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Impact of terrorist attacks on stock market volatility in emerging markets

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ABSTRACT

We use an event study methodology alongside an improved bootstrapping test to evaluate the impact of terrorist attacks on the volatility of stock markets in 12 MENA countries, and test for regional financial integration. Results show that the impact of terrorist attacks on financial markets' volatility lasts about 20 trading days, which is considered to be long compared to the term effect of similar events in developed markets. Moreover, we find evidence of regional financial integration. Our robustness check shows that the bootstrapping approach is more robust, and that theoretical p-values might be misleading if underlying assumptions are violated.

1. Introduction

Most research examining the reaction of financial markets to terrorist attacks suggests that the impact of these events on stock markets is *limited* and lasts for a *short* period (Essaddam and Mnasri, 2015; Baumert et al., 2013; Chesney et al., 2011; Brounrn and Derwall, 2010; Arin et al., 2008; Chen and Siems, 2004; among others). These conclusions were based on studies examining the effects of terrorist attacks on stock *returns* in *developed* markets, where financial systems and institutions are well-established (Essaddam and Karagianis, 2014; Kollias et al., 2011; Karolyi and Martell, 2010; Johnston and Nedelescu, 2005; among others). The current study contributes to the body of research on this subject in two ways. First, we investigate the impact of terrorist attacks on market *volatility*, instead of the market returns. Second, we examine the impact of terrorist attacks on the volatility of stock markets in *emerging* markets, instead of developed markets.

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Our argument for the first contribution is that following a terrorist attack (or any negative shock), stock returns are usually expected to decrease and, depending on the severity of the shock, the reaction of the returns might be dramatic. What would be interesting to know is the impact of these attacks on stocks' volatility, instead. In fact, what is important for investors is the amount of risk the market is subject to. The second contribution is related to our focus on the reaction of stock markets in emerging markets. Our focus is justified by the fact that developed countries have well-established financial markets and strong institutions. Following terrorist attacks, governments in these countries react quickly with a set of measures to smooth out the shocks, while efficient economic and financial institutions (endowed with the appropriate tools and resources) implement such policies and measures. In the case of developing countries, however, institutions are usually weak and the financial markets are unstable which may result in over reaction of the markets and inefficient implementation of the policies and measures undertaken by the government after terrorist attacks.

To validate our contribution and fulfill our mandate, we investigate the impact of terrorist attacks on *stock market volatility* in eleven (12) *emerging* countries from the Middle East and North Africa (MENA) region. Our sample selection is motivated by four rationales. First, to the authors' knowledge, no previous studies have investigated the impact of terrorist attacks on stock market volatility in these countries. Second, given the strong political and economic ties between many countries in this region and many developed countries (driven by the abundance of hydrocarbon resources in this region), terrorist attacks induce reactions not only by local governments and regional authorities but also by the international community. This fact may delay the stock markets' adjustment following a terrorist attack. Third, most countries in our sample lack economic diversification, which could make the impact of the terrorist attacks magnified and longer lasting. Fourth, given that MENA countries share many cultural and historical aspects, the reactions of the regional markets to a major attack occurring in one country might be an indicator of the degree of MENA markets' integration.

Following a significant trend in the existent literature, we use an event study methodology to investigate the impact of terrorist attacks on the volatility of stock markets. The advantage of using this approach is to allow for measuring both, the size effect and the term effect of the terrorist attacks on stock market volatility. The basic idea consists of estimating the volatility processes in stock markets before the attacks, predicting the volatility levels for the post-events (attacks) period based on the assumption that no event had taken place, and then comparing the predicted volatilities with the actual (abnormal) ones induced by the terrorist attack. In addition, we use the event study methodology to assess the degree of financial integration in the MENA region; an application which we consider original in this literature.

To test the significance of the impact of an event on the value of a variable, event study models usually refer to the classical parametric testing approach (i.e., theoretical p-values). This approach may not be the best way to test the significance of the impact of terrorist attacks on stock markets. In fact, one common issue in financial data is non-normality and serial correlation. Parametric tests assume that the errors are normally distributed and are not serially correlated. When these conditions are violated, the test will be biased and the conclusions drawn from it might be misleading. To overcome these drawbacks, some studies have considered bootstrapping techniques to test the significance of some events on stock markets. For instance, Bialkowski et al. (2008) investigate the impact of national elections on stock market volatility in 27 OECD countries using an event study methodology alongside a bootstrapping test. In this paper, we propose an improved semi-parametric bootstrapping technique, and we show that it is more efficient and more consistent than the Bialkowski et al. (2008) bootstrapping methodology.

The originality and the efficiency of the bootstrapping technique we use, represent an additional contribution. In fact, our bootstrapping algorithm overcomes the drawbacks of the Bialkowski et al. (2008) bootstrapping method, which consists of randomly drawing (with replacement) N country/date combinations from the entire set of available countries and dates, to match the number of events. As we will elaborate in more detail in Section 6.2, the test empirical distribution obtained from their bootstrapping technique may not be consistent with the null hypothesis. However, in our paper, the empirical distribution of the Cumulative Abnormal Volatility (CAV) test is derived from re-sampled and rescaled residuals obtained from the estimations of the benchmark GARCH equations before events. Hence, the implied test empirical distribution is going to be perfectly consistent with the null hypothesis, and circumvent the potential problems caused by the cross-sectional dependence or autocorrelation of the regression residuals.

Our results show that terrorist attacks have a significant impact on stock markets' volatility in the MENA region. This impact lasts for 20 trading days at least. Compared to the results of similar studies for developed