



Analysis of Reinsurance Transactions and Gross Premium Income of Non-Life Insurance Companies in Nigeria: An ARDL Approach

Olajide Solomon Fadun¹, Sunday Adekunle Aduloju², Taiwo Olarinre Oluwaleye³

Abstract: The study examined the relationship between reinsurance premiums ceded and gross premium income and the effect of reinsurance premiums accepted on the gross premium income of Nigerian non-life insurance providers. This study is a longitudinal research design. We engaged secondary data extracted from the Nigeria Insurance Association (NIA) Digest's report for all the non-life insurers from 2007–2021. The data was analysed using descriptive statistics and auto-regressive distributed lag (ARDL). The results revealed that reinsurance premium ceded has a significant positive relationship with gross premium income, and reinsurance premium accepted has a significant positive effect on the gross premium income of Nigerian non-life insurance providers. It was also confirmed that reinsurance premium ceded and reinsurance premium accepted have a short- and long-run effect on the gross premium income of Nigerian non-life insurance providers. This study established that reinsurance transactions significantly positively affect the gross premium income of Nigerian non-life insurance firms. Therefore, this study recommends, among others, that Nigerian non-life insurance providers should improve their underwriting capacity, especially for high-risk sectors like oil and gas, marine, and aviation, as well as other sectors, to increase their gross premium income.

Keywords: ARDL; Nigeria, non-life insurance; reinsurance premium accepted; reinsurance premium ceded

JEL Classifications: G22; E1

1. Introduction

Reinsurance is an extension of an insurance contract, thereby strengthening the risk transfer mechanism of insurance practices. Reinsurance is a risk-management approach that allows insurance providers to transfer parts of their risks to reinsurers. This helps non-life insurance providers to mitigate the impact of significant losses, expand underwriting capacity, and access specialized expertise (Ogunlami, 2021). Reinsurance agreements enable insurance companies to reduce the impact of catastrophic losses by transferring a portion of their exposure to risks, thereby reducing financial strain, protecting policyholders, and enhancing business continuity (Soye, Olumide & Adeyemo, 2022). Reinsurance also facilitates sustainable growth in the insurance industry (Senn, 2012).

The concept of reinsurance could be traced back to centuries when merchants and shipowners sought to protect themselves against the risks associated with maritime trade. Reinsurance is critical in the global insurance sector because it allows insurers to control their risk portfolios more successfully

¹ Department of Actuarial Science and Insurance, Faculty of Management Sciences, University of Lagos, Lagos, Nigeria, Corresponding author: sofadun@yahoo.co.uk.

² Department of Actuarial Science and Insurance, Faculty of Management Sciences, University of Lagos, Lagos, Nigeria, E-mail: ksaduloju@gmail.com.

³ Department of Finance (Insurance Unit), Faculty of Management Sciences, Ekiti State University, Ado-Ekiti, Nigeria, E-mail: taiwo.oluwaleye@eksu.edu.ng.

while ensuring their financial stability (Aduloju & Ajemunigbohun, 2017). The insurance sector provides risk protection, it manages both its risks and the risks of others (Soye, Olumide & Adeyemo, 2022). The stability of the economy depends on the availability of insurance services since companies may operate with greater risk, and due to its rising productivity share in the financial industry, insurance is becoming more significant in emerging nations (Idowu & Fadun, 2022; Aduloju & Ajemunigbohun, 2017).

In recent times, the business environment has become highly complicated and plagued with various economic-climate disasters, thereby increasing the need for prudent use of risk mitigation measures such as reinsurance to enhance insurers' long-term financial stability (Silwimba & Fadun, 2022a; Taylor, Bisira, & Farinde, 2019). The insurers can utilize reinsurance expenditures to lower the tax burden on their premium income. This is because every person and economic agent wants to understand the tax burden and minimize the amount of money they pay to the government through taxes from their income (Fadun, 2021; Nuta & Nuta, 2020). Among many other reasons, non-life insurance providers engage in reinsurance transactions to safeguard themselves against potential losses that might be catastrophic if they exceed certain limits (Bressan, 2018). Nigeria's non-life insurance providers are crucial in covering risks related to property, liability, and other non-life assets. Reinsurance usage helps insurance providers strengthen their financial stability and broaden their capacity to absorb various client and business risks, both catastrophic and non-catastrophic (Oladunni & Eche, 2022).

The gross premium income generated by Nigerian non-life insurance providers is a vital indicator of the sector's financial health and growth potential. Reinsurance assists non-life insurers in reducing the volatility of their earnings, followed by beneficial impacts on capital expenses, which insurers may pass on to policyholders in the form of cheaper pricing (Abass & Obalola, 2018). According to the National Insurance Commission (NAICOM) and the Nigerian Insurers Association (NIA), the gross premium income in the Nigerian insurance industry increased steadily between 2015 and 2019. In 2015, the gross premium income was reported to be approximately 315 billion Naira (about \$1 billion). By 2019, it had grown to around 490 billion Naira (approximately \$1.6 billion). Due to the COVID-19 pandemic, there was a substantial decreasing trend in 2020 and an uptrend in 2021 (Isimoya & Akindipe, 2022).

The GPI rate reduced to 1.2 per cent in the 2020 fiscal year before rebounding to 19.7 per cent in 2021, according to NAICOM. The Nigerian non-life insurance industry's gross premium income is influenced by several factors, including insurance market size, economic conditions, regulatory environment, competition, the demand for insurance products, and limited reinsurance capacity. This issue hinders companies' ability to underwrite complex risks, impacting gross premium income and slowing growth potential. Addressing this issue is crucial for the industry's success. Therefore, this study explores the connection between re-insurance transactions as a risk management strategy and the gross premium income of non-life insurance companies in Nigeria. Specific objectives are:

- i. to examine the relationship between reinsurance premiums ceded and the gross premium income of non-life insurance companies in Nigeria.
- ii. to examine the effect of reinsurance premiums accepted on the gross premium income of non-life insurance companies in Nigeria.

2. Literature Review

2.1.1. Reinsurance as a Risk Management Strategy

Abass and Obalola (2018) averred that reinsurance is a risk management strategy and protection for insurers, and it is a key source of risk financing for insurance firms due to its nature and role. Reinsurance provides standard coverage from exposures to primary insurers who assumed individual and corporate risk exposures by collecting premiums and assuring the insured of indemnity when loss eventually occurs. The reinsurer consents to provide coverage to the insurer for a portion of the claims paid on its issued policies. In exchange, the insurer pays a premium to the reinsurer for assuming the risk. This premium is typically a percentage of the original insurance premium collected by the insurer (Insurance Information Institute, 2021).

Reinsurance is essential to the operations of insurance firms since it acts as a primary risk management tool frequently utilized to cushion loss experience (Abass & Obalola, 2018). It serves as a risk control technique by allowing insurance companies to mitigate their exposure to potential losses and stabilize their financial position. Neglecting risk management might adversely affect a company's value and shareholders' rights or even lead to insolvency (Lee & Lee, 2012). Reinsurance arrangement allows non-life insurers to transfer some of their risks to another insurance company with a larger capital base, extensive experience, and expertise in analyzing and assessing risks. It provides valuable insights and guidance to primary insurers regarding risk selection, pricing, and underwriting practices. This collaboration enhances risk control by improving risk assessment and overall risk management strategies within the primary insurer's operations. Reinsurance is in high demand when financial leverage grows, as Garven and Tennant (2003) demonstrated reinsurance may be viewed as both a financing choice and a risk management tool.

2.1.2. Gross Premium Income and Reinsurance Usage

The earnings from the sale of an insurance policy that aims to mitigate the insured's risk throughout the coverage period are known as the gross premium (Fadun, 2023, Fadun & Silwimb, 2023). Aduloju and Ajemunigbohun (2017) asserted that reinsurance acquisition significantly boosts insurers' premium income. It is also demonstrated that the non-life insurance's income is sensitive to variations in reinsurance usage and has favourable relationships with it. Every rise in insurance premiums will increase profits made, thus premium income influences earnings (Reschiwati & Solikhah, 2018). Both individuals and companies pay income taxes, people may be encouraged to purchase insurance at any premium rate by lowering the effective tax rate for income (Nuta, 2011). Moreover, the cost of insurance plans for policyholders may decrease if premium income is excluded from taxes. An investment in insurance coverage may be encouraged by lower rates for both people and organisations, fostering resilience and financial stability in the face of unforeseen circumstances (Fadun & Shoyemi, 2018).

According to Iqbal and Rehman (2014), reinsurance benefits direct insurers by reducing volatility in financial statements, particularly income statements, thereby increasing insurers' revenue. Furthermore, reinsurance reduces the risk of bankruptcy or insolvency for direct insurers (Cole & McCullough, 2006). If the company assumes additional capital risk, this risk might increase. However, appropriate diversification through reinsurance usage can help to mitigate this risk. Non-life insurers employ other reinsurance facilities to maintain premium growth rates, especially for risks with substantial loss potentials (Dansu & Obalola, 2018). However, Iqbal and Rehman (2014) asserted that

the majority of insurance firms relied heavily on reinsurance and leverage to raise underwriting capacity and stabilise profit, heavy reliance exposes them to the possibility of insolvency.

2.1.3. Reinsurance Premium Ceded

Reinsurance ceded premium refers to the portion of insurance premiums that an insurance company transfers or "cedes" to a reinsurer. In other words, when an insurance company takes out reinsurance, it passes on some of its assumed risks through its policies to a reinsurer in exchange for paying a portion of the premium collected from policyholders. The relevance of reinsurance premiums ceded to gross premium revenue stems from its influence on insurance firms' financial stability, risk management, and capacity (Cummins, Dionne, Gagne & Nouria, 2008). Insurance firms might gain various benefits by surrendering a portion of their premium income to reinsurers. According to Aduloju and Ajemunigbohun (2017), ceding premium income to reinsurers mitigates the potential impact of large and catastrophic losses, enhancing non-life insurance firms' financial stability. Ceding premium income to reinsurers makes reinsurers obliged to provide financial support and share the burden of claims payments with the primary ceding firm. This will reduce the impact of claims payments on the insurer's capital reserves.

Iqbal and Rehman (2014) avowed that the ratio of reinsurance ceded premium to premium income indicates an insurer's dependency on its reinsurers and a general understanding of potential exposure to reinsurance collectability problems. Bressan (2018) avowed that a high reinsurance ceded value indicates that the company is actively providing reinsurance. Augustine and Lukmon (2017) acclaimed that ceding premiums to reinsurers helps insurance companies manage their risk portfolios more effectively. Insurers can diversify their risk and lessen concentration in certain business lines or geographical areas by shifting a portion of their risk exposure to reinsurers. This diversity can lessen the sensitivity of insurance businesses to significant losses and improve their overall risk management system (Silwimba & Fadun, 2022b). Ansah-Adu, Andor and Abor (2012) submitted that effective utilisation of firms' resources reveals effective and efficient management, which will benefit the insurers and the economy. According to Obonyo (2016), insurance firms that purchase more reinsurance coverages generate more consistent financial performance, resulting in high risk-adjusted premium income.

2.1.4. Reinsurance Premium Accepted

Reinsurance premium accepted is a rarely discussed concept in insurance literature. It forms part of insurers gross premium written or gross premium income. The reinsurance premium accepted is a co-insurer arrangement. It refers to the portion of premiums that an insurer receives from another insurance company for taking up a portion of the risk related to the insurance policies that the insurer writes. In other words, it represents the premium income the insurer collects in exchange for providing insurance coverage to another insurance firm. Bressan (2018) primary insurers are more willing to offer reinsurance to other companies as their reinsurance portfolio grows. Premiums accepted via reinsurance arrangements enable insurance companies to take on additional risks. As a result, it strengthens insurance firms' image as the market becomes larger and helps responsive insurers operate with confidence in an uncharted area of their company (Augustine & Lukmon, 2017; Cole & McCullough, 2006).

According to Soye, Olumide and Adeyemo (2022), reinsurance is a risk management technique that enables insurance firms to reduce their capital requirements and buffer against greater claimant payouts. This could be achieved by assuming a certain percentage of risks of another insuring firm

through reinsurance premium accepted and ceding a portion of its premium to a reinsurer to facilitate reinsurance arrangement (Cole & McCullough, 2006). Castries (2005) submits that because the insurance industry operates on an inverse cycle, insurance firms must project the future before accepting risks (Lelyved, Liedorp & Kampman, 2009). However, insuring firms should be cautious in assuming or accepting a higher percentage of risks because the premium accepted may be inadequate to fund the needed payout, resulting in financial ache.

2.1.5. Reinsurance commission to shareholder's equity and Gross Premium Income

The ratio of reinsurance commission to shareholder's equity indicates the proportion of the company's shareholder's equity that is being utilised to pay for reinsurance commissions. A higher RCSE ratio may suggest that a significant portion of the company's equity is being allocated to cover reinsurance expenses, which could impact the financial health and stability of the company. When reinsurance costs decrease, insurance firms can afford it more, which leads to increased capacity, pricing competition, and ultimately more significant loss and combined ratios (Meier & Outreville, 2006)

An effective reinsurance contract removes risk from the primary insurer's balance sheet, often lowering the capital need for the risk the cedant absorbs (Comerford, et al., 2020; Shah et al., 2015). Reinsurance or ceding commissions are the percentages that each insurer keeps, and the expenditures and profits from providing reinsurance cover may be shared by reinsurance firms and cedants. The higher the cedant commission to the investors' equity ratio, the bigger the provisional respite of excess (Kwon & Leigh, 2016). However, insurers must carefully consider administrative costs, reinsurance commissions, and other expenses because they can affect the company's premium income and financial stability (Akindipe and Isimoya, 2022).

2.2. Theoretical Review

Risk Diversification Theory

This study is supported by the risk diversification theory, which is a fundamental concept in reinsurance. The risk diversification theory suggests that by spreading the risk across multiple reinsurers and different geographical regions, the primary insurer can reduce its exposure to a single catastrophic event or concentrated risks. This allows the insurer to achieve a more balanced and stable risk portfolio. This theory by Harry Markowitz from 1950 to 1952 emphasizes the importance of spreading risks through reinsurance.

2.3. Empirical Review

Lee and Lee (2012) examined the connection between reinsurance and company performance. This research uses panel data from the Taiwanese property-liability insurance market from 1999 to 2009. It is observed that insurers who have a better return on assets (ROA) also prefer to buy less reinsurance. At the same time, insurers that depend more heavily on reinsurance tend to perform worse as a company. The study suggested that managers must, therefore, compromise between lowering the danger of insolvency and lowering possible profitability.

Using a mixed technique, Abass and Obalola (2018) researched the effect of reinsurance utilisation on the performance of non-life businesses in the Nigerian insurance market. Data was gathered from the (41) non-life insurance firms operating in Nigeria's annual reports between 2006 and 2015. The

study's findings showed that profitability, as measured by return on assets and return on equity, had a positive, substantial impact on the use of reinsurance. They advised Nigerian non-life insurance companies to implement new risk management strategies and improve operations.

Bressan (2018) examined the impact of reinsurance usage on the solvency, taxes, and profitability of insurance companies in the United States. Secondary data sourced from Obis Bank Focus for insurance companies years 2009-2017 were collated and analysed using descriptive statistics and regression analysis methods. The key finding of the study is that the primary insurers with more reinsurance usage have lower capital ratios. Specifically, the study finds that as the amount of reinsurance utilised increases, primary insurers are more likely to offer reinsurance to other firms. This in turn will increase their capital adequacy.

Andoh and Yamoah (2021) investigated the impact of premiums ceded to a reinsurer on the profitability of non-life insurance firms operating in Ghana. Data for twenty non-life insurance firms for the years 2008–2018 was collated from the National Insurance Commission and Bank of Ghana. A panel regression model was utilised to analyse the data. The findings demonstrate that the combination of reinsurance and solvency ratio has a substantial influence on non-life insurance businesses' profitability while acquiring large amounts of reinsurance on its own has little effect on the profitability of non-life insurance companies in Ghana. The study recommended that Ghanaian non-life insurance company managers should improve their capacity to pay back all debts in the short, medium, and long terms.

Isimoya and Akindipe (2022) investigated gross premium income and claims settlement of marine and aviation insurance markets for the period 2011 to 2022. Data were obtained from the Nigerian Insurers Association Annual Reports and Digest. Data collected was analysed using ordinary Least Square Regression methods. The findings from the analysis revealed an insignificant relationship between the gross premium income and claim payment for marine and aviation. The authors recommend that continued efforts should be made to boost insurance companies' performance in the marine and aviation insurance sectors.

Soye, Olumide and Adeyemo (2022) looked at the impact of reinsurance on non-life insurance business profitability in Nigeria. According to the study's findings, the premium cession and net retention ratios significantly influence insurance businesses' profitability. However, the finding shows that reinsurance dependence ceded premium and reinsurance commission to shareholder's equity have a negative and little effect on the profitability of insurance companies (Soye, Olumide & Adeyemo, 2022).

Abass and Olubusade (2023) studied how Nigerian non-life insurance businesses' financial resources affected how much reinsurance was used. Twenty Nigerian non-life insurance businesses' annual financial statements from 2011 to 2020 served as the study source of secondary data. A substantial joint relationship between the utilisations of reinsurance and the return on assets and financial leverage of non-life insurance enterprises in Nigeria was found using multiple regression analysis for data analysis. According to the survey, insurance companies should prioritise providing reinsurance facilities with enough attention.

3. Methodology

This study is based on a longitudinal research design. This design permits the collection and analysis of time series data for more than one unit (firm) in one study. Therefore, the investigation of all non-life insurance firms for fifteen years was carried out.

The population of the study consists of all the registered insurance companies quoted on the Nigerian Stock Exchange. The total number of insurance companies listed in Nigeria as public companies is fifty-eight (NAICOM, 2022). Therefore, the population of this study is the fifty-eight listed insurance firms in Nigeria.

The purposive selection was employed in this research to choose a sample of all non-life insurance companies operating in Nigeria whose annual reports and digests from 2007 to 2021 were available online. This makes it possible to get the data needed for this investigation from a dependable source. Secondary data were sourced from the Insurance Digest report by Nigeria's Insurance Association, and the data covered 15 years spanning from 2007 to 2021.

This study employed descriptive and inferential analysis methods. The descriptive analysis methods used were mean, variance, standard deviation, skewness, kurtosis, and sum. On the other hand, the inferential analysis employed is the auto-regressive dynamic lag and error correction model because the researcher is interested in investigating the short- and long-run relationship between gross premium income and reinsurance transactions. ARDL was used because of its ability to use a mix of I (1) and I (0) for empirical analysis and still produce an unbiased estimate.

Model Specification

This study model was specified as follows:

$$GPI = F(RPC, RPA, RCSE,)$$

$$\Delta \ln GPI_{t-i} = \alpha_0 + \sum_{i=1}^p + \alpha_1 \Delta \ln RPC_{t-i} + \alpha_2 \Delta \ln RPA_{t-i} + \alpha_3 \Delta \ln RCSE_{t-i} + \mu t \quad (i)$$

where:

α_0 represent the constant term

α_1 α_3 represent the coefficient of the variables

μt represents the error term in the year t

GPI = Gross Premium Income of non-life companies i at time t

RPC = Reinsurance Premium Ceded of non-life companies i at time t

RPA = Reinsurance Premium Accepted of non-life companies i at time t

RCSE = Reinsurance Commission to Shareholders' Equity of non-life companies

t = time dimension

ln = log,

Below are the long-run ARDL estimation and ECM for this investigation:

$$\Delta \ln(GPI)_t = \alpha_0 + \sum_{i=0}^n \alpha_1 \Delta \ln(RPC)_{t-1} + \sum_{i=0}^n \alpha_2 \Delta \ln(RPA)_{t-1} + \sum_{i=0}^n \alpha_3 \Delta \ln(RCSE)_{t-1} + \mu \epsilon_t \tag{ii}$$

In a cointegration model, the error correction term can be expressed using the equation below:

$$\Delta \ln(GPI)_t = \alpha_0 + \sum_{i=0}^n \alpha_1 \Delta \ln(RPC)_{t-1} + \sum_{i=0}^n \alpha_2 \Delta \ln(RPA)_{t-1} + \sum_{i=0}^n \alpha_3 \Delta \ln(RCSE)_{t-1} + \varphi(ECM)_{t-1} \tag{iii}$$

Where φ represent speed of adjustment parameter.

$$(ECM)_{t-1} = \ln(GPI)_t - \alpha_1 \ln(RPC)_t + \alpha_2 \ln(RPA)_t + \alpha_3 \ln(RCSE)_t \tag{iv}$$

4. Data Presentation, Analysis and Results

Table 1. Descriptive Analysis of Variables

STATS	GPI	RPC	RPA	RCSE
mean	19.02935	17.97094	14.89088	-.1895013
sd	.3460443	.5907264	.6361177	1.514604
max	19.64798	18.75582	16.02378	3.091043
min	18.25625	16.78506	13.41753	-3.506558
skewness	-.3165804	-.4689596	-.378017	.3863041
kurtosis	3.20194	2.242007	3.294181	4.416521
sum	285.4403	269.5642	223.3632	-2.842519
N	15	15	15	15

Source: Stata_64 Output, 2023

Table 1 displays descriptive statistics of variables, with mean values of GPI, RPC, RPA, and RCSE of 19.02935, 17.97094, 14.89088, and -.1895013, respectively. Standard deviation values are 3460443,.5907264,.6361177, and 1.514604, with RCSE having the highest standard deviation value of 1.514604. The data series has maximum values of 19.64798, 18.75582, 16.02378, and 3.091043, while minimum values are 18.25625, 16.78506, 13.41753, and -3.506558. GPI has the highest value at 19.64798, while RSCE has the lowest at -3.506558.

From the table, GPI, RPC, and RPA have negative skewness values of -.3165804, -.4689596, and -.378017, respectively, except RCSE, which has .3863041 positive skewness and lengthy right tails. The data kurtosis values are 3.20194, 2.242007, 3.294181, and 4.41652, respectively. RPC is flat, while GPI, RPA, and RCSE are leptokurtic.

4.2. Correlation Matrix

H₁₁: There is a positive relationship between reinsurance premium ceded and gross premium income of non-life insurance companies in Nigeria.

Table 2. Correlation Analysis Result

	GPI	RPC	RPA	RCSE
GPI	1.0000			
RPC	0.9582	1.0000		
RPA	0.6555	0.4710	1.0000	
RCSE	0.1858	0.2401	-0.0124	1.0000

Source: Stata_64 Output, 2023

Table 2 displays the relationship matrix between dependent and independent variables used in the study. The independent variables RPC, RPA, and RCSE had positive relationship values of 0.9582, 0.6555, and 0.1858, respectively, with the dependent variable GPI. As shown in Table 2, reinsurance premium ceded and reinsurance premium accepted have the highest positive correlation of 95% and 65%, respectively, with gross premium income. In comparison, reinsurance commission to shareholder equity has the lowest relationship of 18% with gross premium income. All the variables' coefficients are less than 1.0000, implying that the dataset used in the research is devoid of multicollinearity, as Brooks (2008) asserted.

4.3. Stationarity Test

Table 3. Augmented Dickey-Fuller Unit Root Test

Variable	Stationary Order	ADF Calculated	ADF 5% Critical Value	Order of Integration	Decision
lnGPI	@ level	3.735	-1.950	1(0)	Stationary
lnRPC	@ level	4.518	-1.950	1(0)	Stationary
dlnRPA	1 st difference	-3.758	-1.950	1(1)	Stationary
lnRCSE	@ level	-2.741	-1.950	1(0)	Stationary

Source: Stata_64 Output, 2023

The ADF result demonstrated that the logarithm form of the three variables (GPI, RPC, and RCSE) was stationary at order zero 1(0), except for RPA, which was stationary at first difference 1(1). Since the value of the ADF statistic is greater than the conventional critical value at a significance level of 5% and the variables are stationary at levels 1(0) and 1(1), the unit root test analysis is justified using autoregressive distributed lag (ARDL). So, ARDL was used for study analysis.

Table 4. Optimal Lag Structure Selection

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-13.8004	NA	0.0003	3.23644	3.38113	3.14523
1	23.0173	82.36155*	9.0e-06	-.55842	.165026	-1.01445
2	437.209	15.88799	3.5e-36*	-72.9471	-71.6449	-73.768
3	1357.55	1840.7*	.	-239.831	7.567205	-239.831
4	1363.76	12.416	.	-239.957*	-238.365*	-240.96*

* Indicates lag order selected by the criterion, LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion

Source: Stata_64 Output, 2023

Table 4 presents the findings of the Akaike Information Criterion (AIC), Schwarz Information Criterion (SC), and Hannan-Quinn Information Criterion (HQ), which suggests that a lag of 4 is recommended for the investigation. Therefore, the analysis concludes that lag 4 is the best option.

4.5. ARDL Estimations

Co-integration Bound Test

Table 5. Pesaran/Shin/Smith (2001) ARDL Bounds Test

<i>Critical Value</i>	<i>(I_0) Lower Bound Value</i>	<i>(I_1) Upper Bound Value</i>
10%	2.72	3.77
5%	3.23	4.35
1%	4.29	5.61
<i>F-Statistics = (4.573)</i>	HO: no level of relationship	

Source: Source: Stata_64 Output, 2023

According to the result shown in Table 5, the F-statistic is 4.573, which is above (I_0) and (I_1) values, revealing that the study variables (GPI, RPC, RPA, and RCSE) have a long-run connection with one another. This outcome confirms that the ARDL long-run model was fit to evaluate the level of a long-run relationship among the variables. Hence, the null hypothesis was rejected, and it was established that a valid co-integration exists among the variables used in the study at a 5% level of significance.

H₁₂: Reinsurance premiums accepted have a positive effect on the gross premium income of non-life insurance companies in Nigeria.

Table 6. ARDL Long Run Result

<i>Variable</i>	<i>Coefficient</i>	<i>Std. Error</i>	<i>t-stat</i>	<i>P> t </i>	<i>[95% Conf. Interval]</i>	
<i>lnGPI</i>	-5.279275	1.667827	-3.17	0.087	-12.45536	1.896807
<i>lnRPC</i>	.4959297	.0120426	41.18	0.001	.4441144	.547745
<i>lnRPA</i>	.1483217	.0075756	19.58	0.003	.1157267	.1809167
<i>lnRCSE</i>	.0100492	.0042326	-2.37	0.141	-.0282608	.0081624

R-squares= 0.9481, Adj R-square= 0.6888, RMSE= 0.0378, Log likelihood= 36.290317

Source: Stata_64 Output, 2023

The long-run effect of independent variables (RPC, RPA, and RCSE) on the dependent variable GPI is revealed in Table 6. Considering the log value of reinsurance premium ceded, reinsurance premium accepted, and reinsurance commission to shareholders' equity, we confirmed that RPC has a positive and significant effect on the GPI; RPA also has a positive and significant effect on the GPI, and RCSE has a positive but insignificant effect on the GPI in the long run. Specifically, RPC, RPA, and RCSE have a positive long-run effect on GPI with a coefficient of .4959297, .1483217 and .100492, respectively. This suggests that a unit increase in RPC, RPA, and RCSE will increase GPI by .4959297, .1483217, and .0100492, respectively. Also, RPC and RPA had a significant positive effect on GPI with a probability value of 0.001 and 0.003. In contrast, RCSE has an insignificant positive relationship with GPI by 0.141, greater than a 5% significant level. The R² value of 0.9481 indicates that the independent variables can account for 94.81% of the variance in GPI over a long period. Furthermore, this suggests a strong and significant long-term relationship exists among the variables.

The equation for the long-run effect is represented thus:

$$\ln(GPI)_t = -5.28 + 0.49\ln(RPC)_t + 0.15\ln(RPA)_t + 0.01\ln(RCSE)_t$$

Table 7. ECM Result

Variable	Coefficient	Std. Error	z-stat	P> z	[95% Conf. Interval]
D_lnGPI					
_cel L1.	.3461287	.6069189	0.57	0.568	65.38603 33.45854
D_lnRPC					
_cel L1.	-2.204727	.6060618	-3.64	0.000	-3.392586 -1.016868
D_lnRPA					
_cel L1.	15.61248	3.172293	4.92	0.000	9.394897 21.83006
D_lnRCSE					
_cel L1.	-15.96374	25.21591	-0.63	0.527	65.38603 33.45854

AIC= -2.216689, HQIC= -2.457867, SBIC= -1.04333, Log likelihood= 41.40848, Det (Sigma_ml) = 2.01e-08

Source: Stata_64 Output, 2023

Table 7 displays the short-run connections among the study variables. The ECM result confirms that RPC has a negative effect on GPI in the short run, and it is significant with a coefficient of -2.204727 and a p-value of 0.000. RPA has a positive and significant effect on GPI in the short run with a coefficient of 15.61248 and a p-value of 0.000, while RCSE has a negative and insignificant effect on GPI in the short run with a coefficient of -15.96374 ($p = 0.527 > 0.05$). This infers that a unit rise in RPC and RCSE decreases GPI by -2.204727 and -15.96374, while a unit increase in RPA increases GPI by 15.61248 in the short run. Additionally, the outcome showed a rapid and considerable short-run speed of adjustment (ECM) among the variables.

The ECM equation showing the speed of adjustment among the variables in the short run is stated below:

$$(ECM)_{t-1} = 0.35\ln(GPI)_t - 2.21\ln(RPC)_t + 15.61\ln(RPA)_t - 15.96\ln(RSCE)_t$$

Diagnostic Test

This diagnostic test assesses the research model's thoroughness and goodness of fit using serial correlation and heteroscedasticity.

Table 8. Serial Correlation and Heteroscedasticity Result

Test	chi2	Prob > chi2
IM test: Heteroscedasticity	13.00	0.3690
Skewness	3.39	0.9707
Kurtosis	1.64	0.1997
Breusch-Godfrey LM test lag s(p) 1	11.382	0.0007
Durbin-Watson d-statistic (11, 13) = 3.624735		

Source: Stata_64 Output, 2023

Table 8 revealed the results of various diagnostic tests to check the existence of serial correlation and heteroscedasticity in the study model. IM and LM test p-values (0.3690, 0.9707, 0.1997, and 0.0007) are quantitatively significant above the five per cent significance threshold. The Durbin-Watson, IM, and LM test results indicate that the residuals of the model are not affected by the existence of serial correlation and heteroscedasticity; therefore, the study result is confirmed to be valid.

4.6. Discussion of Findings

This study investigates the relationship between reinsurance premiums ceded and gross premium income and the effect of reinsurance premiums accepted on the gross premium income of Nigerian

non-life insurance firms. The analysis for hypothesis one established that reinsurance premium ceded has a favorable and significant association with the gross premium income of non-life insurance companies in Nigeria, both in the short and long run. This could be because insurance companies have mastered the art of risk management, which helps to enhance their underwriting capacity and safeguard themselves against possible catastrophic losses that can threaten their business operations and affect their premium income. Therefore, this study accepts the *hypothesis* stated for this study. This result is in line with Abass and Olubusade (2023), who averred that the reinsurance ceded proportion significantly affects the capital adequacy of non-life insurance companies in Nigeria. However, this study is against the findings of Soye et al. (2022) and Andoh and Yamoah (2021), although these studies focused on firm profitability rather than gross premium income.

For hypothesis two, this study established that reinsurance premiums accepted (*RPA*) significantly positively affect the gross premium income (*GPI*) of Nigerian non-life insurance companies. This could be because primary insurers agree to jointly take cover for insured risks, thus generating more income from assumed risks. Although, over the years, the ratio of reinsurance accepted by the primary insurer has always been small compared to the reinsurance ceded ratio, as confirmed by Nigeria Insurance Digest reports (NIA, 2021), the reinsurance premium accepted also forms the basis of income for primary insurers. Thus, any rise in accepted reinsurance premiums will result in a rise in gross premium income. This is achievable when non-life insurance companies have sound experience managing risk and eventually conclude quality business with another primary insurer. Therefore, this study accepts the alternative hypothesis, which states that reinsurance premiums accepted (*RPA*) substantially positively affect the gross premium income (*GPI*) of Nigerian non-life insurers.

5. Conclusion and Recommendations

This study investigated the effect of reinsurance transactions on the gross premium income of non-life insurance companies in Nigeria for 2007–2021. The results obtained from this investigation affirm that reinsurance premium ceded and reinsurance premium accepted (used to proxy reinsurance transactions) have a significant positive effect on the gross premium income of non-life insurance companies in Nigeria. However, reinsurance commissions on shareholders' equity have a positive but insignificant effect on gross premium income. The positive effect of independent variables *lnRPC*, *lnRPA*, and *lnRCSE* on gross premium income confirms the proposition of diversification theory and establishes that reinsurance transactions play an inevitable role in the income generation of non-life insurance companies in Nigeria. It contributes to the stability and expansion of insurance firms.

Based on the results and conclusions of this research, the following recommendations are proposed:

Non-life insurance companies should improve their underwriting capacity, especially for high-risk sectors like oil and gas, marine, and aviation, as well as other sectors, to increase their gross premium income. This is because increased underwriting capacity will help insurers assume larger risks and, at the same time, use reinsurance to share the claim ratio. Also, the Nigerian government should expedite action in formulating laws and orders that will enforce the Nigerian populace's usage and purchase of insurance policies. This will not only increase insurers' premium income generation but also improve the standard of living of citizens.

This study revealed that using reinsurance practices can improve industry-wide risk management strategies and encourage insurance companies to adopt the most effective reinsurance transactions that

increase their premium income and ensure their financial stability. The relevance of this study elucidates that reinsurance premiums ceded and reinsurance premiums accepted contribute significantly to the revenue generation of non-life insurance businesses in Nigeria. Furthermore, non-life insurance companies should modify their tactics in response to learnings from successful reinsurance operations; this would influence innovation and market rivalry among insurance companies. Lastly, the management of non-life insurance companies in Nigeria should always reevaluate the types of reinsurance contracts they have and focus on the cost-effectiveness and the overall financial viability of their reinsurance activities. This is important to ensure that the cost of securing reinsurance (RCSE) increases gross premium income.

References

- Abass, O. A. & Obalola, M. A. (2018). Reinsurance utilization and performance of non-life business in the Nigerian insurance industry: A mixed methods approach. *The Journal of Risk Management and Insurance* 22(2), pp. 18-30. <https://jrmi.au.edu/index.php/jrmi/article/>.
- Aduloju, S. A. & Ajemunigbohun, S. S. (2017). Reinsurance and performance of the ceding companies: The Nigerian insurance industry experience. *Economics and Business* 31, pp. 19-29. <https://www.degruyter.com/view/j/e>.
- Akindipe, O. E., & Isimoya, O. A. (2022). Gross premium income and claims settlement for fire insurance policy in Nigeria: A panel approach. *Annals of Spiru Haret University. Economic Series*, 22(3), 223-235, doi: <https://doi.org/10.26458/22312>.
- Andoh, C. & Yamoah, S. A. (2021). Reinsurance and financial performance of non-life insurance companies in Ghana. *Management and Labour Studies*, pp. 1–14. <https://doi.org/10.1177/0258042X21989942>.
- Ansah-Adu, K.; Andoh, C. & Abor, J. (2012). Evaluating the cost efficiency of insurance companies in Ghana. *Journal of Risk Finance*, 13(1), pp. 61-76. <https://doi.org/10.1108/15265941211191949>.
- Augustine, S. Y. & Lukmon, A. D. (2017). Evaluation of impact of reinsurance mechanism on insurance companies' sustainability in Nigeria. *International Journal of Research, Innovations and Sustainable Development*, 7(1), pp. 20-37.
- Bressan, S. (2018). The impact of reinsurance for insurance companies. *Risk Governance and Control: Financial Markets & Institutions*, 8(4), pp. 22-29. <http://doi.org/10.22495/rgcv8i4p3>.
- Bressan, S. (2018). The impact of reinsurance for insurance companies. *Risk Governance and Control: Financial Markets & Institutions*, 8(4), pp. 22-29. <http://doi.org/10.22495/rgcv8i4p3>.
- Cole, C. R. & McCullough, K. A. (2006). A re-examination of the corporate demand for reinsurance, *Journal of Risk and Insurance*, 73(1), pp. 179-192.
- Comerford, E.; Fulcher, P.; Beers, R. V. & Maher, R. (2020). Reinsurance as a capital management tool for life insurance. *Milliman Research Report*. Available at: [milliman.com https://us.milliman.com/en/insight/reinsurance](https://us.milliman.com/en/insight/reinsurance).
- Cummins, J. D., Dionne, G., Gagne, R., & Nouria, A. (2008). The cost and benefit of reinsurance. *Geneva Papers on Risk and Insurance – Issues and Practice*, pp. 1-33. <http://www.palgrave.com/gp/journal/41288>.
- Dansu, F. S., & Obalola, A. M. (2018). Reinsurance utilisation and dependence on the financial performance of non-life insurers: Evidence from Nigeria. *Studies and Scientific Researches Economics Edition*, 28, 48-58. <http://dx.doi.org/10.29358/sceco.v0i28.428>.
- De Castries, H. (2005). Capital adequacy and risk management in insurance. *General papers on Risk Management and Insurance Issues and Practice*, (30), pp. 47-51. <https://link.springer.com/a>.
- Fadun, O. S. & Shoyemi, O. S. (2018). Insurance investment funds and economic growth in Nigeria: An empirical analysis (2000 – 2015). *International Journal of Development and Management Review*, 13(1), 73-88. <https://www.ajol.info/index.php/ijdmr/article/view/172265/161664>.
- Fadun, O. S. (2021). Nexus between insurance penetration and economic growth: Evidence from Nigeria. *Nigeria Journal of Risk and Insurance*, 11(1), pp. 20-36. <http://njri.unilag.edu.ng/article/view/1388/1065>.

- Fadun, O. S. (2023). Analysis of the impacts of insurance claims settlement on economic growth: The case of Nigeria. *International Journal of Business Ecosystem & Strategy*, 5(3), pp. 51-59. <https://doi.org/10.36096/ijbes.v5i3.424>.
- Fadun, O. S., & Silwimba, P. (2023). Does Insurance Promote Economic Growth? Evidence from Nigeria. *Nigeria Journal of Risk and Insurance*, 13(1), pp. 1-24. <http://njri.unilag.edu.ng/article/view/1741/1345>.
- Garven, J. R., Tennant, J. L., Consultants, G. R. C., Center, F., & Street, E. M. (2003). The demand for reinsurance: Theory and empirical tests. *Insurance and Risk Management*, 71(2), pp. 217-238. <https://ideas.repec.org/p/wop/riskar/008.html>.
- Goran, B., Ilija, C., & Vladimir, Đ. (2010). The impact of globalization on the insurance and reinsurance market of Eastern Europe. *South East European Journal of Economics and Business*, 5(1), pp. 95-112. <https://doi.org/10.2478/v10033-010-0010-7>.
- Hasibuan A. F. P., Sadalia I., & Muda I. (2020). The effect of claim ratio, operational ratio and retention ratio on profitability performance of insurance companies in Indonesia stock exchange. *International Journal of Research and Review*, 7(3), pp. 223-231. https://www.ijrrjournal.com/IJRR_Vol.7_Issue.3_March2020/IJRR0031.pdf.
- Idowu, T. S., & Fadun, O. S. (2022). Analysis of insurance products and services effectiveness in rural areas (Case study of Lagos state, Nigeria). *Nigeria Journal of Risk and Insurance*, 12(1), pp. 243-258. <http://njri.unilag.edu.ng/article/view/1602/1244>.
- Insurance Information Institute (2021). *Reinsurance*. <https://www.iii.org/article/reinsurance>.
- Iqbal, H. T., & Rehman, M. U. (2014). Empirical analysis of reinsurance utilisation and dependency with respect to its impact on the performance of domestic non-life stock insurance companies operating in the private sector of Pakistan. *International Journal of Financial Services Management*, 7(2), pp. 95–112. <https://doi.org/10.1504/IJFSM.2014.063946>.
- Isimoya, O. A., & Akindipe, O. E. (2022). Gross Premium Income and Claims Settlement of marine and aviation insurance in Nigeria: A Panel Approach. *Acta Universitatis Danubius* 18(6), pp. 108-118. <https://dj.univ-danubius.ro/index.php/AUDOE/article/view/2053>.
- Kugler, M. & Ofoghi, R. (2012). Does insurance promote economic growth? Evidence from the UK. *Division of Economics, University of Southampton, UK*, 7(5), pp. 147 - 155. <http://repec.org/mmfc05/paper8.pdf>.
- Kwon, W. J. & Leigh, W. (2016). Analytical tools for the insurance market and macro-prudential surveillance. *OECD Journal: Financial Market Trends*. DOI: <http://dx.doi.org/10.1787/fmt-2016-5jln6hmvwdzn>.
- Lee, H. H., & Lee, C. Y. (2012). An analysis of reinsurance and firm performance: Evidence from the Taiwan property-liability insurance industry. *The Geneva Papers*, 37, pp. 467–484. <http://www.palgrave-journals.com/gpp/journal/v37/n3/pdf/gpp20129a.pdf>.
- Lelyveld, I. V., Liedorp, F., & Kampman, M. (2009). *An empirical assessment of reinsurance risk*. DNB Working Paper. https://www.researchgate.net/publication/24110150_An_
- Meier, U. & F. Outreville, 2006. Business cycles in insurance and reinsurance: The case of France, Germany and Switzerland. *Journal of Risk Finance* 7, pp. 160-176. <https://ideas.repec.org/a/eme/jrfpps/>
- Nuta, A. C. & Nuta, F. M. (2020). Modelling the influences of economic, demographic, and institutional factors on fiscal pressure using OLS, PCSE, and FD-GMM approaches. *Sustainability*, 12(4), pp. 1-12. <https://doi.org/10.3390/su12041681>.
- Nuta, A. C. (2011). A theoretical approach of fiscal and budgetary policies- Acta Universities Danubius. *Economic*, 7(6), pp. 91-98. <https://journals.univ-danubius.ro/index.php/oeconomica/article/view/1303>.
- Obonyo, S. N. (2016). *The effect of reinsurance programs on the financial performance of general insurance companies in Kenya*. Master thesis submitted to School of Business, Department of Finance, University of Nairobi.
- OECD (2018). *The contribution of reinsurance markets to managing catastrophe risk*. www.oecd.org/finance/the-contribution-of-reinsurance-markets-to-managing-catastrophe-risk.pdf.
- Ogunlami, K. (2021). Effect of reinsurance on the development of insurance industry and the Nigeria economy. *International Journal of Social Relevance & Concern*, 9(5), pp. 29-40. <http://ijournals.in/wp-content/uploads/2021/05/5.IJSRC-9506-Ogunlami.pdf>.

- Okonkwo, I. & Okeke, D. (2019). Developments and innovations in Nigerian insurance industry: 2010-2018. *International Journal of Research in Business, Economics and Management*, 3(1), pp. 1-17. https://www.researchgate.net/publication/330619469_Developments_an.
- Oladunni, E. O. & Eche, A. N. (2022). Impact of reinsurance underwriting operations on assets management of insurance companies in Nigeria. *International Journal of Research and Innovation in Social Science*, 6(4), pp. 604-613. <https://www.rsisinternational.org/journals/ijriss>.
- Reschiwati, K., & Solikhah, R. P. (2018). Random Effect Model: Influence of Income Premium, Claim Cost and Underwriting Results on Net Income in Insurance Company in Indonesia. *International Journal of Modern Trends in Business Research*, 1(3), pp. 1-17. <http://www.ijmtbr.com/PDF/IJMTBR-2018-03-09-01.pdf>.
- Senn, M. (2012). Reinsurance: An introduction to the industry. *Springer Science & Business Media*. <https://www.swissre.com/dam/jcr>.
- Shah, A.; Wilcox, R. & Alip, A. (2015). *Insurance regulation for sustainable development*. <https://www.cisl.cam.ac.uk/system/files/documents/insurance-regulation-report1a.pdf>.
- Silwimba, P. & Fadun, O. S. (2022a). Awareness levels of the dynamics of the climate change risk impacts: Evidence from Africa, Eastern Asia and emerging countries. *International Journal of Research in Business and Social Science*, 11(9), pp. 373-393. <https://doi.org/10.20525/ijrbs.v11i9.2233>.
- Silwimba, P. & Fadun, O. S. (2022b). Allocation of resources for risk management activities by business organisations in developing countries: Evidence from Zambia. *International Bussecon Review of Social Sciences*, 4(1), pp. 15-24. <https://doi.org/10.36096/brss.v4i2.381>.
- Soye, Y. A. & Adeyemo, D. L. (2017). Evaluation of impact of reinsurance mechanism on insurance companies' sustainability in Nigeria. *International Journal of Research, Innovations and Sustainable Development*, 7(1), pp. 117-190. <https://www.researchgate.net/pu>.
- Soye, Y. A.; Olumide, R. O. & Adeyemo, D. L. (2022). Reinsurance: A risk management instrument for insurance companies' profitability (A case of non-life insurance in Nigeria). *Economic Insights – Trends and Challenges*, 11(2), pp. 21-36. <https://upg-bulletin-se.ro/wp-co>.
- Taylor, H.; Bisira, D. & Farinde, J. (2019). Effect of re-insurance on economic growth. *Journal of Entrepreneurs*, 7(3), pp. 314-342.