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Insurance Markets Risk Affects Global Reinsurance Market Risk? Evidence from USA and Europe Insurance Markets

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Abstract

Reinsurance is the last shelter of traditional international risk management. Insurance companies cede part of their risks incurred to the reinsurance companies and this enhances the proper risk diversification procedure. This paper investigates the risk transmission characteristics from the USA and Europe insurance markets on the Global reinsurance market in order to analyse the risk affection of insurance to the reinsurance sector. The results suggest that there is a relatively low risk influence of non-life and life insurance companies on the global reinsurance index. Also, last four years the U.S. non-life and life insurance markets volatility asymmetry has an impact on the volatility of the global reinsurance index in terms of bad and good news. The volatility persistence is high before and after the pandemic period, indicating that if there is an extreme volatility shock in the insurance markets, the impact will occur faster on global reinsurance, except for the European non-life insurance index, which has the lowest impact on the reinsurance market in terms of the volatility persistence.

JEL classification: G22, G32, D53, C5.

Keywords: Reinsurance, Risk Analysis, Non- Life Insurance, Life Insurance, TGARCH.

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1 Introduction

Reinsurance is a major risk management technique in which the primary insurer cedes part of its own risk to another entity, a Reinsurance Company. Reinsurance companies have greater risk capacity than primary insurers and this is the reason that the reinsurance procedure is considered as the last shelter of traditional risk management in respect of the insurable risks. Thus, reinsurance plays a key role in keeping the global economy sustainable and healthy. By acting as the last provider of risk transfer and also as an institutional investor, reinsurance reinforces financial stability, mitigates financial losses and transfers savings into investments efficiently (Arena, 2008; Kiohos, 2020). Also, it provides increased underwriting capacity, stabilizes the underwriting results of the primary insurers and allows insurance companies to diversify their risks using the same capital by keeping a smaller portion of each risk (Wehrhahn, 2009). Moreover, reinsurance companies offer catastrophic protection in a more feasible way than direct insurance companies by participating in large risk exposure (Wehrhahn, 2009).

Another crucial issue that is well recognized in the risk management science is that reinsurance failures are not systemically important (Kessler, 2014). Domino effects in reinsurance are an exception and not the "normal daily life". Kessler (2014) ensures that *"a failing reinsurance company does not interrupt its contracts overnight but continues settling the claims and that the settlement of claims is guaranteed by the reinsurer's assets, with reinsurers being required to hold reserves against the claims"*. The above proposal confirms that reinsurance and insurance are resistant business against one of the most uncontrolled and possible catastrophic speculative risks: the systemic risk. Another aspect with respect to reinsurance is that the maturity of its assets usually matches that of their liabilities. Consequently, reinsurance companies have a long liquidity position. Kessler (2014) also declares that reinsurers hold highly diversified portfolios and have limited risky possibilities in their asset management.

In respect of the systemic risk of the primary insurance sector Acharya et al. (2009) determine that insurers and reinsurers are too interconnected to fail. For instance, a failure of several reinsurers might, in theory, trigger the default of primary insurers. In practice, however, reinsurance failures are not a cause of direct insurers' financial problems (IAIS, 2012).

Primary insurance has two main business lines, Life and Non-Life Insurance. These companies have different business units and insure different categories of risks. Life insurance companies provide protection, in general, against death, illness and retirement and also provide accident and health insurance. Life insurance companies offer a variety of investment products, such as annuities, unit links, whole life, universal life, endowment life, group life, credit life, guaranteed investment contracts, stock mutual funds (Saunders and Cornett, 2018). Life insurance has some characteristics that influence reinsurance such as the average life of the insurance, the insurance is concluded for a fixed amount guaranteed and the capital accumulation. In life reinsurance, almost all reinsurance arrangements are proportional, and the largest share has the "surplus" agreements (Vaduva and Vaduva, 2018).

Non-life insurance companies provide protection against individual and professional property and casualty loss. Specifically, they protect against fire risk, flood risk, theft risk, natural disaster risks, property risks, civil liability, motor risks, marine, aviation and transport risks (Saunders and Cornett, 2018). The influence of the non-life insurance sector to reinsurance is more uncertain than the influence derived from life insurance sector. This is because of the nature of non-life insurable risks concerning the duration of coverage, the frequency of claims appearance and the level of loss. In non-life reinsurance, the reinsurance arrangements are either proportional or non-proportional.

The main motivation regarding this study is the lack of any research which analyses the influence of non-life and/or life insurance markets to the reinsurance markets. It is important, as motivation, to investigate the volatility relations and news transmissions between primary insurance and reinsurance companies. The prior related studies have not directly or specifically examined the volatility relation between reinsurance markets vs non-life and life insurance markets.

The main research hypothesis of this study is that no asymmetric volatility difference takes place between the USA or Europe life insurance indices and the Global Reinsurance index as well as the USA or Europe non-life indices and the Global Reinsurance index.

That is, we test the hypothesis:
H0: no statistically asymmetric volatility difference takes place between life and/or non-life indices and the global reinsurance index, against,
H1: statistically asymmetric volatility difference takes place between life and/or non-life indices and the global reinsurance index.
Also, this study tests the hypothesis:
H0: the response of bad news coming from European and USA insurance indices volatility is the same on the global reinsurance index volatility, against.
H1: the response of bad news coming from European and USA insurance indices volatility is not the same on the global reinsurance index volatility

To the best of my knowledge, this study is the first that provides empirical evidence in respect of volatility clustering, asymmetry and persistence from U.S. and Europe non-life and life insurance respectively towards the global reinsurance market risks.

This paper indicates that after the covid-19 period the bad news of U.S. non-life and U.S. life insurance shows a greater impact on the volatility of the global reinsurance index than the good news.
Furthermore, the volatility persistence is high before and after pandemic period indicating that if there is an extreme volatility shock in the U.S. and the European insurance markets the impact it will be high on global reinsurance market. Also, the results show that the immediate impact of volatility (volatility clustering) of the Europe non-life insurance index on the global reinsurance index is much higher in respect of the other insurance indices under study.

2 Literature Review

There are several studies in the literature which focus on the economic and management relations among primary insurance and reinsurance. Chang and Jeng (2016) using pooled time-series and cross-sectional data from 1994 to 2006, found that the non-life insurer's liquidity has a negative influence on reinsurance purchases, and a non-life insurer with more reinsurance tends to maintain less liquidity. Shiu (2020) confirms that non-life insurers using more reinsurance tend to have lower financial performance. Also, there is evidence that non-life insurers that conduct risk management activities tend to use both reinsurance and derivatives, and that non-life insurers with better return on assets tend to use more reinsurance. Soye et.al (2017) stated that ratio of ceded reinsurance has not positive impact on return on assets (ROA) of insurance companies, even though is positively correlated with ROA of insurance companies.

Other studies analyse the capital and financial structure of the (re)insurance companies to determine some interconnections among reinsurance and direct insurance markets.

Siu (2011) using data before the global financial crisis, found that insurers with higher leverage tend to purchase more reinsurance, and insurers with higher reinsurance dependence tend to have a higher level of debt. Mankaï and Belgacem (2016) based on a sample of U.S. general insurance firms found that reinsurance is negatively associated with capital of non-life insurance companies, for which it acts as a substitute. The capital ratio is slowly adjusted to its target level. Furthermore, the results show that for low-capitalized insurers, capital, risk, and reinsurance adjustments are more extensive than for their high-capitalized counterparts. Cummins et.al (2010) found in US insurance market that large non-life insurers tend to rely on less reinsurance than smaller insurers due to their stronger financial ability and superior diversification. However, large non-life insurers have a higher degree of concentration in reinsurance counterparties, since they do business more often with a few leading reinsurers. The products and markets between reinsurance and primary insurance entities are becoming more price competitive in developed economies such as the USA and EE, especially in the wake of the global economic crisis period (2008-2009) (Upreti and Adams, 2015) as well as the Covid-19 period.

Upreti and Adams (2015) conclude that reinsurance performs an important strategic function in insurance markets through its impact on product-market outcomes in competitive insurance markets. Also, Feldblum (2007) notes that the markets structure of insurance is in a state of perpetual disequilibrium with high volatile prices of premiums.

Contrary to previous studies, this paper examines the possible risk affection from non-life insurance and life insurance indices respectively to the global reinsurance index, using data from Europe and USA stock markets. Thus, this paper studies the volatility transmission dynamics from the non-life and life insurance indices to the global reinsurance index.

This attempt, based on the notion that reinsurance is usually the less risky insurance sector, compared to primary insurance business lines, owing to the fact that reinsurance is the last shelter of insurable risks.

3 Data

The dataset comprises daily observations of listed non-Life and Life Insurance price return indices of USA and Europe as well as the global Reinsurance price return index which is the unconditional variable of this study. The dataset has been obtained through the LSEG Eikon database by Thomson Reuters. Trading days in daily basis natural logarithmic returns for the selected data are calculated as $R_t=100*\ln(P_t/P_{t-1})$ where R_t and P_t are the daily returns and prices respectively.

The sample covers from 12-08-2008 until 12-4-2024 period and incorporates daily trading observations for each index.

4 Methodology

4.1 Zivot-Andrews Unit root test

Zivot and Andrews (1992) is a popular unit root test which allows endogenous structural breaks and uses the full sample and a different dummy variable for each possible break date. The break date is selected where the t-statistic from the ADF test of unit root is at a minimum (most negative). Consequently, a break date will be chosen where the evidence is least favorable for the unit root null. There are three alternations of Zivot-Andrews test: (a) change in the intercept, (b) change in the slope and (c) change in both slope and intercept. This research used the 3rd alteration of Zivot-Andrews with the following model:

$$\boldsymbol{y_t = \mu + a y_{t-1} + \beta_t + \theta DU_t + \gamma DT_t + \sum_{j=1}^{k} c_j \Delta y_{t-j} + e_t} \quad (1)$$

Where:

DU_t represents the intercept dummy $DU_t=1$, when t>TB (breakpoint) and zero otherwise.

DT_t represents the slope dummy DT_t= t-TB, when t>TB (breakpoint) and zero otherwise.

4.2 TGARCH model

The TGARCH (Threshold Generalized Autoregressive Conditional Heteroskedasticity) model, also known as the GJR-GARCH (Glosten-Jagannathan-Runkle GARCH) model, is an extension of the GARCH model that incorporates asymmetry in the volatility process. (Zakoian, 1994). This means that the model can account for the fact that positive and negative shocks can have different impacts on volatility.

$$\boldsymbol{\sigma_t^2 = \omega + \sum_{i=1}^{q} a_i \varepsilon_{t-i}^2 + \sum_{i=1}^{q} \gamma_i I(\varepsilon_{t-i} < 0) + \sum_{j=1}^{p} \beta_j \sigma_{t-j}^2} \quad (2)$$

Where,

σ_t^2 is the conditional variance at time t

ω is the constant term

α_i are the coefficients for the lagged squared error (ARCH terms)
γ_i are the coefficients that capture the asymmetry or the leverage effect, where $I(\varepsilon_{t-i} < 0)$ is an indicator function that is 1 if $\varepsilon_{t-i} < 0$ and 0 otherwise.
β_j are the coefficients for the lagged conditional variances (GARCH terms).
According to the ARCH terms capture the impact of past squared returns (or past shocks) on current volatility. The asymmetry or leverage effect indicates the additional impact of negative shocks on volatility. $I\ (\varepsilon_{t-i} < 0)$ is an indicator function that equals 1 when the past shock is negative and 0 otherwise. If $\gamma_i > 0$, it indicates that negative shocks increase volatility more than positive shocks of the same magnitude and vice versa. Also, the GARCH terms capture the impact of past conditional variances on current volatility, modeling the persistence in volatility. (So et al. 2002).

5 Empirical Results Analysis

Table 1 presents the descriptive statistics of the insurance indices returns (life and non-life) in Europe and in USA as well as for the global reinsurance index return. Most indices have a positive average return. Europe life insurance index provides the lowest mean (-0.0000652), whereas the global reinsurance index the highest (0.000252). There are crucial differences for standard deviations between life and non-life insurance indices returns in the USA and Europe, whereas the volatility of life insurance indices is higher. The global reinsurance index has closer volatility with the non-life insurance indices.
It is found out that all the indices display negative skewness that is left skewed. All the indices are leptokurtic. The kurtosis appears to be the largest for the Europe non- life index (183.9216275), followed by the Europe life index (55.1942984).

Table 1: Descriptive Statistics

	Global Reinsurance	**US Life**	**US Non-life**	**Europe Life**	**Europe Non-life**
Mean	0.000252	0.0001306	0.00035507	-0.0000652	0.00009503
Median	0.0006300	0.000120	0.000615	0.000432192	0.000496397
Maximum	0.148025	0.2106816	0.10742947	0.327870314	0.444133806
Minimum	-0.17626295	-0.1904383	-0.11601357	-0.476780906	-0.558389585
Std. Dev.	0.01382365	0.02478067	0.01347623	0.024540919	0.020911449
Skewness	-0.32623184	-0.3192476	-0.48230185	-1.47406523	-2.307360866
Kurtosis	21.2257352	19.610680	15.3960756	55.1942984	183.9216275
Jarque-Bera	56209.9298	46698.4854	26126.2425	461866.229	5535414.3315
Probability	0,000	0,000	0,000	0,000	0,000

The following figures illustrate the timeline of volatility of the five reinsurance and insurance indices under study. We observe that there are two periods with high volatility. First, the 2008 financial crisis period and the first months of 2020 which reflect the beginning of the covid-19 era.
After covid -19 era, volatility remains higher than the previous period under study for all the indices except the Europe life insurance index which depicts approximate the same volatility as the previous pandemic period.

Also, U.S. non-life and life insurance indices present greater volatility than European non-life and life insurance indices during the covid-19 period.

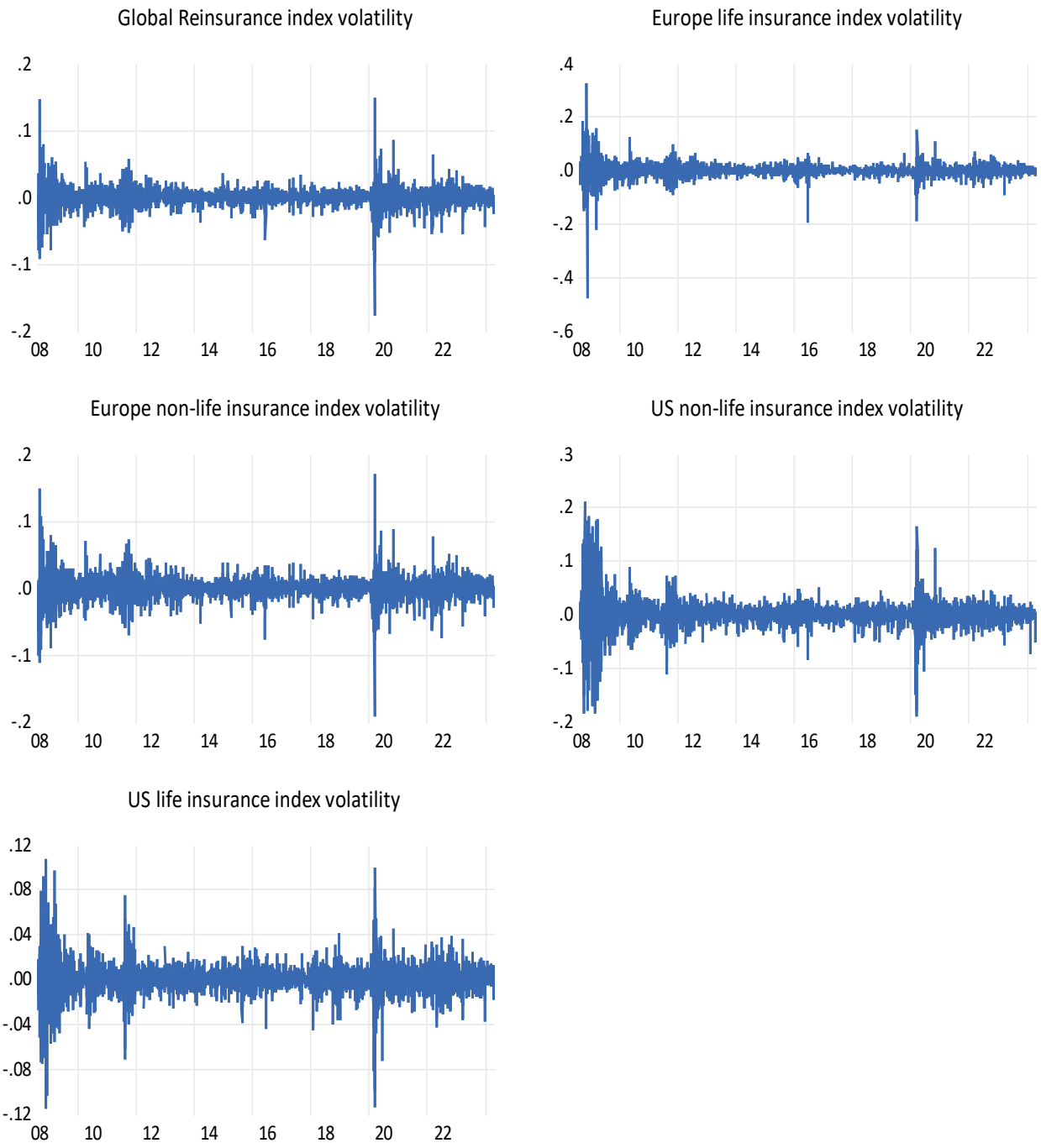

Figure 1: Timeline of Volatility of Insurance and Reinsurance Indices

Table 2 presents that each index is integrated in zero I(0) and is stationary at the first differences. Also, the date breakpoint of Zivot-Andrews test is displayed taking into consideration any change in both slope and intercept (with 4 lags). The dependent variable of the model of this study is the global reinsurance index (GRI) and therefore this breakpoint (i.e. 18/02/2020) of the global reinsurance variable is selected in order to split the dataset into two periods. It is obvious that the find break point date (18/02/2020) signals the beginning of covid-19 period.

Table 2: Results of Zivot-Andrews with structural break unit root test (in intercept and trend)

Variable	t-statistic	Critical values	Date Breakpoint[2]
Global reinsurance index	-28,282	-5.34*	18/02/2020
Europe life insurance index	-32,436	-5.57*	25/06/2013
US life insurance index	-30,045	-5,57*	18/02/2020
Europe non-life insurance index	-32,601	-5,57	20/02/2020
US non-life insurance index	-31,776	-5,57	24/02/2020

Table 3 presents the findings of the TGARCH model for each examined period (i.e. total dataset period, period before covid-19, period after covid-19). In particular, the results show the impact of volatility of each insurance index on the volatility of the global reinsurance index.

Firstly, the ARCH effect (which is displayed from the coefficient α_i) helps in capturing the phenomenon of volatility clustering, where large changes in returns are followed by large changes, and small changes tend to be followed by small changes. We observe from Table 3, that shocks of all insurance indices which come from the past are low sensitive to the current volatility of the global reinsurance index. In general, a low value of ARCH effect means that the model places less emphasis on recent shocks when determining the current level of volatility. This suggests that the volatility process is not highly reactive to short-term fluctuations on the Global reinsurance index volatility. However, the ARCH effect coming from Europe non-life insurance index is high and equal to 10,62% after the pandemic period. This means that the immediate impact of past squared errors on current volatility of the Europe non-life insurance index on the global reinsurance index is approximately three times higher in respect of the majority of the other insurance indices.

Furthermore, the leverage effect, which comes from each insurance index to the global reinsurance index, is positive for every period examined. For instance, the leverage effect is equal to 12,36% after the pandemic coming from the U.S. life insurance index. This indicates that negative shocks to returns of U.S. life insurance index increase future volatility of the global insurance index by an additional 12,36% compared to positive shocks of the same magnitude. In general, last four years the bad news of U.S. non-life and life insurance indices shows a more acute impact on the volatility of the global reinsurance index than the good news. However, the volatility impact of the European non-life insurance index on the global reinsurance index shows that bad and good news are not statistically important.

Therefore, regarding the main research hypothesis of this study we failed to accept the null hypothesis that no asymmetric volatility difference takes place between the USA and Europe life insurance indices and the Global Reinsurance index as well as the USA non-life indices and the Global Reinsurance index. These results are in line with the majority studies that analyse the leverage effect in capital markets last decades.

[2] Breakpoint was selected according to the results of Zivot-Andrews test in levels.

However, to my knowledge this study is the first that reveals results in terms of the leverage effect between insurance and reinsurance international capital markets.
On the other hand, we accept the null Hypothesis regarding Europe non-life insurance index after the pandemic period.
In terms of the second research hypothesis of this study, we also failed to accept the null hypothesis that the response of bad news coming from European and USA insurance indices volatility is the same on the global reinsurance index volatility.

Table 3: Results of TGARCH model on the return of global insurance index (GBI)

Indices	Periods	Constant	ARCH effect	Leverage effect	GARCH effect persistence
Europe life insurance index	Total	0,00254 (9,161)*	0,0325 (4,785)**	0,0903 (10,558)*	0,9032 (133,39)*
	Before pandemic	0,00236 (7,365)*	0,0366 (4,608)*	0,0764 (6,563)*	0,9031 (101,82)*
	After pandemic	0,00247 (3,767)*	0,0617 (4,052)*	0,0652 (3,468)*	0,8913 (67,98)*
Europe non-life insurance index	Total	0,00251 (9,043)*	0,0321 (4,722)*	0,0906 (10,624)*	0,9036 (132,03)*
	Before pandemic	0,00227 (7,321)*	0,0379 (4,779)*	0,0763 (6,587)*	0,9021 (102,57)*
	After pandemic	0,00181 (4,479)*	0,1062 (4,652)*	0,0573 (1,659)	0,8587 (64,46)*
US life insurance index	Total	0,00251 (9,439)*	0,0309 (4,659)*	0,0918 (11,063)*	0,9044 (138,52)*
	Before pandemic	0,00221 (7,258)*	0,0362 (4,644)*	0,0769 (6,707)*	0,9039 (104,15)*
	After pandemic	0,00682 (5,618)*	0,0306 (2,582)*	0,1236 (7,843)*	0,8741 (56,428)*
US non-life insurance index	Total	0,00251 (9,548)*	0,0291 (4,379)*	0,0926 (11,166)*	0,9057 (138,77)*
	Before pandemic	0,00225 (7,346)*	0,0371 (4,689)*	0,0766 (6,625)*	0,9027 (103,41)*
	After pandemic	0,00594 (5,091)*	0,0249 (2,105)*	0,1267 (8,667)*	0,8819 (54,894)*

Lastly, the GARCH term captures the phenomenon that volatility tends to be persistent. High volatility periods are followed by high volatility and low volatility periods are followed by low volatility. When GARCH term is close to unity indicates that shocks to volatility are highly persistent. This means that if there is a spike in volatility, it will decay very slowly over time. Additionally, it means that the conditional variance remains elevated for an extended period after a shock, reflecting long memory in the volatility process.

We observe that the volatility persistence is both high before and after pandemic period indicating that if there is an extreme volatility shock in the insurance markets the impact it will occur faster on global reinsurance. However, the European non-life insurance index has the lowest impact to the reinsurance market in terms of the volatility persistence.

6 Conclusions

This paper investigates the influence of U.S. and European non-life insurance and life insurance markets risk to the reinsurance market risk globally. The volatility of the capital markets indices function as an approximation of the risks incurred in the insurance and reinsurance companies underwriting and business profits/losses and claims.

The study examines the volatility news transmission and the leverage effect of non- life on life insurance business lines. Broadly, the results show that there is a low-risk influence of non-life and life insurance companies on the global reinsurance index. However, this risk influence is rather higher from Europe non-life insurance index to the global insurance index after the covid-19 era.

Regarding the leverage effect findings, the results are different in terms of the region. Specifically, last four years the U.S. non-life and life insurance markets as well as the European life volatility asymmetry has an impact on the volatility of the global reinsurance index in terms of bad and good news. Hoewver, the volatility impact of the European non-life insurance index on the global reinsurance index indicate that bad and good news are statistically not asymmetrical after the covid-19 era.

Last four years' volatility remains higher than the previous period under study for all the indices except the Europe life insurance index which depicts approximate the same volatility as the whole period under study. Moreover, during the covid-19 period, U.S. non-life and life insurance indices present greater volatility than European non-life and life insurance indices.

The findings of this paper are very important for risk and portfolio managers, taking into account that the insurance and reinsurance markets are used as a hedging tool and low risk investments.

References

Acharya, V. V, Biggs, J., Richardson, M. and Ryan, S. (2009). On the Financial Regulation of Insurance Companies. Working Paper, NYU Stern School of Business, New York.

Arena, M. (2008). Does Insurance Market Activity Promote Economic Growth? Across-Country Study for Industrialized and Developing Countries. Journal of Risk and Insurance, 75(4), 921-946.

Brooks, C. (2014). Introductory Econometrics for Finance. Cambridge: Cambridge University Press.

Chang, V. Y., and Jeng, V. S. (2016). The Relationship among the Demand for Reinsurance, Liquidity, and Leverage in the US property-liability Insurance Industry. Jing Ji Lun Wen Cong Kan, 44(4), 543-576.

Cummins, J. D., Feng, Z., and Weiss, M. A. (2012). Reinsurance Counterparty Relationships and Firm Performance in the US property-liability Insurance Industry. Available at SSRN 1997444.

Feldblum, S. (2007). Capital Structure, Solvency Regulation, and Federal Income Taxes for property-casualty Insurance Companies. Variance, 1(2), 157-172.

International Association of Insurance Supervisors (2012). Reinsurance and Financial Stability. Special Report, July.

Kessler, D. (2014). Why (Re)insurance is not Systemic. Journal of Risk and Insurance, 81(3), 477-488.

Kiohos, A. (2020). Risk Affection and Transmission of News of Conditional Volatility from the Non-Life to Life Insurance Sector, Bulletin of Applied Economics, 7(2), 87-96.

Mankaï, S., and Belgacem, A. (2016). Interactions between Risk Taking, Capital, and Reinsurance for Property–Liability Insurance Firms. Journal of Risk and Insurance, 83(4), 1007-1043.

Saunders, A., and Cornett, M.M. (2018). Financial Institutions Management: A Risk Management Approach, New York, NY: McGraw-Hill Education.

Shiu, Y. M. (2011). Reinsurance and Capital Structure: Evidence from the United Kingdom Non-Life Insurance Industry. Journal of Risk and Insurance, 78(2), 475-494.

Siu, Y.M. (2020). How does Reinsurance and Derivatives usage Affect Financial Performance? Evidence from the UK Non-Life Insurance Industry. Economic Modeling, 88, 376-385.

So, M. K., Li, W. and Lam, K. (2002). On a Threshold Stochastic Volatility Model. Journal of Forecasting, 22, 473–500.

Soye, Y. A., Adeyemo, D. L., and Ayo, J. (2017). Evaluation of Impact of Reinsurance Mechanism on Insurance Companies Sustainability in Nigeria. International Journal of Research, Innovations and Sustainable Development, 7(1), 1-14.

Upreti, V., and Adams, M. (2015). The Strategic Role of Reinsurance in the United Kingdom's (UK) Non-Life Insurance Market. Journal of Banking and Finance, 61, 206-219.

Vaduva, M., and Vaduva, E.C. (2018). The Role of Reinsurance in Insurance. Annals of Constantin Brancusi University of Targu-Jiu. Economy Series/Analele Universităţii'Constantin Brâncuşi'din Târgu-Jiu Seria Economie, 2.

Wehrhahn, R. (2009). Introduction to Reinsurance. Primer Series on Insurance, 2.

Zakoian, J.M. (1994). Threshold Heteroskedastic Models. Journal of Economic Dynamics and Control, 18(5), 931–955.

Zivot, E. and Andrews, K. (1992). Further Evidence on the Great Crash, the Oil Price Shock and the Unit Root Hypothesis. Journal of Business and Economic Statistics, 10(10), 251-270.