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In search of hedges and safe havens: Revisiting the relations between gold and oil in the rolling regression framework

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ABSTRACT

The aim of the paper is to investigate the role of gold and crude oil as hedges and safe havens for the stock and currency markets. We generalize Baur and Lucey's (2010) original idea by allowing for the nonstationarity of the returns. First, we look for structural changes in long term volatility of returns in order to identify flights to safety moments. Next, we analyse the relations between variables of interest using the rolling regression framework. Our study reveals that only some relations are stable, and only gold is a weak hedge for equity.

1. Introduction

Due to co-movement of various classes of instruments, effective portfolio management has always been difficult, especially during financial crises in the market. The greatest difficulty lies in identifying instruments whose behaviours do not depend on the behaviour of other instruments or the ones which follow different paths during turmoil periods. In their seminal paper, Baur and Lucey (2010) examine the role of gold as an instrument which potentially behaves differently than stocks and can be used as a hedge or a safe haven. They identify two financial market regimes: a normal one and a turmoil one (also called flights to safety moments) and define two categories of instruments connected with them: a hedge (which can be weak or strong) for the normal market regime and a safe haven (which can also be weak or strong) for the turmoil market regime. An instrument is defined as a strong (weak) hedge for assets if its returns are negatively correlated (uncorrelated) with the returns of other assets or portfolios in the normal market regime, while an instrument is defined as a strong (weak) safe haven if its returns are negatively correlated (uncorrelated) with the returns of other assets or portfolios in times of market turmoil.

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Baur and Lucey (2010) focus on prices of gold and demonstrate that it is a hedge and a safe haven for the stock and bond markets in the USA, the UK and Germany. Other authors also investigate the possibilities of using gold as a hedge or a safe haven for the stock and bond markets (e.g., Baur and McDermott, 2010; Hood and Malik, 2013; Gürgün and Ünalmis, 2014; Beckmann et al., 2015; Wanat et al. 2016), for oil (e.g., Reboredo, 2013a), and for exchange rates (e.g., Capie et al., 2005; Pukthuanthong and Roll, 2011; Joy, 2011; Reboredo, 2013b; Reboredo and Rivera-Castro, 2014). Ciner et al. (2013) test hedge and safe haven properties of gold, oil, currency, stock and bond markets, while Dyhrberg (2016) test such properties of bitcoin. A unique role of gold stems from the fact that it is treated as a potential inflation hedge (Sjasstad, 2008; Bampinas and Panagiotidis, 2015).

Various authors use various methods to define flights to safety moments. Baur and Lucey (2010) and Baur and McDermott (2010) define such moments as quantiles of the distribution (1%, 5%, 10% of extreme negative returns), and they use a distributed lag model regression including different dummy variables given by flights to safety moments. The regression model and the same way of identification of market regimes are used by, e.g., Hood and Malik (2013), Lucey and Li (2015), Gürgün and Ünalmış (2014), Ciner et al. (2013), and Low et al. (2016). Additionally, Lucey and Li (2015) use a rolling regression procedure to investigate time-varying safe haven relations. Joy (2011) uses DCC–(M)GARCH model, while Reboredo (2013a,b) uses the copula function and dependencies in the tails of distribution to define the relations in turmoil. Reboredo and Rivera-Castro (2014) use the extreme value theory to classify extreme returns as the ones that exceed a specific threshold. Beckmann et al. (2015) use a STR model and Bredin et al. (2015) use the wavelet analysis. Chan et al. (2011) propose an approach in which univariate and multivariate Markov switching models are used to examine relations between the returns of five assets in three different asset classes: financial assets, commodities and real estate assets.

The aim of the paper is to investigate the role of gold and oil as a hedge and a safe haven for the stock market, the currency market, the commodity market and the bond market. The originality of our paper lies in two aspects. First, we adopt a different definition of market turmoil, which allows for volatility of structural changes. Second, we use the rolling approach, which enables us to consider changes in the relations between financial instruments (indicated in e.g., Gaffen and Slater, 2009; Baruník et al., 2016).

The paper is based on weekly data from the period between 02.01.1995 and 28.12. 2015. The variables represent: gold prices, oil prices, bond yields, the S&P 500 index and the US dollar exchange rates. Following Baur and Lucey's (2010) idea, the analysis of the role of particular instruments is conducted in two stages. During the first one, normal and turmoil (flights to safety moments) market regimes are identified (the latter are characterised by price slumps). The conventional approach, proposed by Baur and Lucey's (2010) and Baur and McDermott's (2010), define flights to safety moments as quantiles of the distribution (1%, 5% and 10%) of returns. In our approach, flights to safety moments are related to the long term volatility of returns, which, however, may change. In such cases (when long term volatility shifts), the quantile approach distinguishes more flights to safety moments in the period of greater long-term variance. As a consequence, some part of large returns movement that appears in the period of smaller volatility can be ignored[1]. Thus, at first, we look for structural breaks in long-term volatility using Inclan and Tiao's (1994)approach and Sanso et al.'s (2004) modified test. After distinguishing subperiods of stable long-term variance, we define flights to safety moments as the ones in which the returns are lower than the multiple of long-term volatilities. This allows us not to impose an exogenously defined number (percentage) of flights to safety moments for each instrument (which do not have to be the same). As a consequence, we are able to identify flights to safety moments in extensive periods with low volatility (in comparison to other periods).

During the second stage, we analyse the role of gold, oil and bonds as a hedge or a safe haven for other assets using univariate ARMA–(E)GARCH models with external regressors in different market regimes[2]. The results obtained for the whole period are non-stable, as the Nyblom-Hansen stability test indicates, so we study the relations in subperiods.

2. Methodology

To account for changes in long time variance which could affect the results, we use the iterative cumulative sum of squares (ICSS), the volatility structural break methodology developed by Inclan and Tiao (1994), and the modified test proposed by Sanso et al. (2004).

Next, we identify flights to safety moments with (extreme) negative financial instrument returns, whenever these returns exceed a given threshold $z_{i,\,t}$. The flights to safety moments indicator (FTS) for instrument i at time t is calculated as $FTS_{i,\,t} = I\{r_{i,\,t} < z_{i,\,t}\}$, where $r_{i,\,t}$ denotes i -asset returns, and I is the indicator function returning a value of one if the logical argument is true, and zero otherwise. The threshold $z_{i,\,t}$ can be defined by using standard deviation of the returns in a particular market regime:

$$z_{i,t} = -B \cdot \sigma_{i,t}, \qquad (1)$$

where[3] $\sigma_{i,\,t}$ is time-varying volatility of the returns for asset i at time t, and B is the positive threshold parameter. Changing the value of B allows us to take into account the adequate percentage of the most negative returns.

[1] In other words, our approach takes into account nonstationarity of a heteroskedastic process of conditional variance of returns.

[2] Such regressors are used by Baur and Lucey (2010) and Baur and McDermott (2010).

[3] In case of bond returns, threshold z_i is defined as $z_{bond,\,t} = B \cdot \sigma_{bond,\,t}$.

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