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Terrorism and Latin-American Stocks Markets

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Abstract

This paper investigates the effects of major terrorist attacks of the last 20 years on a set of stocks listed at Latin-American stock markets. Utilizing the capital market model, we calculate abnormal returns during the day of the terror attacks for 115 stocks listed in 6 Latin-American countries. In this sense, we appreciate different reaction between countries, where Brazil, Peru, and Chile have a significant market reaction of terrorism. These results promote international diversification and the use of this loss to avoid significant capital losses. However, the results are limited by the validity of the capital market model. This paper has important implications for international investors and their investment risk management strategies. Despite the frequency of terrorist events, this is the first work that addresses a wide range of these in Latin American countries. The main conclusion is that there is a negative effect of terrorist events on Latin American markets, but this effect is mixed; there is a negative and significant impact of the US terrorist attacks and a weak and non-significant effect when the attacks occur outside the US.
JEL Classification: G14, G15, O54
Keywords: Event study, terrorism, Latin-America stocks

Terrorismo y mercados bursátiles latinoamericanos

Resumen

Este artículo investiga los efectos de los grandes ataques terroristas de los últimos 20 años en un conjunto de acciones que cotizan en los mercados bursátiles latinoamericanos. Utilizando el modelo de mercado de capitales, calculamos rendimientos anormales durante el día de los ataques terroristas para 115 acciones que cotizan en 6 países de América Latina. En este sentido, apreciamos diferentes reacciones entre países, donde Brasil, Perú y Chile tienen una reacción significativa del terrorismo en el mercado. Estos resultados promueven la diversificación internacional y el uso de esta pérdida para evitar pérdidas significativas de capital. Sin embargo, los resultados están limitados por la validez del modelo de mercado de capitales. Este documento tiene importantes implicaciones para los inversores internacionales y sus estrategias de gestión de riesgos de inversión. A pesar de la frecuencia de los eventos terroristas, este es el primer trabajo que aborda una amplia gama de estos en los países de América Latina. La principal conclusión es que hay un efecto negativo de los acontecimientos terroristas en los mercados latinoamericanos, pero este efecto es mixto; hay un impacto negativo y significativo de los ataques terroristas estadounidenses y un efecto débil y no significativo cuando los ataques ocurren fuera de los Estados Unidos.

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Resumen

Clasificación JEL: G14, G15, O54
Palabras clave: Estudio de eventos, terrorismo, reservas de América Latina

1. Introduction

Terrorism has several adverse economic and financial effects such as a reduction in the physical capital, increased costs of financial and other counter-terrorism regulations, damage of critical infrastructure (power plants, nuclear facilities, chemical factories, bridges, pipelines and water supply), increased economic instability, destruction of market infrastructure and operations and a decrease in investor confidence (Chesney, Reshetar, & Karaman, 2011)

Enders, Sandler, & Gaibulloev (2011) define Terrorism as "a premeditated use or threat to use violence by individuals or subnational groups against noncombatants to obtain a political or social objective through the intimidation of a large audience beyond that of the immediate victims". This intimidation, together with the destruction of assets, economic growth, and life perception reduction, generate effects in the financial markets. In this regard, Abadie & Gardeazabal (2008) observe a depression in growth of 10 % of the Basque country during the 1998- 2000 period, similar to what was found by (Karolyi & Martell, 2010), who indicate that every terrorist event generates, on average, a negative reaction of a -0.83 % in prices of public companies. In the same line, (Drakos, 2004) observes structural changes in the systematic risk (beta) in the airline business after 9/11.

A terrorist event should affect the price of public companies according to the present value theory Campbell & Shiller (1987), which indicates that the price of an asset depends on the expected cash flow and risk. In this regard, (Drakos & Kutan, 2003) show that a terrorist event affect the cash flow of a company in various forms; diminishes foreign investment, the demand for tourism services and as a consequence, the aggregated demand of the local economy, as well as increasing the risks for business, as the insurance companies exclude from their insurances losses generated by terrorist events. In consequence, beyond the actual terror caused by terrorism, it is reasonable to think that investors would adjust their perceptions of value in front of a specific event, which should motivate them to make investment decisions that affect the prices of public companies.

For this, we should expect to see effects from terrorist attacks of global relevance in Latin-American stocks markets even when these have occurred beyond its borders, as these attacks affect the local economy negatively undermining their growth, investments, and trade, this being relevant for companies in Latin America in regards to economic conglomerates located in the USA, Europe, and Asia. Table 1 shows the total trade of Latin-American countries with the main economics clusters. Chile stands out as an economy with high exposition to international trade (over 35 % of the GDP), where 40 % of its total trade is concentrated in the East, Asia, and Pacific. Similar situation, although more intense is the one in Mexico, which focuses 65 % of its total trade in the USA, that represents 47 % of the GPD.

Table 1 shows the percentage of the total trade of the studied Latin American countries compared to three areas of the world for 2017. Column 1 shows the countries studied; columns 2, 3 and 4 indicate the three continents/areas where terrorist attacks took place; column (a) shows the total trade of each country in the East Asia & Pacific area against their gross domestic product (GDP); column (b) represents the total trade of each country in the East Asia & Pacific area against their total trade with all the world, column (c) shows the total trade of each country in the Europe & Central Asia area compared to their gross domestic product (GDP), column (d) represents the total trade of each

country in the Europe & Central Asia area in relation to their total trade with all the world, columns (e) y (f) show the total trade of each country in relation to its GDP and the world respectively, in the North America area.

Table 1. Statistics for total trade for countries in the sample

	East Asia & Pacific (2)		Europe & Central Asia (3)		North America (4)	
Country (1)	**% Total trade of GDP (a)**	**% Total trade of world trade (b)**	**% Total trade of GDP (c)**	**% Total trade in relation to the world (d)**	**% Total trade of GDP (e)**	**% Total trade in relation to the world (f)**
Chile	19,49 %	40,2 %	7,54 %	15,6 %	8,62 %	17,8 %
Mexico	13,2 %	18,3 %	6,8 %	9,4 %	47,2 %	65,5 %
Peru	14,0 %	35,2 %	6,9 %	17,3 %	8,0 %	20,1 %
Brazil	5,64 %	31,48 %	3,90 %	21,76 %	2,76 %	15,40 %
Argentina	4,5 %	23,1 %	3,7 %	18,9 %	2,2 %	11,3 %
Colombia	5,15 %	19,3 %	4,86 %	18,2 %	7,77 %	29,1 %

Source: Worldbank official webpage, 2019

A second argument for thinking that terrorist events should significantly affect the Latin-American stock markets is the contagion phenomenon. The technological progress, the rising in foreign investment, and the need to diversify investments has increased the contagion risk of negative shocks. Table 2 shows the 13 terrorist events with the highest impact since the attack on the twin towers of 2001, and its effect over the stock indexes, although in different magnitudes. For instance, the terrorist attacks in the United States led to the most significant stock market crashes, along with an active trading connection between Latin American economies and the United States.

The Table 2 shows the variation observed in the price of the main stock indexes of each country the day of the event in relation to the closing price of the day before. Each row represents the 13 events studied, in the last row the percentage of events with negative returns can be observed. *For the case of Colombia, the effects are studied starting event 6, as there is no data of stock indexed for previous attacks.

Table 2. Latin-American stock indexes returns on the day of the attack

Events	**Chile**	**Mexico**	**Peru**	**Brazil**	**Argentina**	**Colombia***
Twin towers	-2,80 %	-5,6 %	-3,60 %	-9 %	-7,70 %	
Bali attacks	-0,46 %	0,34 %	0,14 %	-4,56 %	2,94 %	
Madrid bombing	-1,06 %	-2,5 %	0,6 %	-4,2 %	-0,25 %	
School in Beslan	0,30 %	0,64 %	-0,27 %	-1,28 %	1,10 %	
London bombing	-0,26 %	0,44 %	-0,27 %	-0,27 %	2,57 %	
Bombay shooting	0,32 %	3,77 %	2,75 %	4,76 %	5,34 %	0,54 %
Norway attack	0,21 %	0,56 %	-0,52 %	0,01 %	-0,31 %	1,51 %
Boston bombing	-2,30 %	-2,32 %	-4,11 %	-3,66 %	-1,74 %	-0,99 %
Charlie Hebdo attack	0,00 %	1,17 %	-0,35 %	3,05 %	2,34 %	1,03 %
Paris shooting	-0,40 %	-1,14 %	-0,73 %	-0,78 %	0,01 %	0,60 %
Orlando massive shooting	-0,34 %	-0,55 %	-1,12 %	0,48 %	-1,13 %	0,56 %
Manchester Stadium attack	0,19 %	-0,25 %	0,03 %	-1,54 %	-0,53 %	0,79 %
Strasbourg shooting	0,73 %	-1,11 %	0,22 %	0,59 %	0,61 %	-0,49 %
% Negative events	53,8 %	53,8 %	61,5 %	61,5 %	46,2 %	15,4 %

A third argument is the co-integration between financial markets. When countries are economically and financially integrated, generate a strong correlation, and co-integration in their stock markets (Donadelli & Paradiso, 2014). As a consequence, investors decrease their diversification opportunities and enhance the contagion effect between countries and a higher country risk before a worldwide crisis (Gagnon, Power, & Toupin, 2016). In this regard, Hardy, Magner, Lavin, Cardenas, & Jara-Bertin (2018) find evidence of co-integration between MILA markets when co-integration tests are applied that extend the results delivered by Mellado & Escobari (2015) and Sandoval & Soto (2016).

Despite these conceptual arguments that lead to expect significant effects of terrorist events over the Latin- American stock markets, other might explain the absence of such an impact. The main one is related to their low stock market efficiency or poor reaction,

also named as efficiency market hypothesis. A study of the Mexican Stock Market Bhattacharya, Daouk, Jorgenson, & Kehr (2000) find evidence of reduced efficiency, observed through a weak reaction of the stock prices before relevant events. There are four explanations for this phenomenon: (a) the stock market is informationally inefficient; (b) news are not relevant to determine the value of the company; (c) news are entirely anticipated for the market and; (d) the market has an active presence of insider traders. In the same line Hardy et, al., (2018) find evidence that, even after the MILA integration of four important Latin American stock markets (Chile, Colombia, Perú y México), market efficiency is weak because relevant events not generate a reaction of prices.

In this way, our motivation in this paper is to study the effect of a terrorist attack in the main Latin-American stock markets. We think that this is important for two reasons. First, because the majority of the studies focus on the impact of a terrorist attack on the local economy, while a few papers about the indirect effect on other countries, not considering the existence of a global impact and limiting the possibilities of investment risk management through international diversification. Second, literature is focused on the reaction of developed stock markets, while small fraction studies emerging markets and, to the best of our knowledge, absent to Latin-America, even when Arin, Ciferri, & Spagnolo (2008) find that the adverse effect of terrorism is more significant in emerging countries.

To achieve our purpose, we selected six Latin-American Stock markets and collected the returns of stocks with transactions between the 2000- 2018 period. Then, we choose 13 terrorist attacks in areas with a strong relation with Latin-America, and we implement an event study methodology based on the capital asset market model. Finally, we estimate the terrorism impact with the statistical significance of the cumulative abnormal returns for two days before the attack. For management autocorrelation, multicollinearity and heteroscedasticity problems in our expected generation market model (market model OLS, see section 3.2), we include eight statistical tests, five parametric tests, and three nonparametric tests (see section 3.3 for obtaining a detailed explanation). We believe that with this strategy, we can work with the OLS residues obtained by those that present typical problems in their specifications.

The result indicates a weak reaction of the Latin-American stock markets except for US terrorist attacks. For example, during the 9/11 attack, the markets experienced 6,1 % of cumulative abnormal returns. Contrary to this, during the London attack, the cumulative abnormal return was 1 % positive although with little statistical significance. But the strength of the impact change over the stock markets. In this sense, Brazil is the stock market with the most negative reaction, while Argentina presents a positive one. The results also change between sectors when the most sensitive sectors are energy and industry.

We think that these results have many practical implications oriented to improve the understanding of a new type of catastrophic risk that investors and financial markets must face, quantify and manage. For example, an investor could consider investing their money in Argentina, Colombia, or Mexico in time of terrorism, or increase their exposition in sectors out of energy or industrial sectors.

The rest of the paper is structured as follows: in section 2 we present evidence that shows the effect of terrorist attacks. In section 3 we describe the database and methodology. In section 4 we present results. Finally, in section 5 we conclude.

2. Terrorism and financial markets

The effects of terrorism in the financial markets have been widely documented (see a survey in Kollias, Kyrtsou, & Papadamou (2013)). However, only a few catch the attention in the literature, especially the 9/11 attacks of 2001 in the United States. Terrorist attacks have been a dark side of Latin American history since the '70s. However, following the

9/11 attacks, these events have concentrated in the Middle East, since the invasion of Afghanistan in 2001 and Iraq in 2003, and they account for more than 3.000 deaths, besides from the ones in the United States and Europe (Global Terrorism Database, 2019). In fact, since the 9/11 attacks, terrorist events have not only been a concern in terms of safety or fear, but also for their impacts on the economy. In this regard, (Goel, Cagle, & Shawky, 2017) calculate that the economic impact of terrorism is measured in billions of dollars annually, with the most in 2014 at 52.9 billion.

The psychosocial nature of the markets explain the adverse financial effects of the terrorist attacks, where investors see a negative impact in the valuation for the panic generated by terrorism (Hirshleifer, 2001; Boubaker, Farag & Nguyen, 2015). In this sense, and despite the critical argument of the physical losses of assets, Johnston and Nedelescu (2005) evidence that the financial markets are not only confronted with significant disruptions caused by the massive damage to property and communication systems, but also by the high levels of uncertainty and market volatility. Complementary, Nikkinen, Omran, Sahlstrom & Aijo (2006) say that technological progress causes severe reactions in front of news that may threaten the future of their investments.

From this perspective, Drakos (2010) suggests that terrorist attacks lead to significantly lower returns on the day a terrorist attack occurs. However, there is no complete consensus on the literature. In this regard, Kollias et al., (2013) found opposite results. For instance, following the Madrid terrorist attack, abnormal returns can be verified in most sectors of Spain, while in the London attacks these effects are not statistically significant.

Concerning the duration of the effects, it is possible to classify between temporary effects, those that occurred within the following days to the attack, and long term effects, those that are related to changes in the systematic risk. Drakos (2004) observes that following the 9/11 attacks in the USA companies from the airline's sector suffered high losses in the stock prices and changed their relationship with the stock index significantly increasing their beta. In contrast, Kollias et al., (2013) studied the reaction of public companies of the Spain and UK and observed negative effects on the first days following the Madrid and London attacks, respectively, although said effects disappeared after a few days.

The effect on the stock markets is not constant through all the sectors. More specifically, Chesney et al., (2011) find that airline, travel, tourism, accommodation, restaurant, postal and insurance industries are particularly susceptible to increased terrorism risks and, in consequence, economies with more concentration for these industries hurt most from falls in output and employment.

3. Latin-American security market daily returns

3.1 Data

The dataset employed in our analysis consists of the daily closing prices for 115 stocks[3] covering the 2001 – 2018 period (See table 3). Then, we consider 13 terrorist attacks with global communicational effects outside Latin-America (see table 4).

The Table 3 shows the descriptive statistics by country including: Numbers of companies considered in the study for each country; Average abnormal return (AAR) for the event window; Standard deviation of the abnormal returns; Average of abnormal cumulative return(CAR); Standard deviation of average abnormal cumulative return; Standard deviation of average abnormal cumulative return on absolute value; and percentage of zero returns for each country that has the database, on average, the days that price of companies registered non trading.

[3]We work with index stocks and eliminated stocks with more than 20 % cero returns

Table 3. Descriptive statistic

Statistics	Chile	Mexico	Peru	Brazil	Argentina	Colombia	Total
Number of companies	29	22	21	28	8	7	115
Average abnormal return (AAR)	-0,12 %	-0,23 %	0,01 %	0,10 %	0,35 %	-1,01 %	-0,15 %
Standard deviation AAR	1,49 %	2,66 %	2,40 %	2,43 %	1,85 %	2,20 %	2,17 %
Average CAR	-0,23 %	-0,22 %	0,03 %	-0,15 %	0,30 %	-1,25 %	-0,25 %
Standard deviation CAR	2,43 %	3,49 %	3,57 %	4,07 %	3,83 %	3,70 %	3,52 %
Absolute CAR	1,72 %	2,25 %	2,41 %	2,67 %	2,71 %	2,93 %	2,45 %
Standard deviation CAR absolute	1,76 %	2,73 %	2,68 %	3,08 %	2,73 %	2,72 %	2,62 %
Percentage of Zero returns	19,24 %	12,87 %	4,20 %	13,22 %	21,93 %	20,79 %	15,38 %

The following table shows the 13 events considered in this investigation. Columns 1 and 2 show the number and name of the event; columns 3 and 4 show the location of the event, country, and continent, respectively; column 5 shows the date of the terrorist attack.

Table 4. Detail of studied events

Number of event	Event	Country	Continent	Date
1	Twin towers	United States	America	11-09-2019
2	Bali attacks	Indonesia	Asia	12-10-2002
3	Madrid bombing	Spain	Europe	11-03-2004
4	School in Beslan	Russia	Europe	01-09-2004
5	London bombing	England	Europe	07-07-2005
6	Bombay shooting	India	Asia	26-11-2008
7	Norway attack	Norway	Europe	22-07-2011
8	Boston bombing	United States	America	15-04-2013
9	Charlie Hebdo attack	France	Europe	07-01-2015
10	Paris shooting	France	Europe	13-11-2015
11	Orlando massive shooting	United States	America	13-06-2016
12	Manchester Stadium attack	England	Europe	22-05-2017
13	Strasbourg shooting	France	Europe	11-12-2018

3.2 Event study methodology

The event study methodology (See MacKinlay (1997) for a survey and Corrado (2011) for a good update and recommendations) has two stages: abnormal returns estimation process and event study test statistics for abnormal returns. Since Fama, Fisher Jensen, & Roll (1969), abnormal (excess of) return is typically calculated from the market model (especially in the daily analysis). In this sense, $AR_{i,h}$ is the abnormal return of a security h on day i, $R_{i,h}$ is the realized return and $RM_{i,h}$ is the market index[4]. As the market model is a linear regression (estimated by OLS), the parameters α_i and β_i are the intercept and slope estimates, respectively.

$$AR_{i,h} = R_{i,h} - (\alpha_i + \beta_{ii,h}) \tag{1}$$

Let $h = 0$ denote the day of a hypothetical event for a specific security. Besides, a 200-day estimation period is required; therefore, the event window is defined as $h \in (0; -2)$ for each event date and security combination.

Also, n denotes the length of the event window and m the sample size. We define AAR_{n_i} as the average abnormal return and $PE(AAR_{n_i})$ its prediction standard error as in Salinger (1992):

$$PE\left(AAR_{n_i}\right) = \frac{\sigma_{m_i}}{\sqrt{n_i}} * \sqrt{1 + \frac{n_i}{m_i} + n_i * \frac{\left(ARM_{n_i} - ARM_{m_i}\right)^2}{\sum_h \left(RM_{i,h} - ARM_{m_i}\right)^2}} \tag{2}$$

[4]We use the most important index for each country. IPSA, Chile; IGBC, Colombia; BOVENPA; Brazil; IPC, Mexico; S&P/BVL, Peru; MERVAL, Argentina.

Here, ARM_{m_i} represents the average return of the market index for the estimation window and σ_{m_i} the standard error from the estimation window regression. Under a null hypothesis of no abnormal return, $\frac{AAR_{n_i}}{PE(AAR_{n_i})}$ is distributed t-Student with $m_i - 2$ degrees of freedom (assuming identical, independent and normally distributed data).

3.3. Event study tests

For this research, we applied parametric and nonparametric tests. We included more tests because the standard event study tests cannot be used correctly in Latin-American stocks markets with a higher degree of variability in liquidity and return distributions, until an empirical specification study. Kearney (2012) present that emerging stock markets are significantly less informationally efficient than their developed counterparts. He explain that their limited transparency, scarce corporate information, weak regulation, low auditing standards, lax disclosure requirements, dominant players who can move prices away from intrinsic values, incompletely developed "culture(s) of equity" that reduce the reaction times of market participants to new information, and the resulting illiquidity that impedes the market's ability to accommodate orders.

3.3.1. Parametric tests

a. T-test
The t-test is the simplest statistic test uses for single firms in each time point t.

$$T_{test\ AR_{i,t}} = \frac{AR_{i,t}}{S_{AR_i}} \quad , \quad T_{test\ CAR} = \frac{CAR_i}{S_{CAR}} \tag{3}$$

Where S_{AR_i} is the standard deviation of the abnormal returns in the window. Then, we calculate the statistics of the accumulated abnormal returns (CAR) for each company.

b. *Patell t-test (Patell, 1976)*

$$T_{Patell} = \frac{1}{\sqrt{N}} * \sum (\sqrt{n_i} * \frac{AAR_{n_i}}{PE\,(AAR_{n_i})}) \tag{4}$$

Under the null hypothesis of no abnormal returns, T_{Patell} must theoretically distribute t-student with N degrees of freedom, thus, asymptotically as standard normal.

c. *Boehmer test (Boehmer et al., 1991)*
The Boehmer test of standardized residuals corrected for event-induced changes in volatility. This test is similar to the Patell t-test, but it considers an adjustment due to induced volatility in the cross-sectional event window.

$$T_{Boehmer} = \frac{\sum \sqrt{n_i} * \frac{AAR_{n_i}}{PE(AAR_{n_i})}}{\sqrt{N * \sigma^2(\sqrt{n} * \frac{AAR_n}{PE(AAR_n)})}} \tag{5}$$

Where

$$\sigma^2\left(\sqrt{n} * \frac{AAR_n}{PE\,(AAR_n)}\right) = \frac{1}{N-1} * \sum (\sqrt{n_i} * \frac{AAR_{n_i}}{PE\,(AAR_{n_i})} - \frac{1}{N} * \sum \sqrt{n_i} * \frac{AAR_{n_i}}{PE\,(AAR_{n_i})})^2 \tag{6}$$

The $T_{Adjusted}$ distributes asymptotically under the null hypothesis of no abnormal return as standard normal

d. *Adjusted standardized Cross-section test (Kolari and Pynnon, 2010)*
The Kolari test of standardized residuals corrected for event-induced changes in volatility and cross-correlation. This test proposes a modification to the Boehmer-test to account for cross-correlation of the abnormal returns. The context of this investigation is important because the events are on the same dates for all the stocks in the market. The correlation between financial stocks is a stylized fact in the literature, and it is important to leave out that the results are dragged by correlations between assets. We use the standardized abnormal returns and defining r as the average of the sample cross-correlation of the estimation period abnormal returns.

$$T_{Kolari} = T_{Boehmer}\sqrt{\frac{1-\bar{r}}{1+(N-1)\bar{r}}} \tag{7}$$

e. *Crude dependence (Brown and Warner et al., 1980, 1985)*
CDA is a parametric test, which measures if the average abnormal return time series during the event was statistically different from that of the estimation window. To execute it, a single variance estimate for the entire sample is assumed, so the test does not account for the unequal return variances across securities. In 1985, Brown and Warner suggested that the standard deviation of average residuals should be estimated from the time series of the average abnormal returns over the estimation period. The advantage from CDA is that it avoids the potential problem of cross-sectional correlation of security return.

$$S^2_{AAR} = \frac{1}{M-2}\sum_{t=T_0}^{T_1}\left(AAR_t - A\bar{A}R\right)^2 \tag{8}$$

$$A\bar{A}R = \frac{1}{M}\sum_{t=T_0}^{T_1} AAR_t \tag{9}$$

$$T_{CDA} = \sqrt{N}\frac{AAR_t}{S_{AAR}} \tag{10}$$

3.3.2 Non-parametric test

a. *Rank test (Corrado, 1989)*
The Corrado test is a non-parametric test which considers the ranks of abnormal returns (an adaptation of the popular rank test). Let's consider Rank($AR_{i,h}$) as the rank of the abnormal return in the complete sample (estimation window and event window). Then, under the null hypothesis, each rank is a uniform random drawing of integers from 1 through the complete sample. The Corrado statistic is calculated as follows:

$$T_{Rank} = \frac{1}{\sqrt{N}}\sum_{i=1}^{N}\left(\frac{\sum_{h\in n_i} Rank\left(AR_{i,h}\right) - n_i * \left(\frac{n_i+m_i+1}{2}\right)\right)}{\sqrt{n_i * m_i * \frac{n_i+m_i+1}{12}}} \tag{11}$$

b. *Adjust Rank Test (Corrado and Zivney, 1992)*
The Corrado and Zivney rank test corrected for event-induced volatility of rankings. For cumulative (average) abnormal returns, the aggregation formula in Cowan (1992, p. 346) is applied. For this, it is necessary to define the Rank ($SAR_{i,h}$) as the new ranking

of the abnormal returns considering the complete sample, that is, for the estimation window and the event window.

$$SAR_{i,h} = AR_{i,h} \; si \; h \in m_i \tag{12}$$

$$SAR_{i,h} = \frac{AR_{i,h}}{\sqrt{\sigma^2(\sqrt{n} * \frac{AAR_n}{PE(AAR_n)})}} \quad si \quad h \in n_i \tag{13}$$

$$T_{Rank \; Adjust*} = \frac{1}{\sqrt{N}} \sum_{i=1}^{N} \left(\frac{\sum_{h \in n_i} Rank\left(SAR_{i,h}\right) - n_i * \left(\frac{n_i + m_i + 1}{2}\right)\right)}{\sqrt{n_i * m_i * \frac{n_i + m_i + 1}{12}}} \tag{14}$$

c. *Sign test*
The main issue in the sign test is the non-symmetric distribution of abnormal returns (Brown and Warner, 1985). In emerging markets, large skewness values are expected. We consider Sign$(AR_{i,h} - x_i)$ the sign of the difference between the abnormal return and a specific value of x. In addition, we consider p as the proportion of positive signs in the estimation window for each security.

$$p_i = \frac{1}{m_i} * \sum_{h \in m_i} Sign(AR_{i,h} - x_i) \tag{15}$$

where
$Sign(AR_{i,h} - x_i) = \; 1 \; if \; AR_{i,h} > x_i$ and $Sign(AR_{i,h} - x_i) = 0$ otherwise
As evaluated in Cowan (1992), the first generalization of the sign test establishes $x_i = 0$ (by using the mean of abnormal returns for the estimation period, which by construction, is zero for the market model). In this sense, p_i is the proportion of abnormal returns greater than 0.

$$T_{Sign} = \frac{1}{\sqrt{N}} * \sum_{i=1}^{N} \left(\sum_{h \in n_i} Sign\left(AR_{i,h} - x_i\right) - n_i * p_i\right) / \left(\sqrt{n_i * p_i * (1 - p_i)}\right) \tag{16}$$

4. LATAM stock market reaction and terrorist attacks

To research the effect of terrorism in Latin-American stocks markets, we calculate CAAR for 115 companies in the day of the terrorist attack and the next two days. To expand our results, we repeated this process for 13 international terrorist attacks and applied eight parametric and non-parametric test to determine the stock market reaction. Additionally, we estimate the overall all our results using a GARCH(1,1) model for generating non-normal returns to evaluate the dependence of the non-normal generating model (Bacmann and Dubois (2003) for a survey). Table 5 indicates that the most critical event for LATAM stock markets was the 9/11 terrorist attack (CAAR: - 6,1 %). Besides the magnitude, this event caused a significant reaction in all markets, independent of the test applied. We observe a similar effect in the Boston attack, evidence of the strong dependence between US and LATAM stock markets. Appendix 2 shows the same results but generate with a GARCH(1,1) model. In this sense, the events with more significance are 9/11 attack and attack in Boston, but the attack in Bombay are significant too.

Table 5. T-statistics by event

	9/11 attack	Attack in Bali	Attack in Madrid	Attack in Russia	Attack in London	Attack in Bombay	Attack in Norway
CAAR	-0,061	-0,009	-0,013	0,008	0,010	0,037	-0,010
T Test	-13,420	-1,480	-2,968	2,038	0,728	7,473	-3,298
CDA Test	-5,231	-0,708	-1,318	0,641	0,612	1,240	-0,797
Patell Test	-21,755	-3,253	-8,451	3,427	3,618	9,961	-4,443
Boehmer Test	-11,491	-2,455	-6,678	2,471	3,542	5,716	-3,345
Kolari Test	-3,932	-0,804	-2,229	0,687	1,072	0,777	-0,724
Rank Test	-3,484	-0,759	-2,324	0,255	0,811	1,445	-1,021
Rank Test Adjusted	-3,326	-0,940	-2,176	0,416	0,905	1,402	-1,006
Sign Test	-5,535	0,133	-3,503	0,646	3,121	6,692	-3,383
		Attack in Boston	**Charlie Hebdo attack**	**Attack in Paris**	**Attack in Orlando**	**Attack in Manchester**	**Attack in Strasbourg**
CAAR		-0,031	0,005	-0,013	-0,004	0,008	0,010
T Test		-11,368	1,547	-3,713	-0,965	0,603	3,184
CDA Test		-3,214	0,433	-0,924	-0,238	0,559	0,917
Patell Test		-19,062	3,548	-7,084	-2,308	3,466	3,793
Boehmer Test		-9,459	2,481	-4,736	-3,043	3,123	3,163
Kolari Test		-2,383	0,636	-1,026	-0,636	0,808	0,820
Rank Test		-2,009	0,468	-0,842	-0,291	1,062	1,251
Rank Test Adjusted		-1,823	0,410	-0,859	-0,427	1,141	1,277
Sign Test		-7,440	2,668	-1,672	-1,863	3,441	3,723

The first row shows the average cumulative abnormal return of the 13 terrorist events included in the sample; the following rows show the result of each statistical test specified in the methodology. The grey boxes indicate the statistically significant values to 10 %, where the null hypothesis is rejected.

Table 6 shows the cumulative abnormal returns in the event window between the day of the terrorist attack and the next two days. On average, we show that the Latin-American companies react with positives (returns 0,2 % on average). However, the direction of the reaction is different between countries. Mexico, Argentina, and Colombia show a positive response, while Chile, Peru, and Brazil present an adverse reaction. These results are similar when we change the non-normal return model. Appendix 3 shows the reaction for all test by countries using a GARCH (1,1) model. Argentine has the major percentage of reaction, and Mexico has less percentage. To evaluate the statistical significance, we applied eight tests. The results are mixed and statistically insignificant. On average, the percentage of reaction is 15, 6 % with a minimum rate of the 4,8 % for the sign test, and 29,8 % for the Patell test.

Table 6. Percentage of reaction of companies by country and type of test

	Chile	Mexico	Peru	Brazil	Argentine	Colombia	Mean
Nº	29	22	21	28	8	7	
CAAR	-0,2 %	0,2	-0,1	-0,6	2,1	0,03	0,2
T Test	10,3 %	4,5 %	0,0 %	14,3 %	37,5 %	14,3 %	13,5 %
CDA Test	10,3 %	4,5 %	0,0 %	14,3 %	37,5 %	28,6 %	15,9 %
Patell Test	17,2 %	4,5 %	28,6 %	25,0 %	75,0 %	28,6 %	29,8 %
Boehmer Test	6,9 %	0,0 %	14,3 %	14,3 %	62,5 %	14,3 %	18,7 %
Kolari Test	3,4 %	0,0 %	9,5 %	9,5 %	25,0 %	0,0 %	7,9 %
Rank Test	0,0 %	4,5 %	9,5 %	10,7 %	75,0 %	0,0 %	16,6 %
Rank Test Adjusted	3,4 %	4,5 %	9,5 %	10,7 %	75,0 %	0,0 %	17,2 %
Sign Test	6,9 %	0,0 %	9,5 %	0,0 %	12,5 %	0,0 %	4,8 %
Mean of reaction	7,3 %	2,8 %	10,1 %	12,4 %	50,0 %	10,7 %	15,6 %

Table 6 shows the percentage of companies that react to the events, classified by country. Row (2) indicates the number of people considered by country, row (3) shows the average cumulative abnormal return by country; the following rows show the percentage of companies that react significantly to 10 % according to the different statistical tests described in the methodology. The last row shows the average reaction percentage by country; likewise, the last column shows the average reaction by statistical test.

The effects of the terrorist attacks are different between industries. Table 7 shows CAAR for seven industries according to GICS classification. Sector energy and industry have the most reaction (17 and 16 % of reaction, respectively), while the Materials and Communication services have the lowest reaction rates (7 % of response on average). However, the impact can be changed with the test used. For example, rank test adjusted shows that sectors consumer discretionary and communication service have the most significant reaction. The differences within sectors are in line with the literature. Raby (2003) finds that airline, travel, tourism, accommodation, restaurant, postal, and insurance industries are particularly susceptible.

For deepen our evidence, and approach the capital market model limitations, we use a Garch (1,1) method and replicate all our analysis. Appendix 4 shows that energy and industrial sectors have a high rate of reaction, similar to material and consumer staples sectors. This test is evidence that the global results do not depend on the non-normal return generating method.

Table 7 shows the percentage of companies that react to the events, classified by their respective sectors, according to the Global Industry Classification Standard. Row (2) indicates the number of companies considered by sector, row (3) shows the average cumulative abnormal return by sector; the following rows show the percentage of companies that react significantly to 10 % according to the different statistical tests described in the methodology. The last row shows the average reaction percentage by sector; likewise, the last column shows the average reaction by statistical test.

Table 7. Percentage of reaction by sector according to the eight types of tests

	Energy	Material	Industrial	Consumer discretionary	Consumer staples	Financials	Communication services	Mean
CAAR	-0,003	-0,0002	-0,009	-0,003	-0,0002	0,005	-0,0008	-0,0016
T Test	6 %	3,7 %	28,6 %	0,0 %	18,2 %	16,0 %	0,0 %	10 %
CDA Test	6 %	3,7 %	28,6 %	0,0 %	18,2 %	16,0 %	0,0 %	10 %
Patell Test	39 %	22,2 %	28,6 %	22,2 %	18,2 %	12,0 %	28,6 %	24 %
Boehmer Test	28 %	7,4 %	14,3 %	11,1 %	9,1 %	12,0 %	0,0 %	12 %
Kolari Test	11 %	3,7 %	14,3 %	0,0 %	9,1 %	8,0 %	0,0 %	7 %
Rank Test	17 %	7,4 %	14,3 %	11,1 %	4,5 %	12,0 %	14,3 %	11 %
Rank Test Ajusted	17 %	7,4 %	0,0 %	22,2 %	9,1 %	12,0 %	14,3 %	12 %
Sign Test	11 %	0,0 %	0,0 %	0,0 %	4,5 %	8,0 %	0,0 %	3 %
Mean	17 %	7 %	16 %	8 %	11 %	12 %	7 %	11 %
N	18	27	7	9	22	25	7	115

5. Conclusions

We observe opposite effects of global terrorist attacks in Latin-American stock markets. In specific, we show a negative and significant impact of the US terrorist attacks and weak and non-significant effect when the attacks occur outside the US.

This effect varies through different countries and sectors. The most sensible markets were Brazil, Peru, and Chile, while the most sensitive sectors were energy and communications.

We have some explanation for this contradictory behavior. The adverse effect of US terrorist attacks can be understood by the strong correlation between the Latin American Stock Markets and those located in North America. Another explanation is that investors adjust their expectations when an attack occurs anticipating a drop in the cash flow of Latin American companies traded in local markets with economic connection with the United States. Unfortunately, a limitation of our work is that our methodology does not allow to distinguish between these explanations.

For the other hand, we explain the poor reaction for the other terrorist attacks with the low efficiency of Latin American Stocks Markets. Complementary to this, we considerate that the errors in the statistical tests derived from liquidity problems and abnormal returns present in emerging markets can justify an insignificant response. As before, our methodology does not allow us to separate these explanations.

An application of these results is that the low reaction in Latin American markets makes them a good diversification option for international investment funds in front of terrorism, due to their weak response and low probability of a terrorist attack.

We think that study the effect of the terrorist attacks contributes to understanding better the phenomenon in the financial markets. Their violent, unexpected, sudden, and viral nature make them an attractive laboratory to evaluate how information influences financial markets; after all, is difficult to think that markets would not react to terrorist attack based on explanations related to the use of privileged information (it is not impossible, but it is difficult to think that an investor would know of an attack beforehand) or the lack of attention (the news explode in all media)

An extension of this work is to continue studying in depth the relation between social phenomena, financial ones, and understand psychosocial variables, such as fear and terror, and how these influence investment decisions, especially in contexts of emerging economies where the evidence is scarce.

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Appendix 1. List of stocks companies

Id_Country	Country	Index	Company	Industry
1	Chile	IPSA	Aes Gener	Energy
2	Chile	IPSA	Aguas Andinas	Energy
3	Chile	IPSA	Antar Chile	Financials
4	Chile	IPSA	Banco De Chile	Financials
5	Chile	IPSA	Banco De Credito E Inversion	Financials
6	Chile	IPSA	Banco Santander Chile	Financials
7	Chile	IPSA	Banmedica	Consumer Discretionary
8	Chile	IPSA	Besalco	Consumer Discretionary
9	Chile	IPSA	Cap	Materials
10	Chile	IPSA	Coca-Cola Embonor Series B Pref.	Consumer Staples
11	Chile	IPSA	Colbun Machicura	Energy
12	Chile	IPSA	Compania Cervecerias Unidas	Consumer Staples
13	Chile	IPSA	Compania Sudamericana De Vapores	Industrials
14	Chile	IPSA	Embotelladora Andina Series B	Consumer Staples
15	Chile	IPSA	Enel Generacion Chile	Energy
16	Chile	IPSA	Empresa Nacional De Telecomunicaciones	Comunication Services
17	Chile	IPSA	Empresas Cmpc	Materials
18	Chile	IPSA	Empresas Copec	Energy
19	Chile	IPSA	Enersis	Energy
20	Chile	IPSA	Engie Energia Chile	Energy
21	Chile	IPSA	Gasco	Energy
22	Chile	IPSA	Grupo Security	Financials
23	Chile	IPSA	Latam Airlines Group	Industrials
24	Chile	IPSA	Parque Arauco	Financials
25	Chile	IPSA	Quinenco	Industrials
26	Chile	IPSA	Saci Falabella	Consumer Staples
27	Chile	IPSA	Sociedad Matriz Banco De Chile B	Financials
28	Chile	IPSA	Sociedad Quimica Y Minera De Chile B Pref.	Materials
29	Chile	IPSA	Vina Concha Y Toro	Consumer Staples
30	Mexico	IPC	Alfa 'A'	Industrials
31	Mexico	IPC	America Movil 'L'	Comunication Services
32	Mexico	IPC	Cemex Cpo	Materials
33	Mexico	IPC	Consorcio Ara	Consumer Discretionary
34	Mexico	IPC	Corp Int De Entr	Consumer Discretionary
35	Mexico	IPC	Corporacion Geo 'B'	Consumer Discretionary
36	Mexico	IPC	Empresas Ica	Consumer Discretionary
37	Mexico	IPC	Fomento Economico Mexicano	Consumer Staples
38	Mexico	IPC	Gpo Finance Banorte	Financials
39	Mexico	IPC	Grupo Bimbo 'A'	Consumer Staples
40	Mexico	IPC	Grupo Carso Series A1	Industrials
41	Mexico	IPC	Grupo Elektra	Financials
42	Mexico	IPC	Grupo Financiero Inbursa Sries 'O'	Financials
43	Mexico	IPC	Grupo Kuo 'B'	Materials
44	Mexico	IPC	Grupo Mexico 'B'	Materials
45	Mexico	IPC	Grupo Saltillo	Materials
46	Mexico	IPC	Grupo Televisa	Comunication Services
47	Mexico	IPC	Indust Penoles	Materials
48	Mexico	IPC	Kimberly-Clark De Mexico 'A'	Consumer Staples
49	Mexico	IPC	Organizacion Soriana	Consumer Staples
50	Mexico	IPC	Tv Azteca	Comunication Services
51	Mexico	IPC	Walmart De Mexico 'V'	Consumer Staples
52	Peru	IGBVL	Pomalca	Consumer Staples
53	Peru	IGBVL	Casa Grande	Consumer Staples
54	Peru	IGBVL	Bco Continental	Financials
55	Peru	IGBVL	Grana Y Montero	Consumer Discretionary
56	Peru	IGBVL	Corporacion Aceros Arequipa 'I'	Materials
57	Peru	IGBVL	Corporacion Aceros Arequipa	Materials
58	Peru	IGBVL	Alicorp	Consumer Staples
59	Peru	IGBVL	Union Andina De Cementos	Materials
60	Peru	IGBVL	Un.De Cvcs.Prua. Byj.I	Consumer Staples

Id_Country	Country	Index	Company	Industry
61	Peru	IGBVL	Credicorp	Financials
62	Peru	IGBVL	Volcan Compania Minera 'A'	Materials
63	Peru	IGBVL	Volcan Compania Minera B Pref.	Materials
64	Peru	IGBVL	Ferreyros Saa	Consumer Discretionary
65	Peru	IGBVL	Cementos Pacasmayo Saa	Materials
66	Peru	IGBVL	Luz Del Sur	Energy
67	Peru	IGBVL	Sociedad Minera El Brocal Saa	Materials
68	Peru	IGBVL	Minsur 'I'	Materials
69	Peru	IGBVL	Cerro Verde	Materials
70	Peru	IGBVL	Southern Copper (Lim)	Materials
71	Peru	IGBVL	Austral Group	Consumer Staples
72	Peru	IGBVL	Edegel	Energy
73	Brazil	IBOV	Ambev On	Consumer Staples
74	Brazil	IBOV	Gerdau Pn	Materials
75	Brazil	IBOV	Metalurgica Gerdau Pn	Materials
76	Brazil	IBOV	Lojas Renner On	Consumer Discretionary
77	Brazil	IBOV	Itau Unibanco Holding Pn	Financials
78	Brazil	IBOV	Lojas Americanas Pn Rep1 Pn	Consumer Staples
79	Brazil	IBOV	Cia Energetica De Minas Gerais Pn	Energy
80	Brazil	IBOV	Brf Brasil Foods On	Consumer Staples
81	Brazil	IBOV	Usinas Siderurgicas De Minas Gerais A Pn	Materials
82	Brazil	IBOV	Engie Brasil Energia On	Energy
83	Brazil	IBOV	Weg On	Industrials
84	Brazil	IBOV	Embraer On	Industrials
85	Brazil	IBOV	Raia Drogasil On	Consumer Staples
86	Brazil	IBOV	Itausa Investimentos Itau Pn	Financials
87	Brazil	IBOV	Banco Do Brasil On	Financials
88	Brazil	IBOV	Vale On	Materials
89	Brazil	IBOV	Petroleo Brasileiro Pn	Energy
90	Brazil	IBOV	Cia Paranaense De Energia Copel Pn	Energy
91	Brazil	IBOV	Braskem Pn Series 'A'	Materials
92	Brazil	IBOV	Banco Bradesco Pn	Financials
93	Brazil	IBOV	Banco Bradesco On	Financials
94	Brazil	IBOV	Cpad.Sanmt.Basico De Saop.On	Energy
95	Brazil	IBOV	Telefonica Brasil Pn	Comunication Services
96	Brazil	IBOV	Bradespar Pn	Financials
97	Brazil	IBOV	Companhia Siderurgica Nacional On	Materials
98	Brazil	IBOV	Petroleo Brasileiro On	Energy
99	Brazil	IBOV	Cmpbra.De Distb. Pn	Consumer Staples
100	Brazil	IBOV	Tim Participacoes On	Comunication Services
101	Argentina	IMV	Aluar	Materials
102	Argentina	IMV	Banco Macro Bansud 'B'	Financials
103	Argentina	IMV	Bbva Banco Frances	Financials
104	Argentina	IMV	Gp Finance Galicia 'B'	Financials
105	Argentina	IMV	Pampa Energia	Energy
106	Argentina	IMV	Sociedad Comercial Del Plata	Financials
107	Argentina	IMV	Telecom Argentina	Comunication Services
108	Argentina	IMV	Ypf	Energy
109	Colombia	COLCAP	Banco De Bogota	Financials
110	Colombia	COLCAP	Bancolombia	Financials
111	Colombia	COLCAP	Cementos Argos	Materials
112	Colombia	COLCAP	Grupo De Inversiones Suramericana	Financials
113	Colombia	COLCAP	Grupo Nutresa	Consumer Staples
114	Colombia	COLCAP	Inversiones Argos	Materials
115	Colombia	COLCAP	Almacenes Exito	Consumer Staples

Appendix 2. T-statistics by event with GARCH(1,1) model.
The first row shows the average cumulative abnormal return of the 13 terrorist events included in the sample; the following rows show the result of each statistical test specified in the methodology. The grey boxes indicate the statistically significant values to 10 %, where the null hypothesis is rejected.

	9/11 attack	**Attack in Bali**	**Attack in Madrid**	**Attack in Russia**	**Attack in London**	**Attack in Bombay**	**Attack in Norway**
CAAR	-0,0408	-0,0633	-0,0053	0,0031	0,0115	0,0418	-0,0005
T Test	-8,9123	-1,4801	-1,2306	0,8418	0,8305	9,9039	-0,1717
CDA Test	-4,1730	-6,3319	-0,6520	0,3065	0,7333	2,5387	-0,0511
Patell Test	-18,4365	-1,2424	-5,2343	1,3475	2,4763	6,3232	-2,4355
Boehmer Test	-9,3782	-3,2487	-4,7263	3,4852	3,0297	3,3254	-1,2424
Kolari Test	-5,2724	-1,0023	-3,8272	2,0395	2,9473	1,2412	-0,7126
Rank Test	-2,3591	0,6886	-0,5309	-0,0150	1,2918	2,4663	-0,0731
Rank Test Ajustado	-2,8069	-0,5428	-0,5028	0,0575	1,1910	2,1359	-0,1218
Sign Test	-5,1461	1,3528	-0,4273	-0,7381	2,9710	6,4568	0,9298
		Attack in Boston	**Charlie Hebdo attack**	**Attack in Paris**	**Attack in Orlando**	**Attack in Manchester**	**Attack in Strasbourg**
CAAR		-0,0188	0,0044	0,0010	-0,0033	0,0015	-0,0004
T Test		-6,9516	1,5467	0,3041	-0,8304	0,1070	-0,1205
CDA Test		-2,6099	0,5612	0,1023	-0,2881	0,1104	-0,0442
Patell Test		-8,2484	2,2874	-5,6440	-1,2837	2,3284	2,3285
Boehmer Test		-4,2487	1,5562	-2,2385	-1,2847	4,3584	3,3243
Kolari Test		-1,2841	1,2392	-2,3250	-0,9214	0,8237	0,9374
Rank Test		-1,4507	0,4941	0,5894	-0,6751	-0,0447	-0,5761
Rank Test Adjusted		-1,2312	0,4203	0,3712	-0,7323	0,0346	-0,7320
Sign Test		-3,1146	2,0804	1,2561	-1,8924	-0,4364	-1,0850

Appendix 3. Percentage of reaction of companies by country and type of test with GARCH (1,1) model.
Table shows the percentage of companies that react to the events, classified by country. Row (2) indicates the number of people considered by country, row (3) shows the average cumulative abnormal return by country; the following rows show the percentage of companies that react significantly to 10 % according to the different statistical tests described in the methodology. The last row shows the average reaction percentage by country; likewise, the last column shows the average reaction by statistical test.

	Chile	Mexico	Peru	Brazil	Argentina	Colombia	Mean
CAAR	-0,00117	0,001735	-0,00174	-0,02627	0,019715	0,00001	-0,00129
T Test	10 %	5 %	0 %	11 %	38 %	14 %	13 %
CDA Test	10 %	5 %	0 %	14 %	38 %	14 %	13 %
Patell Test	38 %	18 %	33 %	43 %	63 %	14 %	35 %
Boehmer Test	17 %	0 %	14 %	29 %	50 %	29 %	23 %
Kolari Test	14 %	0 %	14 %	25 %	50 %	14 %	20 %
Rank Test	3 %	5 %	5 %	14 %	63 %	0 %	15 %
Rank Test Ajusted	7 %	0 %	10 %	14 %	75 %	0 %	18 %
Sign Test	3 %	0 %	14 %	7 %	13 %	0 %	6 %
Mean of reaction	13 %	4 %	11 %	20 %	48 %	11 %	18 %

Appendix 4. Percentage of reaction by sector according to the eight types of tests
Table 7 shows the percentage of companies that react to the events, classified by their respective sectors, according to the Global Industry Classification Standard. Row (2) indicates the number of companies considered by sector, row (3) shows the average cumulative abnormal return by sector; the following rows show the percentage of companies that react significantly to 10 % according to the different statistical tests described in the methodology. The last row shows the average reaction percentage by sector; likewise, the last column shows the average reaction by statistical test.

	Energy	Material	Industrial	Consumer discretionary	Consumer staples	Financials	Communication services	Mean
CAAR	-0,0044	0,0001	-0,0090	0,0055	-0,0294	0,0053	-0,0013	-0,0047
T Test	6 %	4 %	29 %	0 %	14 %	16 %	0 %	10 %
CDA Test	6 %	4 %	29 %	0 %	18 %	16 %	0 %	10 %
Patell Test	39 %	38 %	14 %	33 %	32 %	36 %	43 %	34 %
Boehmer Test	33 %	23 %	0 %	11 %	9 %	24 %	0 %	14 %
Kolari Test	44 %	12 %	14 %	11 %	5 %	16 %	14 %	17 %
Rank Test	11 %	8 %	14 %	11 %	9 %	12 %	14 %	11 %
Rank Test Ajusted	22 %	4 %	14 %	22 %	9 %	12 %	14 %	14 %
Sign Test	17 %	0 %	0 %	0 %	14 %	4 %	0 %	5 %
Mean	22 %	12 %	14 %	11 %	14 %	17 %	11 %	14 %
N	18	27	7	9	22	25	7	115