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The influence of terrorism risk on stock market integration: Evidence from eight OECD countries

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ABSTRACT

This study investigates the implications of terrorism activities and fear on the dynamic conditional correlations (DCC) between eight OECD stock markets over time (2001–2014). We begin with eight portfolios, each comprising of eight OECD MSCIs. For each portfolio, we calculate time varying DCCs between one OECD MSCI (of a domestic country) and seven other OECD MSCI (foreign country). Next we examine the reaction of each of the eight sets of DCCs to domestic and foreign terrorism risks. Our findings suggest that the DCCs between France and other seven OECD countries are not affected by terrorism risks over time. The flight-to-safety effects of foreign terrorism or a fall in the DCCs due to foreign terrorism risks are found for the other seven cases. Domestic terrorism is found to have contagion effects for the case of Australia, UK, Germany, Turkey and flight-to-safety effects for the case of the US and Canada. Our study finds that the effect of terrorism depends on expansionary and contractionary phases of the domestic business cycles, particularly in the case of Australia, UK and the US. These results are derived after controlling for other determinants of stock market integration, such as market characteristics and macroeconomic and financial risk factors.

1. Introduction

In addition to causing widespread damage to property and loss of life, terrorism can adversely affect national and global economies, as well as investor confidence. News associated with terrorism may quickly spill over to financial markets, leading to contagion effects, or greater synchronization, of stock markets. This short-term contagion suggests a positive impact of terrorism on stock market integration (Cosma, Beine, & Vermeulen, 2010; Frijns, Tourani-Rad, & Indriawan, 2012). The devastating effects of terrorism depress foreign investment in terrorism-prone nations, and/or disable locals' ability to invest overseas, thus isolating markets; as a result, a negative link between terrorism and stock market integration cannot be ruled out. This hypothesis is commonly known as the flight-to-safety effect (Frijns et al., 2012).[1]

An understanding of the short-term contagion and flight-to-safety effects of terrorist activity is still scarce in the terrorism and finance literature (see, for example, Bilson, Brailsford, Hallett, & Shi, 2012; Frijns et al., 2012; Kollias, Papadamou, & Arvanitis, 2013). Currently, it seems that terrorist activities have the potential to affect investor sentiment and portfolio allocation decisions in both ways. For example, Bilson et al. (2012) show that the September 11, 2001 terrorist attacks in the United States (US) induced contagion for developed stock markets. Frijns et al. (2012) find that terrorist activities, including other political crises, reduced the level of stock market integration for 19 emerging markets. Similarly, Kollias et al. (2013) indicate that all major domestic and transnational terrorist incidents that led to fatalities and/or injuries for Spain, Germany, France and Great Britain caused the flight-to-safety effect for these nations.

In our examination of terrorism effects on stock market integration, we contribute to this strand of the terrorism-finance literature in four ways. **First**, we consider a 'terrorism risk factor' instead of 'terrorist

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[1] In other words, the flight-to-safety phenomenon occurs when investors move their funds from risky to less risky markets. There is a group of studies that examines such capital flights. Connolly, Stivers, and Licheng (2005) find that in times of heightened market uncertainty stock prices fall while Treasury bond and gold prices rise, suggesting a flight from the stock market to Treasury bond and gold markets. Badshah, Frijns, and Tourani-Rad (2013) report positive spillover from the stock market volatilities to gold volatilities. Sarwar (2017) shows that an increase in stock market volatility led to higher volatilities of Treasury notes, gold, and silver markets. There is also an established group of studies that explains the contagion effect (see Aloui, Aissa, & Nguyen, 2011 and Cashin, Kumar, & McDermott, 1995; for example).

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activities', allowing us to investigate the implications of terrorism activities and fear over time (2001–2014). We adopt a terrorism risk rating, developed by the PRS Group,[2] which rates countries according to current terrorist activities and, more importantly, the fear surrounding potential terrorist activities over time. The fear of terrorism is readily documented as affecting stock markets. Days after the March 11, 2004 attacks in Madrid, Shell, in his article "Fear of terrorism jolts stock market" (March 23, 2004) reported movements in the market due to terrorism jitters. On March 24, 2004, PR Newswire (New York, March 24, 2004) also reported that the stock market was inextricably bound up in the terrorist threat, observing that markets remained weak.

Glassman (2006) reported on the fear that lingered in the US stock market after the September 11, 2001 terrorist activities. He argues that the fear of such attacks lives on, as markets continue to fear the worst, and those fears are discounted in prices of stock traded globally. As reported by many studies, the September 11 attack did not only influence the US stock markets but also had a global impact (see, Abadie & Gardeazabal, 2003; Amélie & Darné, 2006; Charles & Darné, 2006; Chen & Siems, 2004; Hon, Strauss, & Yong, 2004; Johnston & Nedelescu, 2006; Nikkinen, Omran, Sahlstrom, & Aijo, 2008; Straetmans, Verschoor, & Wolff, 2008).

It is therefore particularly relevant to examine the impact of terrorist incidents and the fear that terrorism induces upon the stock markets of the country in which the events occur (domestic) as well the international community over time. The PRS risk rating that we use is available in time series format, with the rating increasing as terrorism risk falls and decreasing as the terrorism risk rises. This also enables us to explain the impact of terrorism over time, even for countries, such as Australia and Canada, that go on high terrorism alert whenever there is an attack on any of their western allies, although terrorism activities are relatively uncommon at home.

Second, there is some discussion in the literature regarding the difference in the effects of terrorism due to location, type, and severity of attack (Aslam & Kang, 2015; Bilson et al., 2012; Kollias, Manou, Papadamou, & Stagiannis, 2011; Kollias et al., 2013; Nikkinen et al., 2008). In the same way, we examine the influence of terrorism risks on stock market integration in terms of whether the risk is domestic or foreign. Previous studies have examined the influence of one domestic or foreign terrorist activity on stock markets (see Abadie & Gardeazabal, 2003; Amélie & Darné, 2006; Charles & Darné, 2006; Chen & Siems, 2004; Hon et al., 2004; Johnston & Nedelescu, 2006; Maillet & Michel, 2005; Nikkinen et al., 2008; Straetmans et al., 2008) or many major domestic and transnational activities together (Bilson et al., 2012; Frijns et al., 2012; Kollias et al., 2013). Nonetheless, the current literature makes no distinction between domestic and foreign terrorism.

Third, by capturing the implications of terrorism risk on international stock market integration, our study gauges the gains (or losses) to diversification decisions relating to international portfolio investment. Within a portfolio, increased (reduced) integration lessens (increases) gains from this portfolio investment. Hence contagion effects of terrorism, for example, will be seen as limiting diversification options in equity markets. Flight-to-safety effects of terrorism, on the other hand, may act in favour of portfolio investment if this effect is not widespread. Our measure of stock market integration is different to previous studies that examine stock market integration against terrorism (see, Bilson et al., 2012; Frijns et al., 2012; and Kollias et al., 2013) because we use time-varying correlations between MSCI (Morgan Stanley Capital International) Index returns. These correlations are derived within the Dynamic Conditional Correlations (DCC)-GARCH method chosen from a family of DCC models.[3]

Fourth, we contribute to this line of enquiry by also investigating the importance of timing in the effect of terrorism risk on stock market integration. Specifically, we examine whether the influence of terrorism risk depends on the expansionary and contractionary phases of the business cycle. The key idea behind partitioning terrorism shocks during expansionary and contractionary phases rests on the many empirical studies, starting with Burns and Mitchell (1946), that show evidence of asymmetric output fluctuations between these two phases (see Filardo, 1994; Shively, 2004). Several authors who examine the link between macroeconomic variables and market returns imply that expected returns are related to business cycle fluctuations (see Campbell & Shiller, 1988; Fama, 1990; Fama & French, 1988; Fama & French, 1989; Ferson & Harvey, 1991; Kandel & Stambaugh, 1990; Keim & Stambaugh, 1986). Some studies that examine the link between market timing and stock market returns show that risks and risk aversion tend to be higher (lower) in bad (good) times (see Nyberg, 2013; Van Vliet & Blitz, 2011). Several studies also show that dynamic asset allocation strategies that account for market timing outperform passive asset allocation strategies (see Apergis, 2015; Guidolin & Timmermann, 2007; Jensen & Mercer, 2003; Seidl, 1991; Van Vliet & Blitz, 2011).[4] Hence, there is some evidence that market timing influences portfolio investment diversification gains.

In this study we check whether these diversification gains are influenced by terrorism risks during the business cycles. This is currently unexplained in the literature. In this study we present empirical evidence on the reaction of investors to terrorism risk during the expansionary and contractionary phases of business cycles. Further, we ask whether it is the business cycles of both domestic and foreign countries that matter here or only that of the domestic country.

Indeed, our study is also related to a strand of the literature that examines the determinants of stock market correlation (see Narayan, Srianantha kumar, & Islam, 2014; Quinn & Voth, 2008; Teulon, Guesmi, & Mankai, 2014; Wälti, 2011). To this literature, we introduce terrorism as a determinant of stock market correlations. Further, consistent with this literature, our study accounts for other determinants, including macroeconomic factors (such as interest rates and inflation differentials); finance risks (namely, stock market volatility) and stock market characteristics (such as stock market size and depth).[5]

This study uses the MSCI returns of eight OECD countries, namely Australia, Canada, France, Germany, Italy, Turkey, the United Kingdom (UK), and the US to calculate stock market integration. We begin by creating eight portfolios, all with eight OECD MSCI but in each portfolio, one OECD country is designated as the domestic country and the others are considered as foreign nations. Next, for each portfolio we derive time varying stock market correlations between the MSCI of the domestic country against the other seven (foreign) countries. In effect we end up with eight groups of correlations. These are regressed against the corresponding domestic and foreign terrorism risk factors and other control variables, as mentioned above.

Foreshadowing some of our key results, we find that the influence of terrorism risk on decisions relating to international risk diversification depends strongly on the expansionary and contractionary phases of the business cycle of the domestic country as well as the foreign nation. Our baseline, or simple, model did not include the two business cycle phases and failed to show overwhelming support on the nexus that we see when the two business cycle phases are included. Consistent with the literature (see Section 2), we observe differences in the effects of

[2] Originally the Political Risk Services division of Frost & Sullivan, Inc. and then of UK-based IBC Group (now known as Informa), the PRS Group provides the risk sector two globally recognized, proprietary, quantifiable, and back-tested methodologies: *Political Risk Services (PRS)* and the *International Country Risk Guide (ICRG)*.

[3] See details in Section 3.

[4] Few authors do not have much faith in the dynamic framework. Cooper and Chieffe (2004) show that investors need to accurately predict the peaks and toughs within a month of the actual turning points for this active strategy (which accounts for business cycles) to be more profitable than a passive strategy.

[5] For brevity, we only discuss results relating to terrorism variables. For detailed analyses of the other determinants, contact the corresponding author.