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Hedging Oil and Gold Portfolios in Different Regimes

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Overview

Over the past few years, commodity prices have fluctuated significantly and exhibited high volatility. Although there are a number of reasons to explain the fluctuation in oil and gold prices, such as global demand or cyclical productivities, the most prominent factor is generally believed to be the value of the US dollar, see e.g. Beckers and Soenen (1984), Sjasstad and Scacciavillani (1996), Capie et al (2005), Lizardo and Mollick (2010), Sari et al. (2010). Currently, as a consequence of the 2008 GFC, many countries around the world are still in recession. Typically, in such situations, instability in the real global economy sparks the greater demand for investments in gold and the US dollar as a safe haven asset. Furthermore, due to the recent high volatility in financial markets, the concerns about future global economic growth lead to an unprecedented need for hedging against rising oil prices. In this analysis we concentrate on a portfolio that comprises three important asset classes: oil, gold and investments in so-called commodity currencies such as the Australian or Canadian dollar. A typical hedging strategy against rising oil prices is for example to take a short position in the US dollar / Canadian dollar exchange rate, while gold prices and the US dollar / Australian dollar exchange rate are often considered to be negatively correlated. As a result, the correlation between oil, gold and commodity currencies is of great interest to various market participants. By means of investigating the correlation structure between these assets, we aim to construct a hedging portfolio with minimum risk. We model the time and state dependent correlations between oil, gold and the considered commodity currencies, using a regime switching model. In our model the dynamic correlation structure is allowed to depend on exogenous variables such as, for example, a global volatility index or stock market returns. We further examine the performance of this model by constructing minimum variance hedging ratios in order to investigate the forecasting performance of our model, in particular during times of rising oil prices.

Methods

We apply a regime switching exogenous dynamic conditional correlation (RSDCCX) model in order to model the possible time and state dependent correlation structure among oil, gold and the USD/CAD and USD/AUD exchange rates. Our approach captures the fact that conditional correlations among different commodities and exchange rates are not only subject to their own past evolutions but also to external macro or micro shocks. Subsequently, we apply our model for the derivation of optimal hedging ratios for sample portfolios. We compute the dynamic optimal hedging ratio in order to investigate the performance of our model with respect to risk reduction. The literature on the application of optimal hedging ratios can be divided into several strands: the static hedging for single financial assets is the most commonly used one. In this approach the minimum variance hedging ratio is calculated by modelling the second moments of the spot and futures return series in a static framework. On the other hand, for dynamic hedging, the second moments are modelled by a variety of bivariate GARCH models (see e.g. Myers (1991), Bera et al. (1996), Brooks et al. (2002), Byström,(2003), Lien and Yang, (2008)). However, as pointed out by Gagon et al. (1998), when investors have portfolios with more than two assets and seek to hedge their whole portfolio, it might not be optimal to calculate the hedge ratio for each asset separately. Such an approach might result in a hedging strategy that is not optimal with respect to the construction of a minimum variance portfolio. Recent studies by Gagnon et al. (1998) and Fernandez (2008) suggest that the hedging effectiveness can be significantly improved by hedging the portfolio as a whole. Their studies were later extended by Lee and Yorder (2007), Alizadeh et al. (2008), where optimal hedge ratios are allowed to be both time and state dependent and the hedging effectiveness is found to be improved in comparison to state-independent hedging strategies. Unfortunately, most existing studies only focus on portfolios where the hedging problem relates to spot and futures contracts on the same underlying. So far no study has concentrated on the commodity-currency hedging problem even though this phenomenon has been observed for quite some time. see e.g.

Lizardo and Mollick (2010). In this paper we provide a pioneer study investigating the commodity –currency hedging problem when market conditions are subject to the regime switching.

Results

We find that modeling the correlation between oil, gold and commodity currencies with a regime switching DCCX model provides an appropriate characterization of the correlation structure between these assets. Our findings suggest that during crisis periods, (i) correlations between oil and gold prices are decreasing, (ii) correlations between oil and the USD/CAD, USD/AUD exchange rate are increasing, and, (iii) correlations between gold and the USD/AUD USD/CAD exchange rates also increase. This has important consequences for market participants who need to hedge their risks in different regimes. We also find that portfolios constructed based on optimal hedging ratios according to our estimated model, lead to an efficient reduction of the risk. This is in particularly true for portfolios containing a high share of investments in oil which is the most risky asset class among the considered all assets. Therefore, our findings are of particular interest for investors or market participants exposed to extreme movements in the oil price.

Conclusions

In recent years, participants in oil and gold markets have been exposed to significant price fluctuations and high volatility. We provide a pioneer study on the dynamic correlation structure between oil, gold and commodity currencies. This correlation structure is of great interest to various market participants who need to hedge e.g. the risk of rising oil prices or are interested in the changing dynamics of correlations between asset classes under a normal regime or during crisis periods. Our findings suggest that a RSDCCX model provides a good characterization of the actual correlation structure between the considered assets. The model also proves to be helpful for the construction of optimal hedging and minimum variance portfolios. Therefore, we believe, that instead of using multivariate GARCH models to derive optimal hedging portfolios for participants in commodity markets, it might be more appropriate to use RSDCCX models that capture the distinctive correlation structures during different regimes.

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