INVESTIGATING FINANCIAL INNOVATION AND EUROPEAN CAPITAL MARKETS. THE CASE OF CATASTROPHE BONDS AND LISTED REINSURANCE COMPANIES

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Abstract

Focusing on the financial innovation – stock market interconnections, the present research studies the association between the insurance-linked market activity of European (re)insurance companies and their evolution on the capital markets. With the aim of emphasizing the connections from the perspective of the stock performance and their risk, the empirical analysis is based on vector autoregression (VAR) and Granger causality analyses. The proposed examination is further developed by considering both impulse response functions and variance decomposition insights. The proxies of the catastrophe bond market, as financial innovation, there are employed both the size and the number of catastrophe bonds transactions, while the stock returns and their standard deviation stand for representatives of the evolution of the reinsurance companies on the capital markets in terms of financial performance and risk. The main results confirm other studies, suggesting that the effects of issuing cat bonds on the ceding companies is reflected rather in terms of stocks' risk diminishing.

Key words: *catastrophe bonds, financial performance, risk, reinsurance EU market*

JEL classification codes: *G1, G15, G22*

1. Research backgrounds

In the context of the crisis and post-crisis realm, financial innovation is more than ever in the centre of the academic debates about its role in the economy. As evidence of these concerns, there is a continuously thriving mount of literature that concentrates, at macroeconomic and microeconomic level, on the relationship between financial innovation and economic growth, on one side, and financial innovation and financial markets performance, on the other side. Furthermore, there is generally acknowledged that these concepts are related to the competitiveness desiderates that are nowadays one of the focal point at international and European level.

1.1. Financial innovation and economic growth

Hassan et al. (2011) performed a detailed study to link financial development and economic growth in low, middle and high-income countries. Using panel regressions and Granger causalities they found strong long-run linkages between financial development and economic growth and a positive connection between financial innovations and economic growth for developing countries, results not mirrored however, for high-income countries [8]. It is worth mentioning that while the financial landscape is populated by financial institutions willing and able to provide financial innovations, important aspects of the venture capital and private equity process could be duplicated. However, the institutions themselves could not have been readily replaced, which makes financial innovations to have a larger unique contribution to economic growth (Lerner and Tufano, 2011) [12].

Gai et al. (2008) provide interesting evidence on how macroeconomic stability and financial innovation may have reduced the incidence of systemic financial crises in developed countries during the recent period [6]. However, the flip side to this obvious advantage lies in the fact that crises that did occur had a greater than expected impact. On a general note, there is sufficient recent evidence to support the fact that financial innovations in the insurance industry is positively correlated to economic growth. Although still debated, one may successfully argue that a sound national insurance market is at least a factor for economic growth if not a vector of it (Outreville, 2013) [16]. More localised evidence provides information on the direction of causality between financial development and economic growth in the Middle East and North African (MENA) countries. The empirical results show that the direction of causality between financial development and economic growth is sensitive to the measurement of financial development and supports evidence on the direction of interrelated causality between the financial sector and real sector (Kar et al., 2011) [9]. Oke (2012) also finds evidence that the insurance sector development in Nigeria promotes economic, as an increase in the number of insurance companies contributes to economic growth [15].

1.2. Financial innovation and corporate performance

On the general realm between financial innovation and corporate performance, one of the first studies is that of Tufano (1989) that addresses the compensation investment banks receive when introducing innovative securities. The author concludes that the performance distinguishes through a higher market share in terms of underwritings [19]. A study of Carow (1999), focusing on 64 security innovations, conclude that, with more competition on the market, the underwriting fees diminish [2].

Considering the link between financial innovation and asset prices, the literature generally advanced around two major research connections: *financial innovation – stock prices or returns*, and *financial innovation – stock returns volatility*. Investigating the impact of introducing options on their underlying assets, Detemple and Jorion (1990) [5] conclude that while prices increase, returns' volatility decreases, accounting also for cross-effects among other stocks. Interestingly, the authors acknowledge that the more complete the markets become, the more these effects diminish [5]. Kubler & Schmedders (2012) [11] study incomplete and complete markets with financial innovation and the effects on asset price volatility, considering the wealth shift across older and younger generation. The results suggest that in the complete markets framework, corroborating with the generation-based heterogeneous beliefs, stock returns exhibit more volatility [11]. Schöler et al. (2014), in a recent event study focusing on the impact of financial innovations on stock market returns, conclude that, in spite of being blamed for the recent financial crisis, the financial innovations seem to generate higher returns in times of crisis compared to normal times [17].

As the present research examines the relationship between catastrophe bonds (CB) activity of the reinsurance companies and the evolution of their stock returns, it pertains to the financial innovation – stock market performance scientific thread. On the realm of the link between catastrophe bonds and stock market returns, Cummins and Weiss (2009) examine the link between the returns of CB indices and various assets and conclude that, during normal times on capital markets, there is almost no correlation with the stock returns, while during the subprime crisis, the correlation with the S&P 500, though raises and is significantly positive, is still low [4]. The results of the event studies regarding the effects of announcements of CB issuance on the cedents' companies are rather diverse: neutral effect (Mueller, 2002) [14], positive effect (Bierley et al., 2008) [1], weak performance gains (Hagendorff et al., 2013) [7], and decrease of the contribution to systemic risk of the cedent companies (Weiß et al., 2013) [22].

The present paper considers the previously presented arguments while investigating the connection between alternative risk transfer market activity – stock market evolution for several EU-based reinsurance companies that are sponsors within the cat bond deals. In terms of methodology, the investigation follows a previous research (Constantin, 2014), that concentrated on the link between the cat bond market activity (represented by volume of these transactions) and corporate global performance (as reflected by the return on assets and return on equity ratios) [3], while accounting for a larger sample of companies. For the purpose of emphasizing the effects of the contribution to the cat bond market on the cedent's performance and risk, the research revolves around the following propositions:

(1) CB market activity Granger causes the stock prices evolution (returns and standard deviation) of the reinsurance companies that act as sponsor within the transactions.

(2) CB market activity has a low but positive effect on the stock returns of the ceding companies.

(3) CB market activity has a positive effect on the risk of the stock returns of the ceding companies.

2. Data and methodology

The sample consisted in eight EU headquartered (re)insurance companies (Allianz SE, Assicurazioni Generali, AXA, Hannover Re, Munich Re, SCORE Re, Amlin, Catlin) that developed catastrophe bonds deals between the last quarter of 2005 and the second quarter of 2014 and revolved around the following quarterly time series:

(1) INDEX – a measure of financial performance, determined as the returns of a quarterly index – computed as the average of individual stock prices (displayed in Figure 1);

(2) STD_AV – a measure of volatility, computed as the average of the individual quarterly standard deviations of the stock returns (displayed in Figure 2);

(3) SCORE_CB – it was developed a score computed as a proxy of the intensity of the CB market activity. This score was determined as the sum of two 0.25 incremental (from 0 to 1) series: the sum of the quarterly individual

size/volume of CB deals and the sum of the quarterly individual number of transactions. This score is displayed in Figure 3.

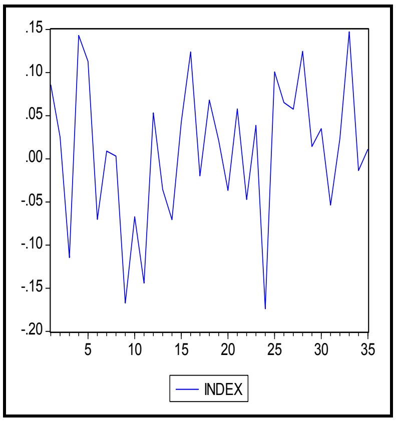

Figure 1. INDEX
Source: Authors' contribution (developed in Eviews)

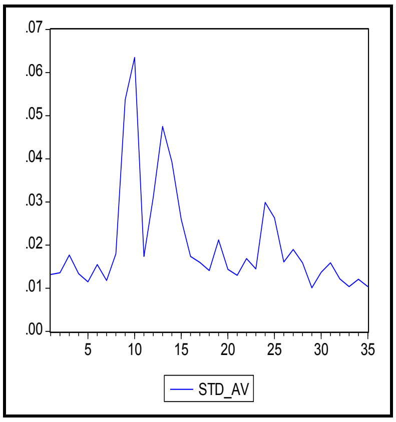

Figure 2. STD_AV
Source: Authors' contribution (developed in Eviews)

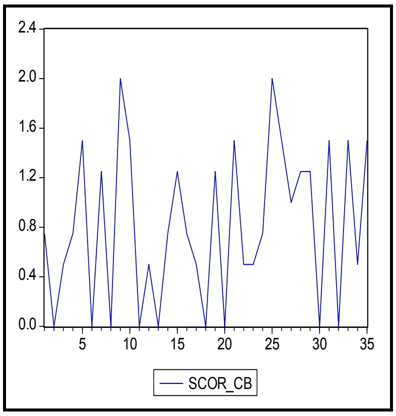

Figure 3. SCORE_CB
Source: Authors' contribution (developed in Eviews)

After analyzing graphically the three time series, the examination of the data was complemented by running three well-known unit root tests in order to further consider the VAR model. The results of this analysis are displayed in Table 1.

As the results of the three tests were rather contradictory in determining the order of integration, there were employed the Toda & Yamamoto (1995) [18] steps for applying the Granger causality method. The research was also complemented with the impulse response and variance decomposition analysis. The study was developed in Eviews and the data was collected from www.artemis.bm (for cat bond deals) and the Thomson Reuters Eikon database (for stock prices).

Table 1. Unit Root Tests

Augmented Dickey-Fuller test		t-Statistic (Prob.)	Phillips–Perron test t-Statistic (Prob.)
Null Hypothesis: SCORE_CB has a unit root			
		-7.3426 (0.0000)	**-7.3681 (0.0000)**
Test critical values	1% level	-3.6394	-3.6394
	5% level	-2.9511	-2.9511
	10% level	-2.6143	-2.6143
Null Hypothesis: INDEX has a unit root			
		-6.0383 (0.0000)	**-6.0349 (0.0000)**
Test critical values	1% level	-3.6394	-3.6394
	5% level	-2.9511	-2.9511
	10% level	-2.6143	-2.6143
Null Hypothesis: D(STD_AV) has a unit root			
		-7.4732 (0.0000)	**-10.712 (0.0000)**

Test critical values:	1% level	-3.6537	-3.646342
	5% level	-2.9571	-2.954021
	10% level	-2.6174	-2.615817
Kwiatkowski, Phillips, Schmidt and Shin test			**LM-Stat**
SCORE_CB is stationary			
			0.3242
Asymptotic critical values	1% level		0.7390
	5% level		0.4630
	10% level		0.3470
INDEX is stationary			
			0.1845
Asymptotic critical values*	1% level		0.7390
	5% level		0.4630
	10% level		0.3470
STD_AV is stationary			
			0.2428
Asymptotic critical values*	1% level		0.7390
	5% level		0.4630
	10% level		0.3470

Source: Authors' contribution (developed in Eviews)

3. Discussion of main results

In order to determine the lag order for the VAR models, there were considered a series of well-known criteria, as can be noted in Table 2. For the SCORE_CB – INDEX bivariate VAR model, the criteria (upper panel) suggested lag 0 as optimal. However, in order to proceed with the analysis, we considered a lag 1 VAR model (Keating and Nye, 1998 [10], referenced by Veselkova, 2010a [20], 2010b [21]).

Table 2. VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
SCORE_CB – INDEX						
0	3.463542	NA*	**0.003076***	**-0.108411***	**-0.012423***	**-0.079868***
1	4.411679	1.685576	0.003863	0.117653	0.405617	0.203280
2	5.292970	1.436178	0.004900	0.348669	0.828608	0.491380
3	6.841950	2.294785	0.005968	0.530226	1.202141	0.730022
4	7.347504	0.674072	0.007957	0.789074	1.652965	1.045954
5	7.979271	0.748760	0.010707	1.038573	2.094440	1.352537
6	9.462370	1.538028	0.013884	1.225010	2.472853	1.596059
7	12.27820	2.502964	0.016912	1.312726	2.752544	1.740859
8	15.12898	2.111685	0.021640	1.397853	3.029648	1.883071
SCORE_CB – STD_AV						
0	52.35058	NA	8.23e-05	-3.729672	**-3.633685***	-3.701130
1	58.32340	**10.61835***	7.12e-05	-3.875808	-3.587844	**-3.790181***
2	61.96699	5.937704	7.36e-05	-3.849407	-3.369467	-3.706696
3	67.16676	7.703356	**6.84e-05***	-3.938278	-3.266363	-3.738483
4	70.20203	4.047026	7.56e-05	-3.866817	-3.002926	-3.609937
5	72.93125	3.234638	8.71e-05	-3.772686	-2.716818	-3.458721
6	79.73490	7.055631	7.62e-05	**-3.980363***	-2.732520	-3.609314
7	80.94021	1.071390	0.000105	-3.773349	-2.333530	-3.345215
8	85.57097	3.430188	0.000117	-3.820072	-2.188277	-3.334853

Source: Authors' contribution (developed in Eviews)

For the SCORE_CB – STD_AV bivariate VAR model, the criteria (lower panel) suggested lag 0 (Schwarz information criterion), lag 1 (sequential modified LR test statistic and Hannan-Quinn information criterion), lag 3 (Final prediction error), and lag 6 (Akaike information criterion). Considering that AIC is one of the most popular criteria and also suitable for small samples (Liew, 2004 [13]), it was chosen a VAR model with 6 lags.

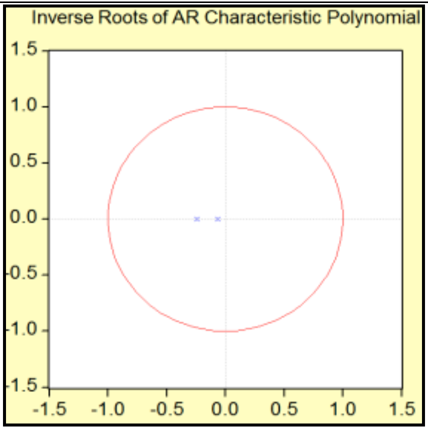

Figure 4. Inverse Roots of Characteristic Polynomial – *SCORE_CB – INDEX*

Source: Authors' contribution (developed in Eviews)

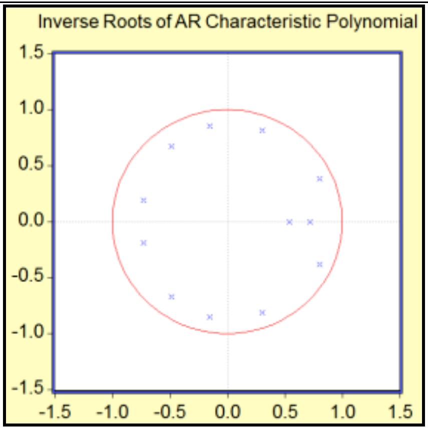

Figure 5. Inverse Roots of Characteristic Polynomial – *SCORE_CB – STD_AV*

Source: Authors' contribution (developed in Eviews)

In order to account for the stability of the model, the characteristic roots were analysed (Figure 4 and Figure 5). As can be noticed, the models are dynamically stable, as the inverse roots of the characteristic polynomial are placed within the unit circle suggesting that the variables are stationary. There were also analysed the residuals in terms of serial dependence through running the LM test and the Portmanteau Tests.

In Table 3-Table 5 there are displayed the results for both the SCORE_CB – INDEX bivariate VAR model and the SCORE_CB – STD_AV bivariate VAR model. As the majority of the probabilities shows, the hypothesis of no serial correlation cannot be rejected.

Table 3. VAR Residual Serial Correlation LM Tests

H0: no serial correlation at lag order h; Sample: 1 35					
SCORE_CB – INDEX – VAR model			***SCORE_CB – STD_AV – VAR model***		
Included observations: 34			Included observations: 29		
Lags	LM-Stat	Prob	Lags	LM-Stat	Prob
1	1.252411	0.8694	1	1.010693	0.9082
2	0.661043	0.9560	2	2.716730	0.6063
3	3.876483	0.4230	3	2.198541	0.6993
4	0.607278	0.9623	4	1.657998	0.7983
5	1.912473	0.7519	5	8.984640	0.0615
6	2.877030	0.5786	6	3.584103	0.4652
7	3.363202	0.4990	7	1.176895	0.8819
8	3.571408	0.4671	8	1.982350	0.7390
9	2.074383	0.7221	9	1.366950	0.8499
10	6.056664	0.1950	10	3.617149	0.4603
11	4.476907	0.3453	11	0.295554	0.9901
12	0.971912	0.9140	12	3.415738	0.4908

Source: Authors' contribution (developed in Eviews)

Table 4. VAR Residual Portmanteau Tests for Autocorrelations – *SCORE_CB – INDEX – VAR model*

H0: no residual autocorrelations up to lagh					
Sample :135; Included observations: 34					
Lags	**Q-Stat**	**Prob.**	**AdjQ-Stat**	**Prob.**	**df**
1	0.054017	NA*	0.055654	NA*	NA*
2	0.797097	0.9388	0.845176	0.9323	4
3	4.889247	0.7693	5.333340	0.7214	8
4	5.493184	0.9394	6.017803	0.9152	12
5	7.461808	0.9633	8.325845	0.9386	16
6	10.26275	0.9632	11.72699	0.9252	20
7	13.22378	0.9623	15.45570	0.9067	24
8	16.31212	0.9610	19.49429	0.8822	28
9	18.17653	0.9762	22.02988	0.9066	32
10	22.73344	0.9582	28.48552	0.8095	36

11	25.15632	0.9677	32.06716	0.8099	40
12	25.80680	0.9869	33.07244	0.8860	44
*The test is valid only for lags larger than the VAR lag order. Df is degrees of freedom for (approximate) chi-square distribution					

Source: Authors' contribution (developed in Eviews)

Table 5. VAR Residual Portmanteau Tests for Autocorrelations – *SCORE_CB – STD_AV – VAR model*

H0: no residual autocorrelations up to lagh					
Sample: 135, Included observations: 29					
Lags	**Q-Stat**	**Prob.**	**AdjQ-Stat**	**Prob.**	**df**
1	0.488783	NA*	0.506239	NA*	NA*
2	2.763301	NA*	2.949241	NA*	NA*
3	3.914703	NA*	4.233497	NA*	NA*
4	4.814067	NA*	5.276758	NA*	NA*
5	9.509647	NA*	10.95058	NA*	NA*
6	10.64721	NA*	12.38491	NA*	NA*
7	11.59466	0.0206	13.63382	0.0086	4
8	13.20046	0.1051	15.85135	0.0446	8
9	14.47240	0.2716	17.69565	0.1252	12
10	17.39007	0.3608	22.14895	0.1384	16
11	17.69046	0.6078	22.63290	0.3072	20
12	19.52595	0.7234	25.76404	0.3652	24
*The test is valid only for lags larger than the VAR lag order. Df is degrees of freedom for (approximate) chi-square distribution					

Source: Authors' contribution (developed in Eviews)

Considering heteroskedasticity of the error terms (tests results displayed in Table 6 and Table 7), the higher than 0.05 p-values (0.7347 for the SCORE_CB – INDEX – VAR model and 0.1980 for the SCORE_CB – STD_AV – VAR model) reflect that the variance of the residuals displays constancy over. For both VAR models, in terms of normality of the residuals, the hypothesis cannot be rejected, as shown in Table 8 and Table 9.

Table 6.VAR Residual Heteroskedasticity Tests – *SCORE_CB – INDEX – VAR model*

No Cross Terms (only levels and squares)		
Included observations: 34		
Joint test		
Chi-sq	**df**	**Prob.**
8.623392	12	***0.7347***

Source: Authors' contribution (developed in Eviews)

Table 7.VAR Residual Heteroskedasticity Tests – *SCORE_CB – STD_AV – VAR model*

No Cross Terms (only levels and squares)		
Included observations: 29		
Joint test		
Chi-sq	**df**	**Prob.**
81.95064	72	***0.1980***

Source: Authors' contribution (developed in Eviews)

Table 8. VAR Residual Normality Tests – *SCORE_CB – INDEX – VAR model*

Orthogonalization: Residual Covariance (Urzua)				
H0: residuals are multivariate normal				
Sample: 135; Included observations: 34				
Component	**Skewness**	**Chi-sq**	**df**	**Prob.**
1	-0.482143	1.567906	1	0.2105
2	0.139204	0.130698	1	0.7177
Joint		**1.698605**	**2**	**0.4277**
Component	**Kurtosis**	**Chi-sq**	**df**	**Prob.**
1	2.426006	0.353894	1	0.5519
2	1.437692	4.224540	1	0.0398
Joint		**4.578433**	**2**	**0.1013**

Component	**Jarque-Bera**	**df**	**Prob.**	
1	1.921800	2	0.3825	
2	4.355238	2	0.1133	
Joint	**7.307882**	**9**	**0.6051**	

Source: Authors' contribution (developed in Eviews)

Table 9. VAR Residual Normality Tests – *SCORE_CB – STD_AV – VAR model*

Orthogonalization: Residual Covariance (Urzua)				
H0: residuals are multivariate normal				
Sample: 135; Included observations: 29				
Component	**Skewness**	**Chi-sq**	**df**	**Prob.**
1	-0.023612	0.003304	1	0.9542
2	0.227294	0.306149	1	0.5801
Joint		**0.309453**	**2**	**0.8566**
Component	**Kurtosis**	**Chi-sq**	**df**	**Prob.**
1	0.815383	7.893662	1	0.0050
2	1.132140	5.574995	1	0.0182
Joint		**13.46866**	**2**	**0.0012**
Component	**Jarque-Bera**	**df**	**Prob.**	
1	7.896966	2	0.0193	
2	5.881144	2	0.0528	
Joint	**14.79624**	**9**	**0.0967**	

Source: Authors' contribution (developed in Eviews)

The results of the Granger analysis (Table 10-Table 11) suggest that neither the CB score Granger causes the return index nor the latter one causes the cat bond score. However, there is one unidirectional Granger-causality that runs from the catastrophe bond score to the average standard deviation.

Table 10. VAR Granger Causality/Block Exogeneity Wald Tests – *SCORE_CB – INDEX*

Excluded	**Chi-sq**	**df**	**Prob.**
Dependent variable: INDEX			
SCORE_CB	0.012142	1	0.9123
Dependent variable: SCORE_CB			
INDEX	0.291846	1	0.5890

Source: Authors' contribution (developed in Eviews)

Table 11. VAR Granger Causality/Block Exogeneity Wald Tests – *SCORE_CB – STD_AV*

Excluded	**Chi-sq**	**df**	**Prob.**
Dependent variable: STD_AV			
SCORE_CB	20.74149	6	**0.0020**
Dependent variable: SCORE_CB			
STD_AV	3.379625	6	0.7599

Source: Authors' contribution (developed in Eviews)

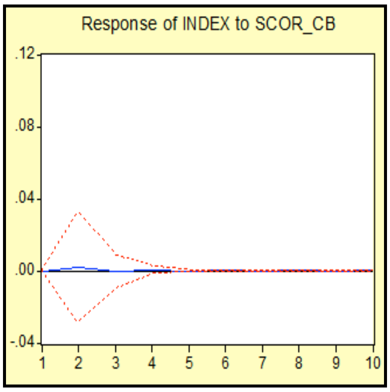

Figure 6. Response of INDEX to Cholesky One S.D. SCORE_CB Innovation
Source: Authors' contribution (developed in Eviews)

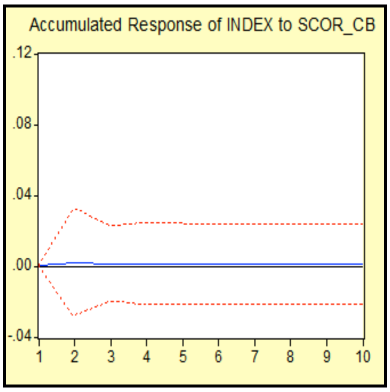

Figure 7. Accumulated Response of INDEX to Cholesky One S.D. SCORE_CB Innovation
Source: Authors' contribution (developed in Eviews)

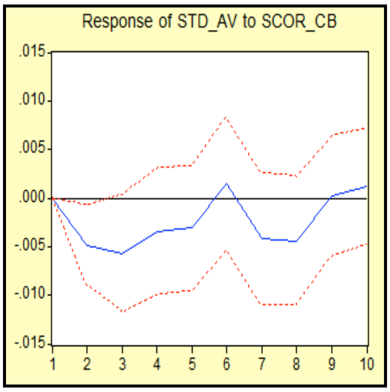

Figure 8. Response of STD_AV to Cholesky One S.D. SCORE_CB Innovation
Source: Authors' contribution (developed in Eviews)

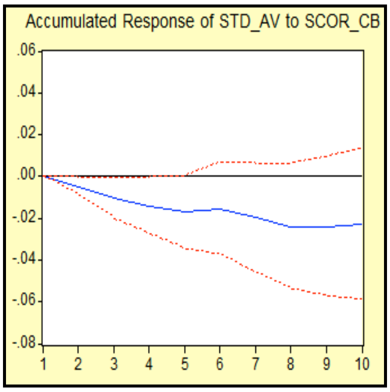

Figure 9. Accumulated Response of STD_AV to Cholesky One S.D. SCORE_CB Innovation
Source: Authors' contribution (developed in Eviews)

The Granger causality analysis was complemented with the impulse response and the accumulated response functions (Figure 6-Figure 9). The blue lines stand for the impulse response functions (that track the effect, both in terms of intensity and direction, of the shocks in the catastrophe bonds score upon the return index and the average standard deviation) and the red lines are the 95% confidence intervals. For the Scor_CB – INDEX link, the impulse response function confirms the results of the Granger analysis of no causality between the two variables (result that becomes statistically significant after the 4th quarter). The cumulated response of the returns to the cat bonds score seems to reflect the same evolution. However, on the short term (up to the 3rd quarter), the average standard deviation of the stock returns will decrease and the result is statistically significant. The cumulated response, though weakly from the point of view of the statistical significance, seems to confirm these results.

Table 12. Variance Decomposition Results

Variance Decomposition of STD_AV			
Period	**S.E.**	**SCORE_CB**	**STD_AV**
1	0.684409	0.000000	100.0000
2	0.731181	15.32606	84.67394
3	0.747517	29.93469	70.06531
4	0.784782	33.85152	66.14848
5	0.793855	33.54901	66.45099
6	0.807819	33.81043	66.18957
7	0.815945	37.76949	62.23051
8	0.817769	41.70444	58.29556
9	0.820204	41.30595	58.69405
10	0.821005	40.92269	59.07731

Source: Authors' contribution (developed in Eviews)

Considering the previous obtained results, the research focused on investigating the variance decomposition (Table 12). Therefore, there was examined the breakdown of the variance forecasting error of the risk representing variable both from the perspective of the catastrophe bonds market representing variable and of itself. Up to the second semester, the results emphasize that, for STD_AV, the variance of the forecasting error is merely determined by itself (approximately 85%, as compared to approximately 15% coming from the catastrophe bonds market proxy). Further, up to the third quarter, the results indicate that about one third of the variance of the forecasting error is influenced by the activity on the catastrophe bonds market, while the rest is explained by its evolution. This situation seems to maintain on the short term.

4. Conclusions

The research results regarding the financial innovation – stock prices in terms of the connection between cat bond market activity and the sponsors' stock returns and standard deviation of stock returns confirmed partially the first formulated proposition: there was revealed a unidirectional Granger causality (from the score of the cat bonds' market involvement to the standard deviation of the returns.

Therefore, the outcomes suggest that the stock returns of the (re)insurance companies that develop cat bonds do not react to the past information embedded in cat bonds activity (reflected, cumulatively, in terms of size and number of deals). In this respect, for the analysed sample, there cannot be formulated a clear cut conclusion regarding the confirmation or contradiction of the second proposition. However, there can be inferred that, for the moment, there is no a noticeable transmission of past information from the catastrophe bond market to the stock returns.

With regard to the reaction of standard deviation of the returns in response to the transmission of past information of the sponsors' activity on the cat bond market, the analysis confirms the third hypothesis, at least on the short term. Therefore, the risk of the stock returns seems to diminish after a short while after the sponsors develop financial innovations in terms of catastrophe bonds.

Overall, the results appear to concord with other studies (Mueller, 2002 [14], Weiß et al., 2013 [22]) and reflect that investors regard the activity on the cat bond market neither as wealth generating or wealth reducing, but rather as risk reducing. The results seem to reflect that, currently, investors of the ceding companies perceive the activity on the catastrophe bonds market as an innovation generating lower risk. Therefore, in terms of competitiveness, there is evidence that issuing catastrophe bonds stands for an advantage of the sponsor companies in terms of volatility of the stock returns determined through standard deviation.

As the cat bond markets develops, further studies could be developed, while considering shorter terms of aggregating the data and employing more refined measures of volatility.

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6. Bibliography

[1]. Bierley, B.E., Hilliard, J.I., Hoyt, R.E., *Catastrophe Securitization: A Multi-Factor Event Study on the Corporate Demand for Risk Management*, Terry College of Business, University of Georgia, 2008, http://portal.business.colostate.edu/projects/ARIA/Shared%20Documents/5e_Bierley_Catastrophe%20Securitization.pdf (accessed on October 8, 2014).

[2]. Carow, K.A., *Evidence of Early-Mover Advantages in Underwriting Spreads*, Journal of Financial Services Research, 15(1), pp. 37-55, 1999.

[3]. Constantin, L.G., *Corporate Financial Performance and Catastrophe Bonds. Causality Insights at European Level*, research presented at the International Journal of Arts & Sciences, Multidisciplinary conferences in a "study abroad" format, Rome, 28-31 October 2014, Working paper – Unpublished, 2014.

[4]. Cummins, J.D.. Weiss, M.A., *Convergence of Insurance and Financial Markets: Hybrid and Securitized Risk Transfer Solutions*, The Journal of Risk and Insurance, The American Risk and Insurance Association, 76(3), pp. 493-545, 2009.

[5]. Detemple, J., Jorion, P., *Option Listing and Stock Returns. An Empirical Analysis*, Journal of Banking and Finance, 14(1990), pp. 781-801, 1990.

[6]. Gai, P., Kapadia, S., Millard S., Perez A., *Financial Innovation, Macroeconomic Stability and Systemic Crises*, The Economic Journal, 118, pp. 401-426, 2008.

[7]. Hagendorff, B., Hagendorff, J., Keasey, K., *The Shareholder Wealth Effects of Insurance Securitization: Preliminary Evidence from the Catastrophe Bond Market*, Journal of Financial Services Research, 44(3), pp. 281-301, 2013.

[8]. Hassan, M.K., Sanchez, B., Yu, J.S., *Financial Development and Economic Growth: New Evidence From Panel Data*, The Quarterly Review of Economics and Finance, 51, pp. 88-104, 2011.

[9]. Kar, M., Nazlıoğlu Ş., Ağır, H., *Financial Development and Economic Growth Nexus in The MENA Countries: Bootstrap Panel Granger Causality Analysis*, Economic Modelling, 28, pp. 685-693, 2011.

[10]. Keating, J.W., Nye, J.V., *Permanent and transitory shocks in real output: Estimates from nineteenth century and post-war economies*, Journal of Money, Credit and Banking, 30(2), pp. 231-251, 1998.

[11]. Kubler, F., Schmedders, K., *Financial Innovation and Asset Price Volatility*, American Economic Review: Papers & Proceedings 2012, 102(3), pp. 147-151, 2012.

[12]. Lerner, J., Tufano, P., *The Consequences of Financial Innovation: A Counterfactual Research Agenda*, NBER Working Paper No. 16780, 93 pages, 2011, http://www.nber.org/papers/w16780.pdf (accessed on October 10, 2014).

[13]. Liew, V.K.S., *Which Lag Length Selection Criteria Should We Employ?*, Economics Bulletin, 3(33), pp. 1-9, 2004, http://www.economicsbulletin.com/2004/volume3/EB−04C20021A.pdf (accessed on October 10, 2014).

[14]. Mueller, Ph., *Stock Market Reactions to the Issue of CAT Bonds*, Thesis for the masters of Science in Banking and Finance, University of Lausanne, 2002.

[15]. Oke, M.O., *Insurance sector development and economic growth in Nigeria*, African Journal of Business Management, Vol. 6(23), pp. 7016-7023, 2012.

[16]. Outreville J.F., *The relationship between insurance growth and economic development: 80 empirical papers for a review of the literature*, Risk Management and Insurance Review, 16(1), pp. 71-122, 2013.
[17]. Schöler, L., Skiera, B., Tellis, G.J., *Stock Market Returns to Financial Innovations Before and During the Financial Crisis in the United States and Europe*, Journal of Product Innovation Management, 31(5), pp. 973-986, 2014.
[18]. Toda, H.Y, Yamamoto, T., *Statistical inferences in vector autoregressions with possibly integrated processes*, Journal of Econometrics, 66(1-2), pp. 225-250, 1995.
[19]. Tufano, P., *Financial Innovation and First Mover Advantages*, Journal of Financial Economics, 25(3), pp. 213-240, 1989.
[20]. Veselkova, M., *Income Shocks to Trade Balance under the Gold Standard*, pp. 412-427, 2010a, http://nbn-resolving.de/urn:nbn:de:0168-ssoar-310820 (accessed on October 10, 2014).
[21]. Veselkova, M., *Income Shocks to Trade Balance under the Gold Standard*, Historical Social Research. An International Journal for the Application of Formal Methods to History, Section 'Cliometrics', 35(3), pp. 412-427, 2010b.
[22]. Weiß, G.N.F., Bostandzic, D., Irresberger, F., *Catastrophe Bonds and Systemic Risk*, Discussion Paper SFB 823, 2013, https://www.statistik.tu-dortmund.de/fileadmin/user_upload/SFB_823/discussion_papers/2013/DP_3013_SFB823_Weiss_Bostandzic_Irresberger.pdf (accessed on October 26, 2014).