WORKING PAPER SERIES

Terrorism and its Impact on the Cost of Debt

William Procasky, CFA
Texas A&M International University

Nacasius U. Ujah
University of Nebraska at Kearney

WP 2014-002
December 2014

Terrorism and its Impact on the Cost of Debt

WILLIAM PROCASKY, CFA[1]
A. R. Sanchez Jr. School of Business, Texas A&M International University, Laredo, Texas, USA

NACASIUS U. UJAH

College of Business and Technology, University of Nebraska at Kearney, Kearney, Nebraska, USA

We extend the literature on the costs of terrorism by examining its long-term impact on financial markets, an underdeveloped strand of research within the terrorism construct. Specifically, we look at its effect on the sovereign risk of 102 countries (a much broader sample than examined before), which forms the basis of the cost of debt in those countries, postulating that it results in a lower credit rating and that this impact is more pronounced in developing markets as opposed to developed markets. In operationalizing the risk of terrorism, we utilize the Institute for Economics and Peace's Global Terrorism Index, the most comprehensive index constructed to date which incorporates both the economic and social dimensions of terrorism and is based on the Global Terrorism Database covering 104,000 documented incidents. The results of the study support the hypothesis that terrorism results in a higher cost of debt for sovereigns and by extension, firms in impacted countries. In fact, a two-point increase in terrorism on the utilized 10-point scale on average results in a half notch reduction in a sovereign's credit rating, which is roughly equivalent to a change in outlook. Furthermore, this impact is more pronounced in developing markets where we find that a comparable two-point point increase in terrorism on average results in an entire notch downgrade in the sovereign credit rating, e.g., from BB to BB-.

KEYWORDS International Financial Markets, Terrorism, International Debt, Bond Markets, Country Risk, Credit Rating

JEL F34, G1, G15, G32

[1] Address correspondence to William Procasky, CFA, A.R. Sanchez Jr. School of Business, Texas A&M International University, Laredo, Texas, United States of America. Email: williamprocasky@dusty.tamiu.edu

I. INTRODUCTION

Terrorism is defined by the Institute for Economics and Peace as "the threatened or actual use of illegal force and violence by a non-state actor to attain a political attain a political, economic, religious, or social goal through fear, coercion, or intimidation." Although terrorism has been a problem for quite some time (Hoffman 2006) and others link the beginning of the modern era of terrorism to hijackings by the PLO in 1968 (in response to the Israeli Six-Day War), it only recently has received the concerted attention of the research community, largely beginning in the aftermath of the World Trade Center attack on September 11th, 2001.

Unfortunately, since the 9/11 attack and the attendant "War on Terrorism", the global impact of terrorism has increased significantly, and while one could claim that it recently has decreased, in reality it has more or less plateaued, meaning that it likely will remain a problem at least for the foreseeable future, resulting in a general acceptance that dealing with terrorism is an issue that must be dealt with in the 21st century.

Against this backdrop, our contribution to the literature is to extend the limited research strand associated with examining the longer-term impact of terrorism on capital markets, an area of great concern to investors. In doing so, we employ the comprehensive GTI produced by the Institute for Economics and Peace for the first time, looking at the 103 rated countries in the index, exponentially expanding the breadth of countries examined at one time, to determine the link to the cost of debt in those countries. As a proxy for the cost of debt, we utilize a measure of sovereign risk, the sovereign credit risk rating, thereby expanding upon and modifying the seminal work done by Haddad and Hakim (2008). Our primary findings are that the impact is both statistically and economic significant, especially for developing countries. In fact, a two-point increase in terrorism on the utilized 10-point scale on average results in a half notch reduction in a sovereign's credit rating, which is roughly equivalent to a change in outlook. However, in developing markets we find that the same two point increase in terrorism on average results in an entire notch downgrade in the sovereign credit rating, e.g., from BB to BB-.

Obviously, there are significant and immediate costs associated with terrorist attacks, the most visible being the loss of human life and the destruction of property, however beyond that, there are also indirect costs which take more time to manifest and which can be quite deleterious for the affected countries and firms in those countries. For this reason, the literature divides the costs of terrorism into two primary categories, those of direct and indirect costs. The direct costs, as already mentioned, have to deal with loss of life and the destruction of infrastructure, buildings and equipment, and are generally felt by a very small segment of the population (even the WTC attack of 9/11). However, on the other hand, indirect costs tend to be felt much more broadly across the economy and even can take a while to become palpable, for example as per Czinkota et al (2010), declines in buyer demand (e.g., due to fear and uncertainty), increased international business transaction costs (terrorism insurance), international supply chain management interruptions (delays at ports), declines in foreign direct investment (as capital leaves the affected country and seeks lower risk elsewhere) and new government regulations (such as those employed at ports which cause the aforementioned delays), e.g., (Barth et al 2006; Bouchet 2004; Czinkota et al 2004; Ketata and McIntyre 2008; Lenain, Bonturi and Koen 2002; Spich and Grosse 2005).

Almost all of the relevant literature to date has concerned itself with the indirect economic costs of terrorism and its impact on indicators such as GDP growth and federal direct investment, e.g., (Enders and Sandler 1996; Abadie and Gardeazabal 2008). However, there has been some study with respect to the impact of terrorism on financial markets, which is the strand of research that we focus on in this paper. However, the majority of this focus has been on the *short-term* impact of a specific terrorist event on the stock market and by extension, whether it resulted in abnormal profits, e.g., Chen and Siems (2004). One study in particular, though, Haddad and Hakim (2008), dealt with the potential long-term indirect costs of terrorism on sovereign risk for a very small basket of countries in the Middle East and it is on this particular piece of literature where we pick up the thread and seek to advance the knowledge. In accomplishing this, we extend the analysis to over 100 countries around the world and ascertain whether terrorist activity has had an impact on their sovereign debt ratings. We focus on sovereign debt because it sets the "baseline" for the cost of debt in countries, analogous to how the US interest rate curve is set off of the US Treasury curve, which is based largely on the US sovereign debt rating. As a result of this linkage, the systematic effect of terrorism on the bond market can be estimated in this manner.

This paper is structured as follows: the next section looks at the relevant literature in terrorism, followed by a discussion of the data, control variables and estimation/methodology we employ, the main results, a series of robustness checks, including tests for endogenity and the potential limitations of the paper. Finally, we conclude the paper by highlighting the main takeaways as well as opportunities for future research.

II. LITERATURE REVIEW

While there has been broad-based research into the topic of terrorism, for example, its history and the nature of its root causes, as well as the extensive menu of costs that are incurred as a result of it, the strand of research in which we are exclusively interested pertains to the attendant macroeconomic and financial market costs.

The extant research into this topic generally deals with the indirect costs of terrorism and can be classified into three subcomponents for the purposes of this article, namely (i) the effect of terrorism on specific macroeconomic indicators, (ii) the short-term effect of terrorism on primarily stock markets and (iii) the longer-term implications of terrorism on capital markets. Arguably, there is a fine line between the last two subcomponents and they could conceivably be combined into one, however we choose to differentiate the two based on the different temporal effect to elucidate the relative uniqueness of our study.

The first two subcomponents of this strand appear to be more popular and as such, have been researched more rigorously, with research on the latter being nascent. For example, the literature has examined the effect of terrorism on such household economic indicators such as foreign direct investment (FDI) and GDP. Seminal papers in this realm include:

- Enders and Sandler (1996), who found that in Spain, terrorism was believed to have reduced FDI by an average of 13.5% per annum from 1975-1991, while in Greece, the reduction was 11.9% per annum;
- Eckstein and Tsiddon (2004), who found that in a study of the Israeli economy from 1950-2003, terrorism had a negative effect on consumption and that continued terror would decrease annual consumption per capita by 5%;
- Bloomberg, Hess and Orphanides; (2004), who demonstrated that in a sample of 177 countries from 1968-2000, terrorism depressed GDP in a "marked and statistically significant" overall, although the reduction was insignificant for advanced (OECD) economies;
- Enders, Sachsida and Sandler (2006), who showed that the 9/11 attacks had little impact on US FDI flows and that terrorism in general has had a small impact on the stock of US FDI (in OECD countries only); and
- Abadie and Gardeazabal (2008), who operationalized a Global Terrorism Index (produced by the World Research Centre for the years 2003/4) and for a cross-section of 110 countries, and showed that for a one standard deviation change in terrorism risk, the net stock of a country's FDI decreased by approximately 5% of GDP;

With respect to the second subcomponent of the literature, the short-term effect of terrorism on primarily stock markets, significant contributions to the literature have been made by:

- Abadie and Gardeazabal (2003), who showed that when the Basque ETA declared a ceasefire between 1998 and 1999, a sample of Basque stocks generated abnormal returns vis-à-vis non-Basque stocks on 22 trading days characterized by good news (indicating that the truce was credible), whereas after the ceasefire, Basque stocks significantly underperformed their counterparts in 66 days of trading;
- Chen and Siems (2004) who showed in a study of 14 terrorist/military attacks on global stock market returns, that returns on the Dow Jones were not abnormal on the day of terrorist attacks (with the exception of the 9/11 attack, where abnormal returns lasted 40 days) and that the effect on major stock market indexes was transitory, lasting usually from 1-3 days;
- Karolyi and Martell (2010), who globally studied terrorist attacks on firms from 1995-2002 and found that stocks of those firms decreased on average by -0.83% on the day of the attack and that attacks in wealthier, more democratic countries produced larger losses;
- Arin, Ciferri and Spagnolo (2008), who showed that terrorism as defined by a daily terror index has a significant effect on stock market returns and volatility in Indonesia, Israel, Spain, Thailand, Turkey and UK from 2002 -2006 and that the impact is more pronounced in the emerging markets;
- Chesney, Reshetar and Karaman (2011), who studied the impact of terrorism on stock, bond and commodities markets (with the bond and commodity markets being analyzed for the first time) and found that two-thirds of terrorist attacks lead to a significant negative impact on at least one stock market globally (with the Swiss being the most sensitive and the US, the least), primarily on the event day, while global bond markets, except for the US' (which reacts positively on the event day

due to the "flight-to-quality" effect), reacted negatively both on the event day and thereafter (results with respect to commodities were mixed, with general commodities moving higher on the event day followed by a decline and gold moving both positively and negatively in extreme fashion, on the event day and post period); and

- Kollias et al (2013), who showed that terrorist events affect the stock-bond covariance in four developed countries due to a "flight-to-quality" effect.

The third subcomponent of the research stream, the *longer-term* impact on capital markets, is far and away less pronounced than the first two, and while relevant, the topic has only received the attention of two major papers to date. In this vein, Eldor and Melnick (2004) showed that the Israeli stock market lost 30% of its value from 2000-2003 due to the effect of the intensification of the Israeli-Palestinian conflict. In addition, in what could arguably be described as a groundbreaking paper (and the one on which our paper builds), Haddad and Hakim (2008) showed that for a small group of five Middle East and North African nations, terrorism resulted in an increase in sovereign risk from 2002-2006, or the credit risk associated with central governments, as defined by an increase in the yields required on the sovereigns' bonds in the Eurobond market.

III. DATA/METHODOLOGY/HYPOTHESES

3.1 Data and Sources

In this section we discuss the data sources that we operationalize for the independent variable of interest, relative terrorist activity, the dependent variable sovereign credit ratings, and the controlling variables which have been shown to have explanatory value with respect to sovereign credit ratings. All variables are their sources are described below in Table I.

Table I – Description of Variables

Variables	Notation	Years available	Sample Size
Credit Rating: S&P Sovereign Debt Ratings are converted to numerical values. The highest possible score of AAA is converted at 22 and the lowest possible score of D is converted at 1.	CR	2002 - 2011	916
The Global Terrorism Index data is obtained from the Institute for Economics and Peace (IEP). Although IEP reports data for 158 countries, we only use the 102 countries for which sovereign ratings exist.	GTI	2002 – 2011	1020
Log of GDP per capita (current US$) data is obtained from the World Development Indicators and Global Development Finance Database	LGDPPC	2002 – 2011	1020
Inflation deflated by GDP deflator (annual %) data is obtained from the World Development Indicators and Global Development Finance	INFG	2002 – 2011	1010
GDP per capita growth (annual %) data is obtained from the World Development Indicators and Global Development Finance Database	GDPG	2002 – 2011	1010

Total reserve (minus Gold) to GDP per capita (current US$) data is obtained from the World Development Indicators and Global Financial Database	REGDP	2002 – 2011	1020
Log of Export of goods and services (current US$) data is obtained from the World Development Indicators and Global Financial Database	LEXPORT	2002 - 2011	1012
Control of Corruption data is obtained from the World Governance Indicators	COC	2002 – 2011	1019
Political Stability data is obtained from the World Governance Indicators	PS	2002 - 2011	1016

Credit Rating

We use S&P sovereign credit ratings from 2002-2011 obtained from Bloomberg. Following Kedia, Rajgopal, and Zhou (2013) and Klock, Mansi, and Maxwell (2005), we convert the ratings from letters to a scalar index from 1(Default) to 22 (AAA).

Terrorism

We obtain data on terrorism by utilizing the Global Terrorism Index, or "GTI", produced by the Institute for Economics and Peace ("IEP"). The GTI is the first terrorism index to systematically rank countries on the impact of terrorism by incorporating both economic *and* social dimensions. This is done by producing a composite score for each nation and then ranking it ordinally, with higher scores translating into a greater negative impact of terrorism. While the index measures the direct physical impact of terrorism, it also incorporates the psychological effect, or indirect effect, by weighting the final composite score by damage in prior years (with earlier years receiving a lower weighting).

As per the IEP 2012 GTI report, the index is based on data collected by The National Consortium for the Study of Terrorism and Responses to Terror (START), and stored in its Global Terrorism Database ("GTD"). The GTD is considered to be the most comprehensive database on terror activity in the world and has documented over 104,000 individual cases of terrorism. The GTI was actually created when the IEP was in the process of updating the terrorist indicator incorporated into its Global Peace Index, an index similar to that of the GTI, during which time the organization decided to produce it on a stand-alone basis.

The index encompasses a total of 158 countries examined over the last ten years. Countries are scored on the basis of four aggregated physical effect indicators. These are total number of incidents, total number of fatalities, total number of injuries, and sum of property damages. To account for the lingering effect of terrorism, GTI takes into account prior years scores and weights them as follows: current year (52%), previous year (26%), two years ago (13%), three years ago (6%), and four years ago (3%).

The weighted scores are then banded/mapped logarithmically into a ten point scale. This enables each score to be a relative 'linear' indicator of the impact of terrorism in a country with respects to its counterparts. Hence, with GTI, higher score (with ten (10) being the highest

possible score) connote as highest impact of terrorism. One of the limitations of this paper is that, GTI data begins from 2002 and currently stops in 2011. As such, we only use 10 years of data.

By using the GTI, we have the advantage of being able to operationalize terrorist activity over the last ten years across every rated sovereign country, making this source of data the broadest and deepest in existence and permitting for the very first time a comprehensive analysis of the long-term effect of terrorism on a truly global basis.

Control Variables

Based largely on Afonso (2003)[2], who identified factors explaining 87% of the variation in sovereign credit ratings, and augmented by Qi et al (2009) and Connolly (2007), we use variables to control for economic and political variables that have been shown to impact sovereign risk ratings, namely solvency, stability, social cohesion, and degree of interdependence with international economic and financial systems. The control variables are divided into two basic categories, economic control variables, represented by gross domestic product per capita (GDPPC), inflation rate (INFG), real gross domestic product growth (GDPG), national reserves to gross domestic product (REGDP), and exports (EXPORT), and government control variables defined as control of corruption (COC) and political stability (PS).

Table II presents the descriptive statistics and sample sizes for the variables for all available years (2002 through 2011). We split the countries into two subsamples, those of developed economies and those of developing economies so that we may examine the effect of terrorism on those subsamples individually, based on our belief that the effect of terrorism will be more pronounced with respect to developing economies. We used the International Monetary Fund's (IMF) World Economic Outlook published in 2012 to categorize the sample countries into developed vs. developing economies. The combined sample consists of 73 developing countries and 29 developed ones.

Table II Sample Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Developed Economies					
CR	290	20.0586	2.6280	3.0000	22.0000
GTI	290	1.3846	1.8978	0.0000	7.9300
GDPPC	290	35,391.69	15,504.04	5,386.39	99,143.17
INFG	290	2.2966	2.2857	-5.3900	11.8000
GDPG	290	2.1127	3.2934	-14.1000	14.7800
REGDP	290	0.1189	0.1890	0.0010	1.0382
EXPGS	289	310,000,000,000	380,000,000,000	3,330,000,000	2,100,000,000,000

[2] We omitted three variables (Budget surplus as a ratio of GDP, External debt to export, and Previous default) suggested by Afonso (2003) because they reduce the sample size by over 60% and create collinearity between two independent variables (we also included log of exports to proxy for the export variable). The results are reported in Table III. Once collinearity was addressed, the results including these three control variables were similar statistically to those reported in Table III for the GTI, or terrorism coefficient.

COC	290	1.5156	0.6999	-0.1843	2.5527
PS	290	0.8030	0.5747	-1.6230	1.6649
Developing Economies					
CR	626	11.3490	3.3565	1.0000	20.0000
GTI	730	1.9141	2.3718	0.0000	9.0500
GDPPC	730	5,262.27	8,060.35	217.46	89,735.68
INFG	720	8.5822	10.3079	-27.6300	142.4800
GDPG	720	5.3071	4.4898	-17.9500	34.5000
REGDP	730	0.1939	0.1425	0.0128	1.0064
EXPGS	723	58,400,000,000	162,000,000,000	294,000,000	2,090,000,000,000
COC	729	-0.3702	0.5784	-1.4884	1.7228
PS	726	-0.3300	0.7647	-2.8116	1.2087

This table presents the observation, mean, minimum, and maximum values for credit rating, global terrorism index, and control variables used in this study.

Overall, as expected, developed countries have the highest mean credit rating (CR) value of 20.06 (an AA grade) whereas developing countries have a mean CR of 11.35 (BB grade), the drivers of which can be seen/found in the accompanying control variable statistics, which are generally much lower and subject to greater variation for the developing countries. In addition, the GTI is higher in developing countries vs. developed (1.92 vs.1.39), meaning that terrorism is more prevalent in developed countries vis-à-vis developed ones.

3.2 Methodology

We use country level data for the period 2002 – 2011 to estimate the following basic OLS specification for cross-sectional data.

$$CR = \alpha + \beta\, GTI + X + \varepsilon \qquad (1)$$

As explained above, we use the S&P credit rating to measure sovereign credit rating. The GTI measures terrorist risk at the country level and the vector X represents the control variables used. In the regression models, we transformed two variables (GDPPC and EXPGS) to log function for normalization purposes. While we report our "headline" results on the basis of our OLS regressions, we subject the results to a rigorous series of robustness checks to ensure that they are not driven by choice of methodology or subject to endogeneity. These include Tobit, ordered Probit, 2SLS, GMM and Dynamic Panel estimations.

3.3 Hypotheses

With respect to the OLS regression procedure, we first examine the impact of terrorism on the entire sample's sovereign ratings, and then split the sample into developed and developing countries, analyzing the sovereign rating impact separately, since our initial expectation was that the effect will be greater in developing countries. Please note that since the scales for sovereign

ratings and terrorism run in reverse directions, meaning that the coefficients of interest will need to be negative (and statistically significant) on both accounts.

We believe that the financial markets of developed nations will be able to absorb the impact of terrorist activity more flexibly than developing nations due to but not limited to their generally more diversified economies (thereby not being overly susceptible to an attack on one particular sector), greater access to liquidity/capital markets (reducing the risk of being "shut off"), greater political stability and related to these factors, greater ability to inspire confidence in their markets, currency, etc. (Levine 1997). As such, the two relationships that we hypothesize are as follows:

- H1: Terrorism is negatively associated with the cost of debt embedded in sovereign risk ratings; and
- H2: The effect of terrorism on the cost of debt is more pronounced in developing vs. developed countries

IV. RESULTS

Table III, in columns (I) to (V), reports OLS estimates with robust standard errors of the coefficients in equation 1[3]. In column (I) we regressed GTI alone on the credit rating, thereafter adding the economic control variables in column (II) and the governmental control variables in (III). In columns (IV) and (V), we split the sample into developing and developed economies and reported the results separately. The resultant coefficient of GTI in column (I) suggests that a one unit increase in global terrorism index would lead to a -0.24 decrease in sovereign rating, establishing a correlation, though not causality (while the r-squared is low, the intent of this paper is to empirically validate that terrorism has a contributing effect on a country's credit rating and not to suggest that it is a primary driver). The coefficient of interest essentially remains unchanged when all the control variables are added in column (III) and increases (or decreases, as it were) to -0.51 when only developing countries are included in the model in column (IV), interestingly decreasing to both economic and statistical insignificance when developed only countries are included in column (V). All through models (I) – (IV), the GTI coefficient was statistically significant at the 1% level.

To check for multicollinearity in the independent variables, we performed a post-estimation test at the end of each regression known as the variance inflation factor (VIF). A two-digit score of VIF is considered problematic and often even a score of five, however, in all of the regression models, the highest VIF score was 3.67 for COC, and our mean VIF – the average VIF score for all independent variables combined – was below 3.0. Hence, we conclude that our independent variables do not suffer from multicollinearity. In addition, because we utilized robust standard errors, heteroskedasticity is not an issue.

As stated, we hypothesized two relationships in this paper. On the basis of the OLS regressions results, which show that the coefficient on terrorism is both statistically and

[3] The t-statistics are shown in parentheses. A t-statistics higher than 1.96 are statistically significant at 0.05.

economically significant in each model specification, we find support for each. Specifically, the results of the study support the hypothesis that terrorism results in a higher cost of debt for sovereigns and by extension, firms in impacted countries. In fact, a two-point increase in terrorism on the utilized 10-point scale on average results in a half notch reduction in a sovereign's credit rating (-0.24 x 2 = -0.48), which is roughly equivalent to a change in outlook. Furthermore, this impact is more pronounced in developing markets with less diversified economies[4], where we find that the same two-point increase in terrorism on average results in an entire notch downgrade in the sovereign credit rating (-0.51 x 2 = -1.02), e.g., from BB to BB-.

Table III Effect of Terrorism on a Nation's Credit Rating

	I	II	III	IV Developing	V Developed
GTI	-0.2354*** (-3.16)	-0.1797*** (-4.29)	-0.2384*** (-4.96)	-0.5057*** (5.74)	-0.0427 (-0.64)
LGDPPC		2.2591*** (25.68)	0.8585*** (9.6)	0.8957*** (10.15)	0.8957*** (10.15)
INFG		-0.1208*** (-10.82)	-0.0624*** (-6.99)	-0.0547*** (-3.59)	-0.0547*** (-3.59)
GDPG		0.0995*** (4.69)	0.0832*** (5.08)	0.0357 (1.20)	0.0357 (1.20)
REGDP		0.3044 (0.62)	1.0876*** (2.86)	4.4086*** (5.23)	-4.8491*** (-6.42)
LEXPORT		0.8881*** (13.13)	0.8479*** (16.14)	-1.197*** (-10.10)	0.5651*** 13.83
COC			1.7942*** (14.33)	1.9832*** (8.83)	2.0831*** (19.34)
PS			1.4330*** (8.86)	0.9210*** (4.55)	0.8359* (1.93)
_cons	14.5159 (68.29)	-26.7857 (-21.46)	-15.2137 (-14.12)	-14.8577 (-11.53)	9.3725 (4.19)
N	916	898	896	498	289
r^2	0.0108	0.7754	0.8673	0.5875	0.8319
Adj r^2	0.0098	0.7739	0.8661		

*** p<0.01, ** p<0.05, *p<0.1

4.1 Robustness Checks

While our initial results are encouraging, we performed a battery of robustness checks to ensure that they are not subject to omitted variable bias, reverse causality and incorrect regression methodology, i.e., form of model, all of which could bias the coefficients. Specifically, we declared our data as panel data and performed fixed effect, instrumental variable, tobit and ordered probit regressions. In performing these robustness tests, we focused our analysis on the

[4] To validate that the developing and developed sample coefficients are different, we performed a Chow test, interacting a "developing" dummy variable with all independent variables. The resultant F-test statistic of 11.38 rejected the null hypothesis that the coefficients were stable, i.e., the same.

coefficient of our independent variable of interest, GTI coefficient and the sign and statistical significance of that coefficient in the respective tests.

The first test that we performed is a two-way fixed effects regression, where we control for time invariant country and time effects, thereby eliminating any omitted variable bias associated with these variables. The resultant effect of such omitted variable bias, to the extent that it was correlated with the independent variables, would bias our coefficients and could result in spurious causality. However, as can be seen in the second column of Table IV, the coefficient on our variables of interest, GTI, remained negative and is statistically significant at the 1% level.

We then proceeded to perform a test using instrumental variables, which are designed to address the effect of not only omitted variable bias on the coefficient of interest, but also the potential for another form of endogeneity, reverse causality. Reverse causality occurs when the dependent variable actually causes the independent variable, rather than vice-versa, which is what the OLS regression equation assumes. Put another way, although the regression results in Table III describe correlations between sovereign debt rating, terrorism, and other country characteristics, such as economic and governance factors, it could be erroneous to interpret those correlations as measures of the effect of terrorism on sovereign debt ratings since it is conceivable that debt ratings could impact terrorism. For instance, one could argue that the conditions that precipitate a poor country rating, e.g., oversized debt, lack of infrastructure, underdeveloped human capital, etc., eventually give rise to opposition which foments terrorism. If, in fact, debt ratings drive terrorism and not vice-versa, then the resultant regression coefficients will be biased.

To address this, we performed a dynamic panel estimation, which utilizes a lagged dependent variable as an independent variable, controls for fixed effects and addresses the potential endogeneity of *all* independent variables in the regression equation, not just the variable of interest, making it a potentially more useful robustness test just "instrumenting out" the variable of interest. Accordingly, we used the Blundell and Bond (1998) "systems estimator" which utilizes difference equations with lagged levels as instruments and levels equations with lagged differences as instruments. Because we utilized robust standard errors, we tested the validity of the instruments using the Hansen-J test, of which the result was that the null hypothesis of instrument validity was not rejected at a p-value=.999 (note: there is no instrument strength test for dynamic panels). In addition, we tested for second-order serial correlation, the result being that the null of no second-order serial correlation failed to be rejected at a p-value = .968. Finally, in underpinning the results of these two econometric tests, we note that the number of instruments employed in the dynamic panel estimation was less than the number of countries, at 90 vs. 102. Armed with this confidence, we ran the estimation and as can be seen in the fifth column of table IV, the GTI coefficient was negative and statistically significant at the 5% level.

The last two robustness tests performed pertained to the type of regression methodology utilized, i.e., alternative approaches to OLS. Against that backdrop, because our dependent variable was right censored (it ranges from 1-22), OLS could potentially provide inconsistent estimates of the parameters. For instance, the coefficients may not necessarily approach the "true" population parameters as the sample size increases. As a result, we performed a regression

using a tobit model designed for non-negative limited dependent variables. As can be seen in column six of Table IV, the coefficient on GTI was negative and statistically significant at the 1% level.

Finally, because of the non-linear, ordered categorical nature of our limited dependent variable, e.g, a downgrade from 22 (AAA) to 21 (AA) has different implications than a downgrade from 13 (BBB-) to 12 (BB+), we employed an ordered probit model to check whether our OLS results were inconsistent. In performing this particular test, we split the sample into developed and developing economies, as in the final regression in the OLS section, and focused on the developing country results in an effort to validate that OLS result, which pertained to our second hypothesis. As per the next-to-last column in Table IV, the coefficient of interest was negative and statistically significant at the 1% level while in the last column reflecting developed economies only, it remained insignificant.

Table IV Robustness Regressions

	Fixed-Effect	Dynamic	Tobit	Ordered Probit - Developing	Ordered Probit - Developed
GTI	-0.7020*** (-2.6)	-0.7847** (2.23)	-0.8508*** (-2.64)	-0.2209*** (-3.57)	-0.0121 (-0.24)
#	634	373	498	498	289

*** p<0.01, ** p<0.05, p<0.1

Based on the cumulative effect of our extensive battery of robustness tests, we found solid support for both of our hypotheses.

V.CONCLUSION

We make a significant contribution to the literature on terrorism by examining for the first time the longer-term effect of terrorism on the debt capital markets on a broad scale. Specifically, we examined the impact of the level of terrorism in a country on 102 sovereign's credit rating as issued by the rating agency, S&P (which we used as a proxy for the "baseline" cost of debt in the country). We also checked for the potential of differing effects with respect to this impact in developed vs. developing nations, since developing nations have less breadth and depth in their economies and as such, ostensibly less "capacity" to absorb terrorist events.

We found that on average, a two-point increase in terrorism on the utilized 10-point scale on average results in a half notch reduction in a sovereign's credit rating, which is roughly equivalent to a change in outlook. Furthermore, this impact is much more pronounced in developing markets where we found that the same two point increase in terrorism on average results in an entire notch downgrade in the sovereign credit rating, e.g., from BB to BB-.

These results are important to both practitioners and academics alike as they help to fill a gap in the literature and quantify the actual indirect long-term costs of terrorist activity in

countries, in particular developing nations which may be more susceptible to terrorism, costs which must be borne by the sovereign entities and by extension, the peoples of those nations.

We cite as limitations to our research the fact that 2012 was the first year in which the GTI was generated, so there is a limited history. Also, we used sovereign credit ratings as proxies for countries' cost of debt, whereas actual bond yields would provide a more complete picture, for example as employed by Kennedy and Palerm (2014) in their examination of 18 emerging markets, since yields are typically a more current indicator of creditworthiness since they tend to "lead" credit rating changes. Finally, due to data limitations, we were not able to fully replicate the control variables identified by Afonso (2003) in his determinants of sovereign ratings related paper, although we note that our headline results with respect to the terrorism coefficient were robust when we replicated the full suite of Afonso variables as closely as possible.

Potential avenues for future research in this area include the further refinement of the developing nation category into two subcategories, developing and emerging countries, in order to further understand whether there is a difference in how these two types of nations are affected. In addition, it would be interesting to examine whether there is a difference in the impact of "home-grown" vs. international terrorism. Finally, we believe that the usage of actual sovereign bond yields as opposed to credit ratings could aid in quantifying the hard cost of terrorism on debt more precisely (although sufficient data availability and quality on such a broad sample of countries will be a hurdle to overcome).

REFERENCES

Abadie, A., and Gardeazabal, J. 2003. The Economic Cost of Conflict: A Case Study of the Basque Country. *American Economic Review* 93 (1): 113-132.

Abadie, A., and Gardeazabal, J. 2008. Terrorism and the World Economy. *European Economic Review* 52: 237-250.

Afonso, A. 2003. Understanding the Determinants of Sovereign Debt Ratings: Evidence for the Two Leading Agencies. *Journal of Economics and Finance* 27: 56-74.

Arin, K. P., Ciferri, D., and Spagnolo, N. 2008. The Price of Terror: The Effects of Terrorism on Stock Market Returns and Volatility. *Economic Letters 101*: 164-167.

Barth, J., Li, T., McCarthy, D., Phumiwasana, T., and Yago, G. 2006. Economic Impacts of Global Terrorism: from Munich to Bali. In: Mrudula E. (ed) *Terrorism: Global Economic Impact* New York: Icfai Books, 27-60.

Bloomberg, S. B., Hess, G. D., and Orphanides, A. 2004. The Macroeconomic Consequences of Terrorism. *Journal of Monetary Economics* 51(5): 1007-1032.

Bouchet, M. H. 2004. Time Impact of Geopolitical Turmoil on Country Risk and Global Investment Strategy. In: Suder G. (ed) *Terrorism and the International Business Environment: the Security-Business Nexus*, Cheltenham, UK: Edward Elgar, 83-104.

Blundell, R., and Bond, S. 1998. Initial Conditions and Moment Restrictions in Dynamic Panel Models. *Journal of Econometrics* 87 (1998): 115-143.

Chen, A. H., and Siems, T. F. 2004. The Effects of Terrorism on Global Capital Markets. *European Journal of Political Economy* 20(2): 249-266.

Chesney, M., Reshetar, G., and Karaman, M. 2011. The Impact of Terrorism on Financial Markets. *Journal of Banking and Finance* 35 (2011): 253-267.

Connolly, M. 2007. Measuring the Effect of Corruption on Sovereign Bond Ratings. *Journal of Economic Policy Reform,* Vol. 10 (December): 309-323.

Czinkota, M., Knight, G., Liesch, P., and Steen, J. 2010. Terrorism and International Business: A Research Agenda. *Journal of International Business Studies* 41: 826-843.

Czinkota, M., Knight, G., and Liesch, P. 2004. Terrorism and International Business: Conceptual Foundations. In: Suder G. (ed) *Terrorism and the International Business Environment: the Security-Business Nexus* Nottingham: Edward Elgar, 43-57.

Eckstein, Z., and Tsiddon, D. 2004. Macroeconomic Consequences of Terror: Theory and the Case of Israel. *Journal of Monetary Economics* 51(5): 971-1002.

Eldor, R., and Melnick, R. 2004. Financial Markets and Terrorism. *European Journal of Political Economy* 20(2): 367-386.

Enders, W., and Sandler, T. 1996. Terrorism and Foreign Direct Investment in Spain and Greece. *Kyklos* 49(3): 331-352.

Enders, W., Sachsida, A., and Sandler, T. 2006. The Impact of Transnational Terrorism on U.S. Foreign Direct Investment. *Political Research Quarterly* 59(4): 517-531.

Haddad, M., and Hakim, S. 2008. The Impact of War and Terrorism on Sovereign Risk in the Middle East. *Journal of Derivatives and Hedge Funds* Vol. 14 (3/4).

Hoffman, B. 2006. Inside Terrorism. *New York: Columbia University Press*.

International Monetary Fund. 2012. World Economic Outlook, *www.imf.org*.

Institute for Economics and Peace. 2012. 2012 Global Terrorism Index Report, *www.visionofhumanity.org*.

Karolyi, G. A., and Martell, R. 2010. Terrorism and the Stock Market. *International Review of Applied Financial Issues and Economics* 2.2: 285-314.

Kedia, S., Rajgopal, S., and Zhou, X. 2013. Did Going Public Impair Moody's Credit Ratings? Available at SSRN: http://ssrn.com/abstract=2343783 or http://dx.doi.org/10.2139/ssrn.2343783

Ketata, I., and McIntyre, J. 2008. Corporate Social Responsibility as a New Orientation in Response to Crisis Management of Sea Changes and Dead Reckoning. In: Suder G. (ed) *International Business under Adversity* Cheltenham, UK: Edward Elgar, 150-167.

Kennedy, M., and Palerm, A. 2014. Emerging Market Bond Spreads: The Role of Global and Domestic Factors from 20002 to 2011. *Journal of International Money and Finance* 43: 70-87.

Klock, M., Mansi, S., and Maxwell, W. 2005. Does Corporate Governance Matter to Bondholders, *The Journal of Financial and Quantitative Analysis* 40(4): 693-719.

Kollias, C., Papadamou, S., and Arvanitis, V. 2013. Does Terrorism Affect the Stock-Bond Covariance? Evidence from European Countries. *Southern Economic Journal* 79(4): 832-848.

Lenain, P., Bonturi, M., and Koen, V. 2002. The Economic Consequences of Terrorism. Economics Department Working Paper No. 334, Organization for Economic Cooperation and Development, Paris.

Levine, R. 1997. Financial Development and Economic Growth: Views and Agenda. *Journal of Economic Literature* 35: 688-726.

Spich, R., and Grosse, R. 2005. How does Homeland Security affect US Firms' International Competitiveness? *Journal of International Management* 11 (4): 457-478.

Qi, Y., Roth, L., and Wald, J. K. 2009. Political Rights and the Cost of Debt. *Journal of Financial Economics* 95 (2010): 202-226.