achieved by either investing directly or indirectly in precious metals, and effects are found to be more prominent with indirect investments. Again gold claims the winner in diversifying and hedging against inflation pressure. In the research carried out by Li and Lucey (2014???), through the analysis of quarterly data evidence suggests that at certain times silver, platinum and palladium can act as safe haven when gold does not, and the effect can sometimes be stronger. Hood and Malik (2013) argue that unlike gold, platinum and silver act as neither hedge nor safe haven for the US stock market. Gold on the other hand, while serving as a hedge and a weak safe haven, does not exhibit negative correlation with the market during periods of extreme conditions.

Among the four metals, Sari et al. (2010) confirm that platinum and palladium are closely related, rising platinum prices may act as a precursor for a price increase in palladium. A further investigation into their relationships by Sensoy (2013) draw the conclusion that since the correlation among those metals have increased drastically and the trend is likely to be preserved, precious metals may be classified as a single asset in the future. Gold, being used as a popular investment choice and international reserve currency, exert uni-directional volatility shift contagion effect on all precious metals. The study into silver displays a similar effect on platinum and palladium.

**Rare earth ver**

As for rare earths, a concept that might be slightly foreign to the public compared to precious metals mentioned before, have incredibly wide application across various industries and products, including phosphors, batteries, and permanent magnets. Their value in industrial use as well as ability to promote green economy has placed them under the spotlight.

The rare earth elements (REEs) are a group of 17 chemical elements including 15 lanthanides, with the addition of yttrium (Y) and scandium (Sc), due to the reason that they exhibit similar physical and chemical properties. While given the name of rare earth, the elements are not necessarily rare in existence, as a matter of fact, they can be found in almost all massive rock formations. However, REEs are scarce as a mineable resource. The limited availability of rare earth ores reflects a number of factors including the geological controls that affect not only their distribution but underlie technical mining and processing constraints (Golev et al., 2014).

The rare earths ETF, which debuted in 2010, …..

**Gems ver**

Aside from metals, there exists a well-known tag line in the world of jeweleries – A diamond is forever. Diamond consumption has escalated in the past few decades. Looking into the US market alone, currently diamonds totalled 49% of all jewelery purchases ().

In contrast to gold, it is hard to obtain a uniformed price on diamonds.

Prior to 2000, the majority of the rough diamonds were dominated by one company, De Beers, a giant that controlled a proportion of diamond sales as high as 80% ().

With declining production in gem quality diamonds, absence of significant discoveries of diamond deposits in recent years, along with rising demand in both traditional and emerging countries, particularly in China, a change is perceived to take place in the diamond market (). An annual report from Bain & Company () pointed out that supply of diamond will grow at rate sufficiently to meet demand until 2016, however, the subsequent declining supply will widen the demand-supply gap through early 2020s.

There are few papers examining the quality of diamonds as an investment and its diversification potential. Auer and Schuhmacher (2013) concluded that diversified portfolios that contain diamonds can outperform diversified portfolios that solely composed of stocks when stock markets are weak. Low time-varying correlations to traditional assets provide indications of their diversifying qualities, however the potential can only be reached with rather high proportion of diamond in the portfolio. Renneboog and Spaenjers (2012) found evidence of relatively superior performance of diamonds than stock market.

Our paper aims to investigate the hedge or safe haven status of all major precious metals and additionally, rare earth elements. We aim to ….