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- **What affects the transmission of terrorist incidences?**
- **Do terrorist shocks undermine the social mood?**
- **Is there any link between terrorism and investment mood?**

Summary: In this Policy Briefing, we discuss two important questions: (i) whether and how terrorism shocks are transmitted across international stock markets, (ii) what is the role of behavioral factors in explaining these stock market reactions. According to our findings terrorism shocks are indeed diffused cross-nationally in a non-uniform manner. Economic channels such as the degree of a country's integration with the world market, its liquidity and its ties to the zero-ground country are found to play an important role. Additionally, we document that the likelihood and the size of a negative stock market reaction increase with a country's terrorism record and terrorism risk concern, as well as the psychosocial impact caused by the terrorism incident.

POLICY BRIEFING

December 2011 EUSECON Policy Briefing 14

Terrorism shocks and stock market reaction patterns

Introduction

The extant literature has established, from several corresponding vantage points, that terrorism exerts a negative impact on the economy. Perhaps the most emphatic and recurring findings is the strong negative effect of terrorism on the value of stocks. In particular, there is strong evidence for a negative reaction to major terrorist attacks of ground-zero countries (e.g. Abadie and Gardeazabal, 2003; Haque and Kouki, 2009). However, an apparent gap in the literature relates to what the underlying diffusion mechanism of major events is. That is, the question remains as to whether and how major terrorism shocks tend to diffuse cross-nationally. In this Policy Briefing we explore the determinants of terrorist shock diffusion, through specific economic channels. Also, we put forward two behavioral factors as further determinants of stock market response to shocks.

The research underlying the answers to these questions is studied in the EUSECON project, as well as the broader academic world. The results in this Policy Briefing are based on Konstantinos Drakos (2010a; 2010b; 2011). Further research is referenced in these original studies.

Terrorism, capital markets and contagion fears

The empirical literature has established the significant—and immediate—stock market reaction to major terrorist attacks. Reactions typically transcend the “ground-zero” country and diffuse to third

countries' capital markets (Carter and Simkins, 2004 etc). Economic theory can explain this diffusion as the outcome of economic linkages that provide channels through which shocks are transmitted. This transmission is due to either a spillover effect or contagion, where the diffusion to a given third country essentially depends on the degree of its integration with the world markets.

The unfavorable impact on stock markets caused by mega-terrorist events has also been empirically documented with formal econometric models in the literature (Carter and Simkins, 2004; Drakos, 2004). What has not yet been investigated is the diffusion mechanism of terrorism cross-nationally, whether stock market responses to terrorism events are traced by behavioral factors, and whether terrorist activity exerts any systematic effect on stock markets.

The intensity through which terrorism affects third countries depends on country economic linkages

Clearly, providing an answer to these questions, will not only be of value for policy makers, but also could assist portfolio managers in assessing whether diversification is possible.

What drives the stock market reaction of third countries?

We model stock market reaction patterns, defined as the daily abnormal return, across 68 countries on the days of two major events (Madrid and London attacks). We put forward three potential economic determinants of terrorist shock diffusion: (i) the world integration channel, (ii) the bilateral integration channel and (iii) the liquidity channel. Then the analysis investigates whether these alternative transmission channels contain any significant explanatory power for abnormal returns.

Looking at the basic results for the period 2002-2005, we can see that terrorism shocks are indeed diffused cross-nationally, and moreover this diffusion is non-uniform. In particular, we find empirical support for the world integration channel since trade and financial linkages emerge as significant predictors for a

country's stock market reaction to terrorist events. Among the trade and financial linkages considered, a country's share in world trade is able to explain the highest percentage of abnormal-return variation in the occurrence of a major terrorist incident. The bilateral linkages channel is also active where third countries' trade linkages with the "ground-zero" country account for about 24 percent of the cross-country variation in reaction to terrorist shocks. Moreover, we find empirical support for the liquidity channel since stock market capitalization is also a significant determinant of stock market reaction. A hybrid model where all three channels are jointly included suggests that only bilateral trade linkages with the "ground-zero" country are significant determinants of stock market reaction.

These findings have important implications for supervision authorities but also for portfolio managers. The non-uniform reaction to major terrorist shocks implies that there is ample scope for diversification.

Behavioural channels and stock market reaction

Major terrorist incidents undoubtedly fit the description of adverse shocks hitting capital markets. However, such incidents possess several idiosyncrasies that are largely capable of setting off behavioral reactions over and beyond those elicited by economic fundamentals.

We thus aim to investigate whether, after controlling for heterogeneity and economic state variables, stock market responses to major terrorist incidents are traced out by behavioral factors. The explanatory potential of these factors is based on

- i) the ability of terrorist shocks to undermine social mood and thereby activate behaviorally driven decisions, and
- ii) the degree to which the deterioration of the social mood is translated to the deterioration of investor sentiment, as it is the latter that can exercise a downward pressure on stock prices.

The influence of major terrorist events on social mood is almost self-evident given the catastrophic nature—in the form of fatal casualties and /or extensive property damages—alongside the extensive media coverage, all of which generate direct and pervasive psychosocial consequences. Regarding the connection between social mood and investor sentiment, the finance literature has shown a variety of variables as mood indicators to be correlated with stock market activity, such as the weather, sleep patterns or daylight, lunar phases, and even international soccer results. The relevant investigation is whether the stock market response depends on two specific behavioral channels. The first channel's theoretical underpinnings can be found in the *memory-based utility* and the *availability* heuristic. We proxy this channel by a country's past terrorism record. The second channel's theoretical foundation can be found in the *social amplification of risk*. Its operationalization is based on *Eurobarometer* survey, whereby an indicator has been constructed for the degree to which the citizens of different countries are concerned about terrorism.

We focus on abnormal returns generated from a three-factor world model for daily returns across 29 European countries over the period 2002–2005. We then investigate whether the cross-country variation in abnormal returns on the days of major terrorist attacks is related to the cross-country variation in the concern about terrorism risk and the history with terrorism.

These findings imply that terrorist shocks are diffused through both behavioral channels. Thus, in the occurrence of a major terrorist incident, countries with greater concern about terrorism risk and a more severe history of terrorism are more likely to react negatively. In addition, countries with more severe history of terrorism or a higher degree of concern about risk tend to witness larger abnormal returns, with the impact of the latter being rather complex.

Investor sentiment and stock returns

Following up on the behavioural aspect analysis, investor sentiment is a plausible channel through which terrorist activity could exert a negative impact

on stock market returns. In particular, if terrorist attacks were a mood proxy, then their occurrence could be expected to cause investor sentiment to deteriorate and consequently put a downward pressure on stock prices.

Countries with larger history of terrorism react more negatively to attacks

A twofold contribution to the literature can be made through this study. First, in contrast to previous research that has focused on selected major terrorist acts, it tests whether overall terrorist activity significantly affects stock returns. The research covers a large number of countries and a large time span through the use of an econometric framework that controls for global risk factors. Second, by linking terrorism to investor mood, it derives testable hypotheses that relate directly to research concerning investor sentiment found in the literature. In addition to investigating the potential negative effect of terrorism on stock returns, it also explores whether this effect is a function of the level of psychosocial impact caused by terrorist incidents.

The results suggest that terrorist activity indeed leads to significantly lower returns on the day a terrorist attack occurs. In addition, the negative effect of terrorist activity is substantially amplified when terrorist incidents cause higher psychosocial impact. On the one hand, this evidence sheds light on the underlying mechanism through which terrorism affects stock markets while on the other hand, it provides empirical support for the sentiment effect.

Policy recommendations

In this Policy Briefing, we look at three main issues. First, whether terrorism incidents affect, apart from the local (ground zero) stock market returns, stock returns in third countries. We find that indeed terrorism shocks are diffused cross-nationally through specific channels and moreover the diffusion is non-uniform. The second issue we look at is the behavioural channels in the cross-market diffusion of major terrorism events. We find that terrorist shocks are diffused through two behavioural channels. The

last issue, as a normal continuation of the latter one, explores the investor's sentiment in which terrorist activity is assumed to impact on investor mood. We find that terrorist activity leads to significantly lower returns on the day of the attack. In addition, the negative effect of terrorism is amplified when cause higher psychological impact.

The results have important implications for practitioners, as they shed light on issues never touched before. The main breakthrough is the diffusion mechanism of terrorism shocks. Finally, the other main point is the behavioural dimension in researching the impact of violent events on capital markets. From a purely academic point of view, these results add another aspect to the spectrum of behavioural effects on capital markets.

Credits

This EUSECON Policy Briefing was authored by Christos Kallandranis (Business College of Athens) and Konstantinos Drakos (Athens University of Economics & Business). The views expressed in this briefing are the authors' alone.

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EUSECON, or 'A New Agenda for European Security Economics' is a four-year collaborative research project, administered by DIW Berlin and funded by the European Commission that analyses the causes, dynamics, and long-term effects of both human-induced insecurity threats and European security policies.

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