Do terror attacks predict gold returns? Evidence from a quantile-predictive-regression approach

Rangan Gupta [a],[*], Anandamayee Majumdar [b], Christian Pierdzioch [c], Mark E. Wohar [d],[e]

[a] *Department of Economics, University of Pretoria, Pretoria 0002, South Africa*
[b] *Center for Advanced Statistics and Econometrics, Soochow University, Suzhou, China*
[c] *Department of Economics, Helmut Schmidt University, Holstenhofweg 85, P.O.B. 700822, 22008 Hamburg, Germany*
[d] *Department of Economics, University of Nebraska at Omaha, MH 332S, Omaha, NE 68182, USA*
[e] *Loughborough University, Loughborough, UK*

ARTICLE INFO

ABSTRACT

Much significant research has been done to study how terror attacks affect financial markets. We contribute to this research by studying whether terror attacks, in addition to standard predictors considered in earlier research, help to predict gold returns. To this end, we use a quantile-predictive-regression (QPR) approach that accounts for model uncertainty and model instability. We find that terror attacks have predictive value for the lower and especially for the upper quantiles of the conditional distribution of gold returns.

1. Introduction

In recent years, significant research has been done to trace out how financial markets respond to terror attacks. The majority of this research has focused on how terror attacks affect stock markets and exchange rates (e.g., Balcilar, Gupta, Pierdzioch, & Wohar, 2016a, 2016b; Eldor & Melnick, 2004, among others). We contribute to this research by studying whether terror attacks help to predict gold returns. Investors and commentators often recommend gold as a safe-haven investment in times of market jitters. Market jitters may be the result of terror attacks. In consequence, terror attacks may have direct relevance as a predictor of gold returns. The approach that we use in this research to study the relevance of terror attacks for predicting gold returns has three interesting properties. First, the approach sheds light on the incremental predictive value of terror attacks for out-of-sample forecasting of gold

returns. Second, the approach renders it possible to assess the incremental predictive value of terror attacks across a broad spectrum of quantiles of the conditional distribution of gold returns. Third, the approach takes into account model uncertainty (i.e., an investor does not know the "optimal" forecasting model but rather has to search for a good model) and model instability (i.e., the forecasting model may change over time).

The main hypothesis that we study in this research is that terror attacks can forecast gold returns after controlling for the influence of other standard predictors, i.e., that terror attacks add value in terms of gold-returns predictions once information from other predictors have been accounted for. Our secondary hypothesis, however, is that this predictive ability is contingent on the market mode of gold returns. Given that we use a quantile model and, hence, study the conditional distribution of gold returns, by design we are able to analyze the ability of terror attacks to forecast gold returns conditional on whether the gold market is in bear (lower quantiles), normal (median), and bull (upper quantiles) modes. In other words, we analyze whether the predictability is in fact asymmetric across the various market modes of gold. Such an asymmetry is, as we show, indeed important since predictability is restricted primarily to bear and especially bull phases

* Corresponding author.
  E-mail addresses: rangan.gupta@up.ac.za (R. Gupta),
anandamayee.majumdar@gmail.com (A. Majumdar), c.pierdzioch@hsu-hh.de
(C. Pierdzioch), mwohar@unomaha.edu (M.E. Wohar).

of the gold market, i.e., at the extreme ends of the conditional distribution.

The specific approach that we use in our research is the quantile-predictive-regression (QPR) approach recently proposed by Pierdzioch, Risse, and Rohloff (2015). Pierdzioch, Risse, and Rohloff (2016a) use the QPR approach to study the out-of-sample predictive value of several financial predictors for gold returns, but they do not study the incremental predictive value of terror attacks. The QPR approach builds on a recent trend in gold-market research, which has witnessed an increasing interest of researchers in quantile regressions as a useful technique for analyzing various aspects of gold-price fluctuations (Baur, 2013; Ciner, 2015; Ma & Patterson, 2013; Pierdzioch et al., 2016a; Zagaglia & Marzo, 2013, among others). The QPR approach is more informative relative to any linear model because it is not restricted just to target the conditional mean of the conditional distribution of gold returns. Rather, the QPR approach is tailored to study the ability of terror attacks to predict different segments of the entire conditional distribution of gold returns. As we show in this research, looking at just the conditional center of the distribution of gold returns would lead us to conclude that terror attacks have poor predictive performance for gold returns, while they are actually valuable for predicting certain parts of the conditional distribution of gold returns. In fact, we find that terror attacks have predictive value for the lower and especially for the upper quantiles of the conditional distribution of gold returns. In other words, terror attacks have predictive power for large movements of the price of gold, and this predictive power is strong when large gold returns are positive. Our finding is consistent with the notion that terror attacks give rise to market jitters which, in turn, lead market participants to invest in gold as a safe-haven investment.

When studying the predictive power of terror attacks for gold returns it is important to control for other variables that have been studied in earlier research as determinants of gold returns, including determinants like exchange-rates movements, interest rates, stock returns, and oil-price changes (Pukthuanthong & Roll, 2011; Reboredo, 2013a, 2013b; Zhang & Wei, 2010, and others). As with terror attacks, it is likely that not all of the determinants considered in earlier research are relevant to the same extent for predicting gold returns at all times (Aye, Gupta, Hammoudeh, & Kim, 2015; Pierdzioch, Risse, & Rohloff, 2014). The determinants for predicting gold returns in a bull market may differ from the determinants relevant in a bear market. Similarly, the informational content of interest rates for predicting gold returns in periods of high interest rates may differ from their predictive value when interest rates hover around the zero-lower bound. Hence, we use in our research an approach that accounts for model uncertainty and model instability to study the predictive value of terror attacks for gold returns.[1]

To the best of our knowledge, this research is the first attempt to analyze the forecastability of gold returns based on terror attacks, utilizing a QPR approach. We organize the remainder of this research as follows. In Section 2, we review earlier research on terror attacks and financial markets. In Section 3, we briefly describe the QPR approach. In Section 4, we lay out our data and our empirical findings. In Section 5, we offer some concluding remarks.

---

[1] Our approach captures in a simple way that a potential regime dependence of the links between gold returns and their predictors can give rise to instability of a prediction model. Bhar and Hammoudeh (2011) emphasize in a recent study the regime dependence of the links between gold returns and financial variables like interest rates and exchange rates. Beckmann, Berger, and Czudaj (2015) show that a smooth transition model captures important aspects of the safe-haven property of gold investments with respect to stock-market fluctuations.

2. Research on terror attacks and financial markets

The consensus in the literature is that terror attacks have a negative effect on stock markets, albeit stocks of specific sectors like the defense industry may benefit from terror attacks (Apergis & Apergis, 2016; Berrebi & Klor, 2010; for an analysis of the sectoral effects of terror attacks, see also Chesney, Reshetar, & Karaman, 2011). Several studies have found that the significance, magnitude, and duration of the stock-market effect depends on the characteristics of terror attacks and their severity. Karolyi and Martell (2010) report that firm characteristics and the type of an attack are key determinants of how stock markets react to terror attacks. Specifically, they document that terror attacks exert a larger effect on stock markets when firms in rich and democratic countries are the target of a terror attack. As for the type of a terror attack, they find that human capital matters. Their results indicate that negative returns are larger in absolute value when company executives are kidnapped than when a firm is hit by bombings of facilities or buildings. According to results reported by Drakos (2010) the impact of a terror attack on stock markets depends on whether an attack has a major psychosocial effect, and results of a study by Eldor and Melnick (2004) of the effects of Palestinian terror attacks on Israeli financial markets suggest that a 'routine of terror attacks' effect does not evolve in the wake of recurrent terror attacks. The empirical research undertaken by Eldor and Melnick (2004) also shows that the impact of terror attacks on financial markets depends on the type of attacks (especially suicide attacks) and the number of victims. Similarly, Aslam and Kang (2015) find for the Pakistani stock market that the severity of a terror attack as measured in terms of the number of victims killed explains the magnitude of the negative (short-lived) response of stock market returns. In addition, they find that the type of a terror attack (especially bombings rather than, e.g., suicide attacks or attacks on Mosques) and the location where a terror attack takes place matters and, interestingly, that stock markets anticipated subsequent terror attacks, presumably because intelligence agencies published warnings about attacks.

From an international perspective, researchers have documented that the effects of terror attacks differ across international stock markets. Chen and Siems (2004) show that U.S. financial markets recuperate faster following a terror attack than financial markets in other countries (for differences in the effects of terror attacks across stock markets, see also Kollias, Papadamou, & Stagiannis, 2011). Furthermore, the authors argue that the resilience of U.S. financial markets to terror attacks reflects an adequate liquidity provision by the financial system (and the policy responses of the Federal Reserve). Similarly, Johnston and Nedelescu (2006) stress that the liquidity and soundness of financial markets, timely and flexible policy responses, and the regulatory framework in place are key factors that govern the extent to which financial markets can absorb the shock waves triggered by terror attacks. In line with this argument, Kollias, Papadamou, and Arvanitis (2013) find that international differences in the effect of terror attacks on stock-market volatility reflect differences in market size and maturity. Arin, Ciferri, and Spagnolo (2008) find that the impact of terror attacks on the mean and the conditional volatility of stock market returns is less strong in European stock markets than in emerging market stock markets (for evidence on international differences in the effects of terror attacks on stock-price dynamics across developed and developing countries, see also Nikkinen, Omran, Sahlstrom, & Aijo, 2008).

In addition to tracing out the effects of terror attacks on the mean and the conditional volatility of international stock markets returns, researchers have examined the effects of terror attacks on market comovement and international volatility transmission. In this strand of research, Hon, Strauss, and Yong (2004) show that the terror attack of 11 September, 2001 on New York led to a stronger