SEVERAL EVIDENCES FROM THE SECONDARY CATASTROPHE BONDS MARKET

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Abstract: *Within the paper we investigated the influence that a series of indexes that reflect the performance of CAT bonds has on the spread of these financial products. By employing a regression analysis, we have identified several determinants of the premium of the catastrophe bonds.*

Key words: CAT bonds, regression analysis, spread, secondary market

JEL codes: G00, G22, G23

Introduction

Given the fact that *"catastrophic events are having an increased effect on traditional insurance markets"* (Baryshnikov, Mayo and Taylor, 2001) there is a clearly identifiable worldwide trend that indicates that CAT bonds are used more and more in order to *"access capital markets and to extend the flexibility of reinsurance hedging"* (Baryshnikov, Mayo and Taylor, 2001) and are even emerging as staple hedging tool with a relevant secondary market.

The basic benefits of CAT bonds are highlighted by Cummins (2008) which references the important role these play on the capital markets and mentions the fact that starting with 2001 these were priced competitively with catastrophe reinsurance and comparably rated corporate bonds.

The objective of this paper is to examine the secondary market of catastrophe bonds and investigate the influence that a series of indexes that reflect the performance of catastrophe bonds on an international level has on the spread of a sample of CAT bonds. Considering the work of Gomez and Carcamo (2014) that highlights the fact that CAT Bonds are appealing and relevant for different types of investors which leads to the importance to compute and understand the price dynamics of these securities.

The paper is structured in three main sections which include: a brief literature of the recent and relevant developments in the field, the data and methodology proposed within this paper, the main findings of the paper and concluding remarks and future research.

Literature review

Although the study of CAT bonds is relatively new, there is already an established mass of papers that deal with the pricing and performance of catastrophe bonds at issuance.

Lane and Mahul, (2008) analyze 250 catastrophe bonds to examine the manner of assessing catastrophe risk. In this sense, the authors apply both a simple linear model and a cross-sectional analysis to determine the combined effect of expected loss regarding reassurance disasters specific cycles, the type of risk covered (wind USA, USA earthquake, wind Europa, Europa earthquake, wind Japan, Japan earthquake and other risks) and the risk profile of the transaction. The authors show that, individually, each element is statistically significant. Gatumel and Guegan, (2008,) start from staple studies that aim to capture the market price of risk, complementing the same time the analysis with a study on the determinants of the spread. In this respect, the analysis results reflect the vectors that influence the spread, as mentioned by the authors, both a structural component, i.e. investors' risk aversion and a term component type, such as the seasonal nature of hurricanes. On the final determinant, the authors stress that natural risks (such as US hurricanes, storms or earthquakes in California and Europe) have a strong impact on the market.

Lei, Wang and Tzeng, (2008) analyzed a sample of catastrophe bonds issued in 1997-2007 to highlight factors that influence the spread of such securities. Among the factors analyzed they mention: the expected loss, probability event to be triggered, the likelihood that investors may lose the entire principal, the expected loss associated with a dollar invested conditional triggering event, the type of release mechanism to reflect the underlying risk, the size of the tranche, their maturity, rating, risk type, year of issue and the place (to reflect some macroeconomic environment associated events such as cycles of conferences of reinsurance or catastrophe). Results of the analysis reflect: the likelihood that investors will lose their entire principal and the type and size of the release mechanism has no influence on spread of these financial instruments.

Bodoff and Gan (2009) proposed a linear function model of the expected loss, with parameters that vary by risk area. In detail, the relationship between the catastrophe bond premium and expected loss varies according to the risk covered and the geographic area. In this sense, each unique combination of risk and the area is reflected in its price line. In addition, the authors propose an approach that combines these individual models within a single model. Key findings reflect that spread determinants are represented by the expected rate of return on capital and the uncertainty associated with expected loss.

Papachristou (2009, 2011) reviews catastrophe bond prices as determined by the market with a generalized additive model. As specified by the analysis, it includes examining the statistical significance of the various factors that may influence the prices of these bonds and measuring the effect of these factors on the spread. The analysis includes catastrophe bonds issued between 2003 and 2008, and the main determinants of the spread considered in the analysis are: the expected loss, the issue date is representative of the market cycle, risk and geographical area. Of these, the expected loss appears to be the most important influence on the spread. Besides these, the author explains a number of determinants that are not included in the model because they are not significant in statistical terms: the time remaining to maturity, transaction size, time of issue within the year.

Braun (2012) analyzes the main factors that influence the spread, based on a number of assumptions. After running a regression analysis he confirms that the expected loss, the covered territory, the sponsor, reinsurance cycle and spread of corporate bonds rated BB are major determinants of catastrophe bond spreads.

Although there are several approaches to CAT bond pricing, some recent developments involve multifactor spread models with several underlying factors such as *"Spread at Issue, Expected Loss, Credit Rating, Time to Maturity, BB-Bonds Index, Interest Rate and Swiss Re Cat Bond Total Return Index"* (Gomez and Carcamo, 2014)

Data and methodology

Considering primarily the work of Gomez and Carcamo (2014), we have realised several analyses at the catastrophe bonds secondary market level. In this regard, we have focused on the influence that a series of indexes that reflect CAT bond performance on an international level exert on the bond spread in our selected sample. The analysis involved computing index returns on a trimester level to realise the correspondence with the average trimestral spread of CAT bonds traded in that particular trimester. Thus, we considered Swiss Re developed indexes – being considered a CAT bond industry-wide benchmark. In this regard, we build five baskets of indexes: [1] Global [2] Global Un-hedged [3] CAT bonds denominated in USD [4] BB rated CAT bonds [5] CAT bonds that cover storms/ hurricane type events. We selected those indexes that reflect in a composite manner both coupon and price returns (generically called Total Return).

By employing a simple regression analysis, we aim to determine the impact of five independent variables (trimester returns of indexes) by computing respective coefficients to determine the magnitude of the impact. We considered the spread of CAT bonds as the average spread on a trimester level for transactions of EU based reinsurance companies in the respective trimester. We checked the statistical significance of results using a simple t-statistics test.

The raw data was collected from Bloomberg (indexes) and Lane Financial (spread). The log-returns were computed and the analysis was performed in Eviews 5.

Results

Our analysis results highlight the fact that there is a relationship between the trimester performance of CAT bonds indexes (generally negative) and spread, confirming the results of Gomez and Carcamo (2014) but employing a different analysis applied on a different sample. Basically, our results show a negative relationship between indexes (performance on a price and coupon level) and CAT bond spread (according to economical grounded hypotheses). As shown in the figure bellow, all coefficients for all five indexes are statistically significant at 5% and negative.

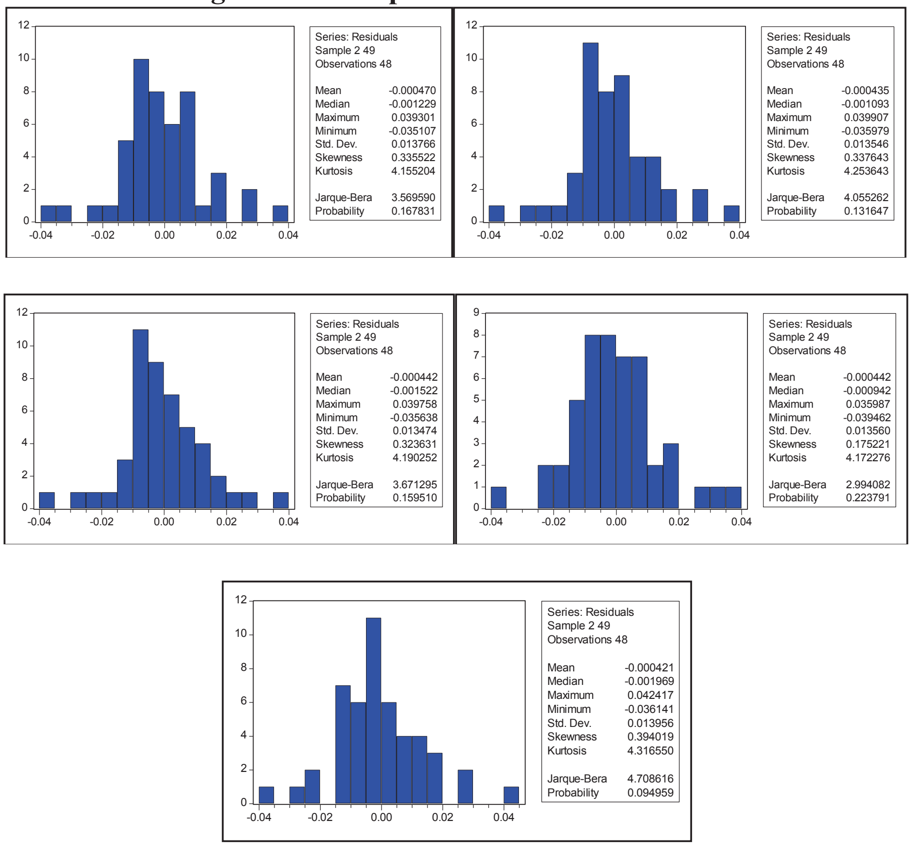
Table 1. Relationship between indexes and spread

Variable	Coefficient	Std. Error	t-Statistic	Prob.
[1] D(SRBBTRR)	-0.255300*	0.086646	-2.946474	0.0050
[2] D(SRCATTRR)	-0.284079*	0.087632	-3.241724	0.0022
[3] D(SRGLTRR)	-0.324112*	0.097186	-3.334972	0.0017
[4] D(SRGLUTRR)	-0.296791*	0.092085	-3.223015	0.0023
[5] D(SRUSWTRR)	-0.178655*	0.066625	-2.681493	0.0101

* statistically significant at 5%

Additionally, as shown in the figure bellow residual testing show that the model used is appropriate, derived from the fact that we cannot reject the normal distribution hypothesis.

Figure 1. Descriptive statistics of residuals



Concluding remarks and further work

The aim of this paper was to determine, on a secondary market level, the influence that a series of indexes that reflect CAT bond performance on an international level exert on the bond spread, considering Swiss Re developed indexes that reflect in a composite manner coupon and price returns. As a result, of our regression analysis we found that there is a negative relationship between the performance of CAT bonds indexes and spread marginally more influence was exerted by CAT bonds denominated in USD than any other index. The results seem to be consistent with mainstream results so far, however, we aim to further extend the analysis by including more factors/ indexes and using various subsamples of spreads as well as various frequency data.

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