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Analysis of the Impact of COVID-19 on the Non-Life Insurance Industry Activities: A Kenyan Perspective

BY

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Abstract

The COVID-19 pandemic has caused significant disruptions to economies and societies worldwide, including the insurance industry. While various studies have been conducted on the impact of the pandemic on the insurance sector, there has been limited research on the specific effects on non-life insurance firms in Kenya.This study examines the impact of the COVID-19 pandemic on non-life insurance companies in Kenya, focusing on the analysis of gross premium income and claims incurred. The data spanning from 2013 to 2022 was divided into pre-pandemic and pandemic-affected periods. We utilized SARIMA models to forecast expected values for 2020 and 2022 and employed the Mean Percentage Error (MPE) metric to quantify the pandemic's specific impact. The analysis of gross premium income revealed a negative impact during the year 2020, with the actual total gross premium income falling short of the expected amount by -3.1%. This decline was likely caused by reduced demand due to economic uncertainties and decreased business activities during the pandemic. However, in the subsequent years, 2021 and 2022, the industry exhibited resilience, with the actual total gross premium income surpassing the expected values by 4.5% and 5.3%, respectively, indicating a promising recovery as economic conditions improved and businesses rebounded from the pandemic's initial impact. Conversely, the analysis of claims incurred showed a contrasting pattern. In 2020, the total claims incurred were slightly lower than the expected claims by -0.019%, indicating a positive outcome during the pandemic as actual claims were lower than anticipated. This was attributed to reduced economic activities, travel restrictions, and decreased accidents. However, in 2021 and 2022, non-life insurance companies in Kenya faced higher claim payouts than initially expected, with actual claims incurred exceeding the expected claims by 0.644% and 0.757%, respectively.This change could be attributed to the normalization of economic activities, shifts in risk patterns, and potential delayed claims from the previous year. Our findings highlight the significant impact of the COVID-19 pandemic on the non-life insurance industry in Kenya, causing disruptions in gross premium income and claims incurred. Despite facing challenges during the pandemic, the industry demonstrated resilience and exhibited signs of recovery in the post-pandemic years, showcasing the adaptability of non-life insurance companies in Kenya during challenging circumstances.

Declaration and Approval

I the undersigned declare that this dissertation is my original work and to the best of my knowledge, it has not been submitted in support of an award of a degree in any other university or institution of learning.

_____	31/07/2023 _____
Signature	Date

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In my capacity as a supervisor of the candidate's dissertation, I certify that this dissertation has my approval for submission.

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Dedication

I dedicate this research project to my beloved parents, Mr. Joseph Cheruiyot and Mrs. Grace Cheruiyot, for giving me life and nurturing me to become the person I am today. My brothers, Ngeno and Kenik, deserve special appreciation for their moral support throughout my academic journey.

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Abigael Cherotich

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1 INTRODUCTION

1.1 Background of the study

Since its emergence in late 2019, COVID-19, also known as the novel coronavirus, has had a profound global impact. Declared a global pandemic by the World Health Organization (WHO) in March 2020, this highly contagious respiratory illness caused by the SARS-CoV-2 virus has disrupted societies, economies, and healthcare systems worldwide. Non-life insurance companies have been significantly affected by the COVID-19 pandemic, experiencing the consequences of reduced economic activity and business closures as a result of the ongoing crisis.

COVID-19, was first reported in Kenya in March 2020. Since then, the country has experienced several waves of infections, leading to varying degrees of impact on the population and the economy.The non-life insurance industry is one sector that has experienced significant impacts as a result of the pandemic. In Kenya, non-life insurance is classified into 14 distinct insurance classes. These are Aviation, Engineering, Fire Domestic and Industrial, Public Liability, Marine, Motor Private and Commercial, Personal Accident, Theft, Work Injury Benefits (WIBA), Medical, Micro Insurance and Miscellaneous insurance. Miscellaneous insurance includes: Agriculture, Golfers, Travel,Bonds, Plate Glass insurances among others,(Association of Kenya Insurers,2021)[1]. However, the outbreak of COVID-19 has raised concerns about the effects on the activities of these companies.

The main objective of this study is to analyze the impact of COVID-19 on the activities of non-life insurance companies in Kenya. Specifically, the study aims to analyze the effects of the pandemic on gross premium income, claims incurred and the percentage share of classes of business covered by non-life insurance companies in the country.

Gross premium income refers to the total amount of money collected by an insurance company from policyholders as insurance premiums within a specific period, usually a year, before brokerage or discounts have been deducted. It represents the revenue generated by the insurance company from selling insurance policies. The pandemic has led to significant disruptions in various industries, affecting businesses, employment rates, and overall economic stability. As businesses faced closures, reduced operations, and financial challenges, the demand for insurance coverage may have fluctuated, impacting the gross premium income of non-life insurance companies. Understanding the extent of this impact is vital for assessing the financial resilience and stability of the industry.

Another aspect to be examined is the impact of COVID-19 on claims incurred by non-life insurance companies.Claims incurred refers to the total estimated financial obligation of an insurance company for all claims that have occurred during a specific period, regardless of whether the claims have been paid or not. It includes both the claims that have been paid during the period and the claims that are still pending or under investigation.This can be payments for damages, medical expenses, or other covered losses. The pandemic has resulted in an increase in health-related claims, business interruption claims, and claims arising from events such as travel cancellations and event cancellations. It is essential to assess the magnitude of these claims and their effect on the financial position of non-life

insurance companies in Kenya.

Lastly, the study aims to determine the impact of COVID-19 on the percentage share of classes of business covered by non-life insurance companies in Kenya. The pandemic has resulted in shifts in consumer behavior, altered risk perceptions, and changes in business operations. These factors may have influenced the demand for different classes of insurance coverage. Assessing the changes in the percentage share of classes of business covered will help identify trends and areas of potential growth or decline within the industry.

In 2020, the insurance industry in Kenya achieved a Gross Written Premium (GWP) of KES 235.31 Billion, an increase from KES 231.30 Billion in 2019. Despite this growth, the insurance penetration rate declined from 2.37% in 2019 to 2.30% in 2020. To address this issue and expand their market reach, it would be beneficial for the industry to develop innovative insurance products that cater to the specific demands of customers, particularly low-income earners and those in remote areas. The GWP for life insurance reached KES 102.61 Billion compared to KES 97.85 Billion in 2019, while non-life insurance recorded a GWP of KES 132.70 Billion, slightly lower than the KES 133.45 Billion in 2019. The main drivers of non-life insurance are the motor and medical classes. Non-life insurance dominates the market, accounting for 56.39% of total GWP, while life insurance holds a 43.61% share. However, the industry's profits after tax decreased significantly from KES 12.71 Billion in 2019 to KES 3.99 Billion , (Association of Kenya Insurers,2020)[2].

In 2021, the gross written premium in the industry increased by 16.9 percent, reaching KES 275.0 billion, compared to KES 235.3 billion in 2020. This indicates a penetration rate of 2.27 percent in 2021, slightly higher than the 2.20 percent recorded in 2020. General insurance accounted for the majority of the premium at 54.7 percent, while life insurance made up the remaining 45.3 percent.In 2021, the total Gross Written Premium (GWP) for non-life insurance business in Kenya reached KES 150.3 billion, showing a significant increase of 13.26% compared to the KES 132.70 billion underwritten in 2020. Among the different insurance classes, motor insurance emerged as the largest contributor to GWP, accounting for 32.81% of the total, followed closely by medical insurance at 31.71%. The higher uptake of motor insurance can be attributed to the compulsory nature of third-party risks, mandated by CAP 405 laws of Kenya. Interestingly, the COVID-19 pandemic acted as a silver lining in terms of insurance awareness and uptake, particularly in the case of medical insurance. This resulted in an increase in the demand for medical insurance coverage. Other insurance classes such as fire, aviation, engineering, public liability, marine, personal accident, theft, Work Injury Benefits (WIBA), and miscellaneous contributed to 35.48% of the total GWP, (Association of Kenya Insurers, 2021)[1].

Overall, this research study will contribute to the existing body of knowledge by providing a comprehensive analysis of the impact of COVID-19 on non-life insurance companies . The findings will assist policymakers, industry stakeholders, and insurance companies in understanding the challenges faced and formulating strategies to adapt and thrive in the post-pandemic landscape and will give insights in case of a future pandemic.

1.2   Problem Statement

The global outbreak of the COVID-19 pandemic has had far-reaching implications, affecting diverse sectors of the economy. The non-life insurance industry in Kenya has also been significantly impacted by this unprecedented crisis. Despite several studies conducted globally to assess the effects of the pandemic on various industries, there has been a notable research gap regarding its specific consequences on the non-life insurance sector in Kenya. This study aims to bridge that gap by investigating the impacts of the COVID-19 pandemic on key indicators such as gross premium income , claims incurred and the percentage share of classes of business covered by non-life insurance companies in Kenya. By understanding these specific impacts, policymakers and industry stakeholders can formulate targeted strategies and policies to effectively mitigate the challenges faced by the sector and ensure its resilience in the face of future crises. The findings of this study will provide valuable insights into the magnitude and nature of the pandemic's effects on the non-life insurance industry in Kenya. This knowledge will be instrumental in guiding decision-making processes and fostering the development of appropriate risk management mechanisms. Ultimately, the aim is to enhance the industry's ability to adapt, respond, and thrive in the post-pandemic landscape, contributing to the overall economic recovery and safeguarding the interests of insurers and policyholders alike.

1.3   Objectives of the Study

The main objective of this study is to analyze the impact of COVID-19 on the activities of non-life insurance companies in Kenya.
The specific objectives are:
1. To analyze the impact of the COVID-19 pandemic on gross premium income and claims incurred by non-life insurance companies in Kenya.
2. To quantify the impact of COVID-19 on the percentage share of classes of business covered by non-life insurance companies in Kenya.

1.4   Significance of the Study

The main contribution of this paper is that it offers fresh insights into how COVID-19 has affected non-life insurance operations in Kenya, providing new information on the subject.
The significance of this study also lies in its contribution to the existing literature on the impact of the COVID-19 pandemic on the insurance industry. The studies conducted by Suryavanshi (2021)[3], Wang et al. (2020)[4], Haque et al. (2021)[5], Worku and Mersha (2020)[6], Grofcikova and Izakova (2021)[7], X. Qian (2020)[8], Parvathi and Lalitha (2021)[9], Babuna et al. (2020)[10], Puławska (2020)[11], Stojkoski et al. (2021)[12], Garrett and Gangopadhyaya (2020)[13], Kirti and Shin (2020)[14], and Haque et al. (2020[5]) provide a comprehensive understanding of the effects of the pandemic on premium income, claims, and underwriting profits in the insurance sector.
This paper also makes a methodological contribution to understanding the dynamics of insurance activities over time. Existing literature (Andrews et al., 2013[15]; Clinebell et al., 1994[16]; Cummins & Griepentrog, 1985[17]; Kumar et al., 2020[18]; Mohammadi & Rich, 2013[19]; Thomann, 2013[20];

Ulyah & Mardianto, 2019[21]) suggests that gross written premium (GWP) and gross claims paid (GCP) exhibit complex patterns, including seasonality.This paper follows a similar approach to Stojkoski, V., Jolakoski, P., & Ivanovski, I. (2021) [12]by utilizing a reliable quarterly data source. Specifically, quarterly data from the Insurance Regulatory Authority (IRA) activity reports are employed to investigate short-term insurance dynamics. By adopting this strategy, the paper enables a comprehensive examination of the dynamics within the insurance industry, with a focus on shorter time intervals.

1.5 Scope of the Study

This study focuses on non-life insurance companies operating in Kenya, specifically examining the impact of the COVID-19 pandemic on three key aspects: gross premium income and claims incurred. The study will analyze data collected from non-life insurance companies in Kenya spanning the period from 2013 to 2021. To analyze the collected data, the study will utilize the R programming language.

The outline of the thesis is as follows:

Section 2:Literature review
Section 3:Methodology
Section 4:Results and discussion
Section 5:Conclusion and recommendations

2 LITERATURE REVIEW

2.1 Gross premium income

The impact of COVID-19 on premium income in the insurance industry has been examined in several studies. Suryavanshi (2021) [3]conducted a study on the life insurance business in India and found that the COVID-19 pandemic had a negative effect on premium income, resulting in a significant drop. Similarly, Wang et al. (2020) conducted research on the Chinese insurance market and reported a 2.03% decrease in gross commercial insurance premium income due to the pandemic. In Bangladesh, Haque, Mohona, Sultana, and Kulsum (2021) [5] investigated the impact of COVID-19 on the insurance sector and observed a decrease in quarterly premium growth. Worku and Mersha (2020) highlighted the variability in the impact of COVID-19 on different lines of insurance business in Ethiopia, with some lines experiencing a significant effect on new premiums while others remained relatively stable. Moreover, a study by Grofcikova and Izakova (2021) [7]focused on the financial performance of insurance companies in Slovakia during the COVID-19 pandemic and revealed a decrease in gross written premiums. Conversely, X. Qian (2020)[8] conducted research in China and revealed an increase in the number of insurance companies and a 6.13% growth in gross premium income, suggesting regional and contextual variations in the impact of COVID-19 on insurance revenue. The COVID-19 pandemic has had a significant impact on underwriting profits and losses in the insurance industry. Worku and Mersha (2020)[6] noted that in Ethiopia, people were hesitant to obtain insurance coverage due to restrictions on their regular activities, leading to a negative impact on underwriting profits. Similarly, the insurance industry in Ghana experienced a drop in profits and total premiums during the pandemic (Babuna et al., 2020)[10]. In Europe, the pandemic resulted in a decrease in the average Return on Assets (ROA) and solvency ratios in some countries (Puławska, 2020)[11]. In North Macedonia, the insurance sector witnessed a reduction of more than 10% in activity during the first six months of 2020, resulting in an 8.2 million euro loss (Stojkoski et al., 2021)[12]. Garrett and Gangopadhyaya (2020)[13] examined the impact of the pandemic on health insurance coverage in the United States and found that up to 43 million individuals may lose their employer-sponsored health insurance if unemployment rates reach 20%. The number of uninsured individuals may increase, and Medicaid coverage and uninsured rates may vary from state to state. Furthermore, Kirti and Shin (2020) [14]suggested that slower economic growth could lead to a slowdown in new business, both globally and in the United States with higher unemployment rates. Haque et al. (2020)[5] found a decrease in new insurance sales in Bangladesh due to the pandemic. On the other hand, X. Qian's (2020) [8]research indicated a 6.24% increase in the number of insurance policies in certain regions despite the overall impact on insurance revenue in areas with inadequate medical facilities or higher medical expenses

2.2 Claims incurred

The COVID-19 pandemic has significantly impacted insurance claims in various regions. In India, Parvathi and Lalitha (2021)[9] reported a drastic reduction in claims volume due to lower levels of economic activity and fewer accidents as people stayed at home. A study by Grofcikova and Izakova (2021)[7] in Slovakia during the COVID-19 pandemic revealed a decrease in insurance claims and benefits but an increase in the share of reinsurers, indicating a shift in risk mitigation from primary insurers to reinsurers. In Bangladesh, Haque et al. (2020)[5] found that some insurers experienced a increase in claims . Worku and Mersha (2020)[6] investigated the potential effect of COVID-19 on the insurance industry in Ethiopia and concluded that it might lead to an increase in claims related to death, hospitalization, event cancellation, and business interruption cover. Furthermore, Babuna et al. (2020)[10] reported a 38.4% rise in total claims during the pandemic in the Ghanaian insurance industry, contributing to a decline in market share for many insurance companies. It is important to note that the authors did not analyze the specific reasons for the decline in market share, which could be influenced by factors such as the inability to provide timely payouts, lack of transparency, or shifts in consumer behavior due to the pandemic.

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3   METHODOLOGY

3.1   Research design

The research design of this study is quantitative and descriptive in nature. The data was collected for the period of seven years before the onset of the pandemic (2013-2019) and the period of two years after the onset of the pandemic (2020-2022). This design will allow us to compare the performance of non-life insurance companies before and during the pandemic, and to identify the impact of COVID-19 on the gross premium income ,claims incurred, and underwriting profits of non-life insurance companies in Kenya.

3.2   Population and sampling

The population for this study was all non-life insurance companies operating in Kenya. The sampling technique that was used is a census, where all non-life insurance companies listed on the IRA website will be included in the study.

3.3   Data collection techniques

The data for this study was obtained from the quarterly financial statements of non-life insurance companies in Kenya. The financial statements will be collected from the Insurance Regulatory Authority (IRA) . The data was collected for the period from 2013 to 2022.

3.4   Data analysis techniques

The collected data was analyzed using R programming language. The econometric model for achieving our objectives is discussed in section 3.4.1 and 3.4.2 below .

3.4.1   Design of SARIMA models

Stationarity, homoscedasticity, and autocorrelation are important considerations in time series analysis and regression modeling. Properly assessing and addressing these aspects ensures the reliability and validity of the statistical models used to analyze time-dependent data.

Stationarity

Stationarity is an assumption made in analyzing time series analysis. A stationary time series is one in which the statistical properties, such as mean and variance, remain constant over time. The Augmented Dickey-Fuller (ADF) [22] test is used to check for stationarity. The ADF test assesses whether a unit root is present in the time series data, which indicates non-stationarity. If the test results in a p-value greater than the significance level , it suggests that the data is non-stationary, and further steps, such as differencing or transformations, may be required to achieve stationarity.

Homoscedasticity

Homoscedasticity refers to the assumption that the variance of the residuals in a regression model is constant across all levels of the independent variables. The studentized Breusch-Pagan test[23] is used to assess the presence of heteroscedasticity in a regression model.If the p-value is greater than the significance level, then there is no significant evidence to reject the null hypothesis. This suggests that the model satisfies the assumption of homoscedasticity.If the p-value is less than the chosen significance level , then there is evidence to reject the null hypothesis of homoscedasticity. In other words, there is a significant presence of heteroscedasticity in the model.

Autocorrelation

Autocorrelation refers to the presence of correlation between the residuals of a time series model at different time points. Autocorrelation violates the assumption of independence of the residuals, which is necessary for reliable statistical inference. The Ljung-Box test [24]is used to assess the presence of autocorrelation in the residuals of a time series model. If the p-value is greater than the significance level, then there is no significant evidence to reject the null hypothesis. This indicates that the residuals do not exhibit significant autocorrelation. If the p-value is less than the chosen significance level , then there is evidence to reject the null hypothesis of no autocorrelation. This suggests the presence of significant autocorrelation in the residuals.

3.4.2 Seasonal Autoregressive Integrated Moving Average (SARIMA) Model

A type of time series analysis technique, known as ARIMA, can be utilized to examine the effects of COVID-19 on the non-life insurance industry in Kenya. Originally developed by Box and Jenkins[25], ARIMA has become a widely-used approach for time series analysis. This research article employs a modified version of the classic ARIMA model, called the seasonal ARIMA model (SARIMA), to capture the seasonal effects inherent in the data. The seasonal autoregressive integrated moving average (SARIMA) model is a generalization of the ARIMA model that includes a seasonal component. It can be written as: SARIMA(p,d,q)(P,D,Q)[m]

The SARIMA model can be written as:

$$\Phi_P(B^m)\phi_p(B)(1-B^m)^D(1-B)^dX_t = \Theta_Q(B^m)\theta_q(B)W_t \tag{1}$$

where: p is the order of the autoregressive (AR) component, d is the degree of differencing, q is the order of the moving average (MA) component,P is the order of the seasonal autoregressive (SAR) component, D is the degree of seasonal differencing,Q is the order of the seasonal moving average (SMA) component,m is the number of time periods per season and B is the backshift operator, such that $B^mX_t = X_{t-m}$ The polynomial notation is used for the AR, MA, SAR, and SMA components, where:

$$\phi_p(B) = 1 - \phi_1 B - \phi_2 B^2 - ... - \phi_p B^p \tag{2}$$

$$\theta_q(B) = 1 + \theta_1 B + \theta_2 B^2 + ... + \theta_q B^q \tag{3}$$

$$\Phi_P(B^m) = 1 - \Phi_1 B^m - \Phi_2 B^{2m} - ... - \Phi_P B^{Pm} \tag{4}$$

$$\Theta_Q(B^m) = 1 + \Theta_1 B^m + \Theta_2 B^{2m} + ... + \Theta_Q B^{Qm} \tag{5}$$

X_t is the time series being modeled, and W_t is a white noise process with mean 0 and constant variance. Autoregressive (AR) Coefficients (ϕ): These coefficients represent the influence of the previous observations (lags) on the current observation. The AR component models the linear dependence of the series on its own past values. For example, an AR(1) coefficient represents the influence of the immediately preceding observation, while an AR(2) coefficient represents the influence of the two preceding observations.Differencing (I) Coefficient (Δ): The differencing coefficient represents the number of times the series is differenced to achieve stationarity. It captures the relationship between the differenced observations and the original observations. Typically denoted as Δ, it helps remove trends and seasonality from the series. Moving Average (MA) Coefficients (θ): These coefficients capture the dependency between the current observation and the errors from the previous observations. The MA component models the linear dependence of the series on the residual errors. An MA(1) coefficient represents the influence of the immediately preceding error, while an MA(2) coefficient represents the influence of the two preceding errors.Seasonal Autoregressive (SAR) Coefficients (Φ): These coefficients capture the seasonal dependency of the series on its past seasonal values. They model the influence of the observations from previous seasonal periods. For example, a SAR(1) coefficient represents the influence of the same season in the previous year, while a SAR(2) coefficient represents the influence of the same season two years ago. Seasonal Differencing (SI) Coefficient (Δ): Similar to the differencing coefficient, the seasonal differencing coefficient represents the number of times the series is seasonally differenced to achieve stationarity. It captures the relationship between the seasonally differenced observations and the original observations.Seasonal Moving Average (SMA) Coefficients (Θ): These coefficients capture the seasonal dependency of the series on the errors from previous seasonal periods. They model the influence of the residual errors from previous seasonal periods. An SMA(1) coefficient represents the influence of the same season's error in the previous year, while an SMA(2) coefficient represents the influence of the same season's error two years ago[26] The construction of the model will follow the Box-Jenkins approach, which is a four-step iterative process including identification, estimation, diagnostic checking, and forecasting.

3.5 Limitations of the Study

The study has several limitations. Firstly, the study only focuses on non-life insurance companies in Kenya, and thus the findings may not be generalizable to other countries. Secondly, the study only analyzes the impact of COVID-19 on gross premium income and claims incurred but does not consider other aspects of the insurance industry such as customer behavior, product innovation, and technological advancements.

3.6 Ethical considerations

Necessary permissions and approvals from the Insurance Regulatory Authority (IRA) were obtained before collecting the data.

4 RESULTS AND DISCUSSION

4.1 Descriptive Statistics

We started by performing a descriptive analysis of the data ranging from 2013 to 2022, focusing on calculating the mean values of gross premium income and claims incurred . The results are visually depicted in Figure 1. The values demonstrate a consistent upward trend over time, with noticeable increases from 2020 to 2021 and 2021 to 2022. This suggests a steady growth in the mean gross premium income over the years, with potential significant changes or events influencing the remarkable surge observed in 2021 and 2023 compared to previous years. Further analysis is required to contextualize these trends within the subject matter and understand the underlying factors driving the observed patterns.
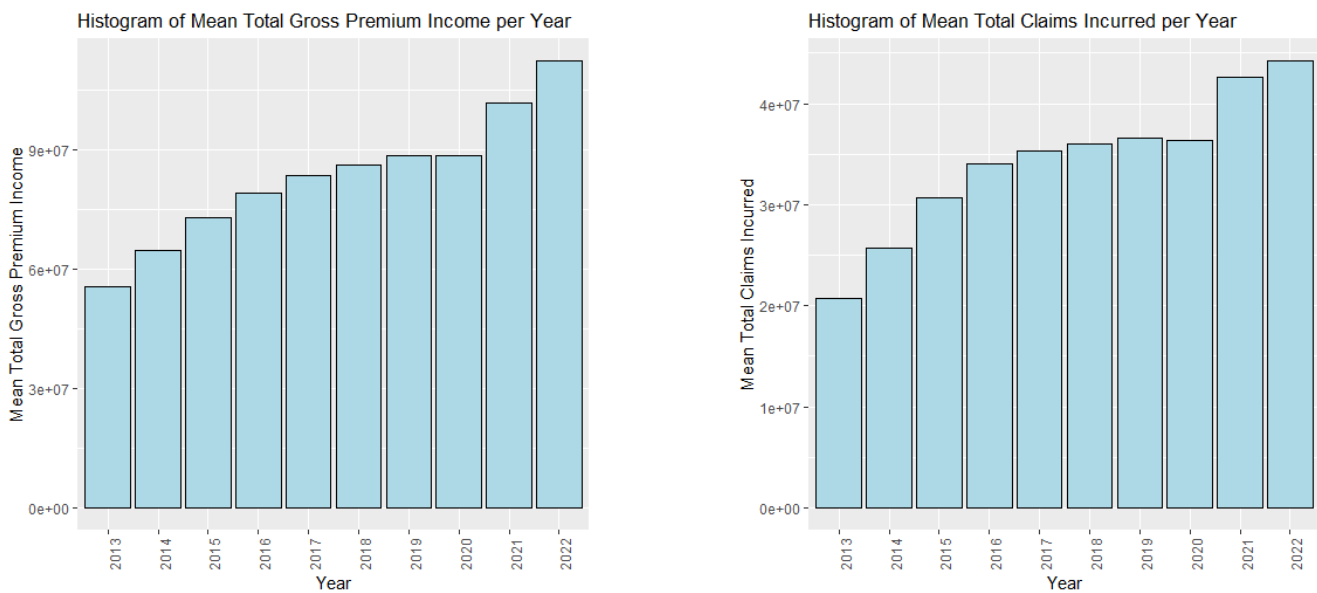
(a) Histogram of Gross Premium Income per Year   (b) Histogram of Gross Premium Income per Year

**Figure 1. Histograms of Gross Premium Income and Claims Incurred**

4.2 Dynamics of Gross Premium Income and Claims Incurred

Figure 2a illustrates the trends in yearly data of total gross premium income and claims incurred by non-life insurance companies in Kenya from the year 2013 to 2022. The data reveals that both gross premium income and claims incurred exhibited an upward trend from 2013 until 2019. However, in 2020, there is a slight dip in the graph line, followed by a resumption of the upward trend in 2021 and 2022, indicating a significant increase. This graph provides valuable insights into the financial

performance of the non-life insurance sector in Kenya, highlighting the notable fluctuations in these key indicators over the given time frame.

Figure 2b and 2c display the dynamics of the quarterly data of gross premium income and claims incurred, respectively, from the year 2013 to 2022. Both figures exhibit a recurring pattern over time, indicating the presence of seasonality. This pattern suggests that utilizing a seasonal model would be appropriate for analyzing and predicting these variables. We also observe that in 2020, the peak of the seasonal pattern for both gross premium income and claims incurred is lower than in all other years. This indicates that the amounts were lower compared to other years.
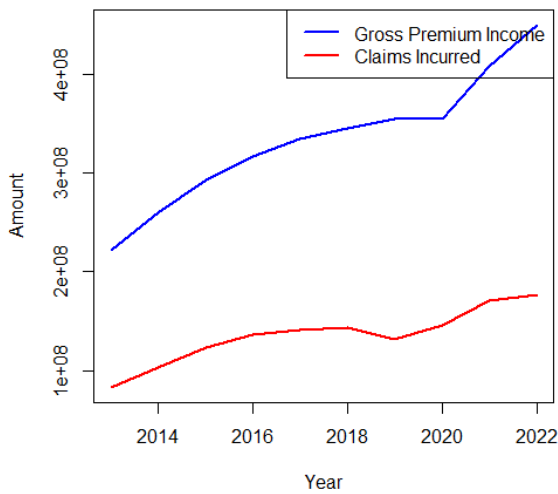
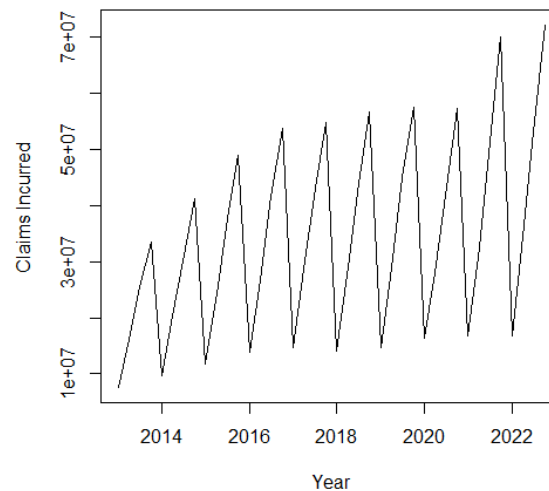

(a) Yearly values of Gross Premium Income(GPI) and Claims Incurred (CI) against time
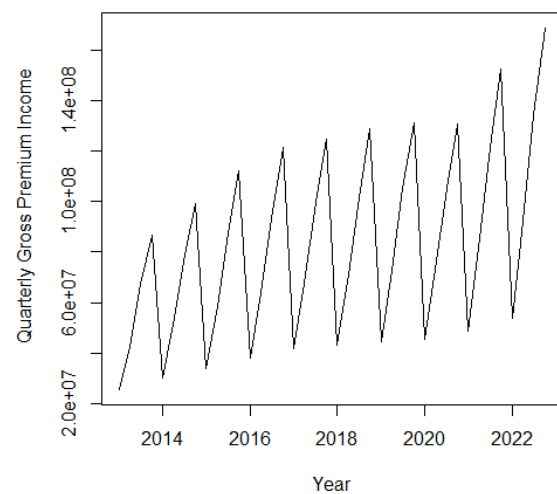
(b) Quarterly Gross Premium Income against time

(c) Quarterly Claims Incurred against time

Figure 2. Dynamics of Gross Premium Income and Claims Incurred

While these findings offer a general understanding of the insurance industry's performance during the COVID-19 pandemic, they do not specifically highlight the disparities between the expected and realized activity in the non-life insurance sector, which is the primary focus of our study and a true measure of the impact of COVID-19 on non-life insurance companies in Kenya. However, the insights obtained from this analysis will serve as a benchmark, albeit with caution, for understanding the implications revealed by the subsequent SARIMA analysis.

4.3   SARIMA Modelling of Gross Premium Income and Claims Incurred

The time series data of quarterly gross premium income (2013-2022) was initially found to be non-stationary using the Augmented Dickey-Fuller (ADF) test, with a p-value greater than 0.05. To achieve stationarity, we applied appropriate transformations and then performed differencing. The results in Table 1 show that the ADF p-value has now reduced to 0.01, indicating stationarity. Based on the minimum values of AIC (-104.37) and BIC (-100.01) shown in Table 1, we selected the SARIMA(2,0,1)(0,1,0)[4] model as the best fit. To evaluate the adequacy of the SARIMA(2,0,1)(0,1,0)[4] model, we conducted the studentized Breusch-Pagan test to evaluate heteroscedasticity. The test yielded a p-value of 0.2207, indicating no significant evidence of heteroscedasticity in the model. Thus, we can conclude that the assumption of homoscedasticity is satisfied. Additionally, the Ljung-Box test was performed to examine autocorrelation in the residuals of the ARIMA model. With a p-value of 0.7101, the test suggests no significant evidence of autocorrelation, indicating that the model effectively captures the temporal dependencies in the data.

Similarly, the time series data of quarterly claims incurred initially exhibited non-stationarity with a p-value greater than 0.05 in the ADF test. To achieve stationarity, we applied appropriate transformations , as indicated in Table 1, resulting in an ADF p-value of 0.01. Based on the minimum values of AIC= -89.86 and BIC=-88.73in Table 1, we selected the SARIMA (0,1,0)(0,1,0)[4] model as the best fit. The adequacy of the SARIMA (0,1,0)(0,1,0)[4] was evaluated using both the studentized Breusch-Pagan test and the Ljung-Box test. The studentized Breusch-Pagan test yielded a p-value of 0.7688, indicating no significant evidence of heteroscedasticity. Thus, we conclude that the assumption of homoscedasticity is satisfied. Furthermore, the Ljung-Box test yielded a p-value of 0.2156, suggesting no significant evidence of autocorrelation in the residuals of the ARIMA model. This implies that the model appropriately captures the temporal dependencies present in the data.

Table 1. SARIMA Models

Activity	Model	AIC	BIC	ADF Test (p value)	BP Test (p value)	Ljung-Box (p value)
Gross Premium income	(2,0,1)(0,1,0)[4]	-104.37	-100.01	0.01	0.2207	0.7101
Claims Incurred	(0,1,0)(0,1,0)[4]	-89.86	-88.73	0.01	0.7688	0.2156

4.4   Measuring the Impact of COVID-19 Pandemic

To evaluate the impact of the COVID-19 pandemic on non-life insurance companies in Kenya, we divided the available data spanning from 2013 to 2022 into two distinct groups. The first group consisted of data from 2013 to 2019, representing the pre-pandemic period, while the second group included data from 2020 and 2022, reflecting the period affected by the pandemic.

We proceeded to fit SARIMA models as discussed in the previous section,to the quarterly data of gross premium income and claims incurred specifically from 2013 to 2019. These models served as a basis for forecasting the expected values for the years 2020 and 2022, assuming a scenario without the impact of the COVID-19 pandemic. By comparing the forecasted values with the actual values observed in 2020 and 2022, we aimed to quantify the specific impact of the pandemic on non-life insurance companies in Kenya.

To measure the difference between the expected and actual values, we employed the Mean Percentage Error (MPE) metric. This allowed us to assess the extent to which the pandemic disrupted the normal trajectory of gross premium income and claims incurred in the non-life insurance sector in Kenya. The corresponding MPE values are presented in Table 2.

Let's begin by analyzing the gross premium income. In the year 2020, the actual total gross premium income was lower than the expected amount by -3.1% .However, in 2021 and 2022, the actual total gross premium income increased and exceeded the expected values by 4.5% and 5.3%, respectively. Turning to the claims incurred, in 2020, the total claims incurred were slightly lower than the expected gross premium income by -0.019%. However, in 2021 and 2022, there was a noticeable change, as the actual total claims incurred were higher than the expected claims by 0.644% and 0.757%, respectively.

Table 2. Mean Percentage Error

Activity	Year		
	2020	2021	2022
Gross Premium Income	-3.15138	4.534443	5.346209
Claims Incurred	-0.01959	0.644523	0.757884

4.4.1 Discussion

The impact of the COVID-19 pandemic on the non-life insurance industry in Kenya is evident through the analysis of gross premium income and claims incurred. In 2020, the industry experienced a negative impact on gross premium income, as the actual total gross premium income fell short of the expected amount by -3.1%. This negative value indicates that the pandemic adversely affected the industry during that year, leading to a decline in gross premium income.The lower gross premium income in 2020 might be attributed to the COVID-19 pandemic's impact on the economy and people's financial situations. Economic uncertainties and reduced business activities during the pandemic might have led to decreased demand for insurance policies. However, the situation improved in the subsequent years, 2021 and 2022, as the actual total gross premium income displayed significant growth, exceeding the expected values by 4.5% and 5.3%, respectively.The subsequent increase in gross premium income in 2021 and 2022 could be indicative of the industry's resilience and recovery as economic conditions improved and businesses rebounded from the pandemic's initial impact.

On the other hand, the analysis of claims incurred revealed a contrasting pattern. In 2020, the total claims incurred were slightly lower than the expected claims incurred by -0.019%. The negative value for this metric indicates a positive outcome during the pandemic, suggesting that the actual claims incurred were lower than initially anticipated. This observation implies that the non-life insurance companies in Kenya experienced lower claims during the pandemic, which can be considered favorable for the industry. The lower claims incurred in 2020 could be attributed to various factors, including reduced economic activities, travel restrictions, and decreased accidents or incidents that typically lead to insurance claims during the pandemic.In contrast to the favorable outcome observed in 2020, the situation took a concerning turn in 2021 and 2022. During these years, the actual total claims incurred surpassed the expected claims by 0.644% and 0.757%, respectively. This noteworthy change implies that the non-life insurance companies in Kenya had to bear higher claim payouts than initially anticipated. The increase in claims incurred in the subsequent years might be due to the normalization of economic activities, changes in risk patterns, and potential delayed claims from the previous year.

4.4.2   Impact of COVID-19 on the percentage share of classes

To assess the impact of COVID-19 on the percentage share of classes, we calculate the difference between the actual percentage share per class and the expected percentage share per class. This difference serves as a measure of the pandemic's impact, and the results are presented in Table 3 and graphically in 3 . Regarding gross premium income, there was no significant difference in the percentage share per class. The share of Workmen's Compensation class increased by 2%. Medical and Aviation classes also experienced a modest increase of 1%. On the other hand, Motor Private, Motor Commercial, and Personal Accident classes saw a decrease of 1% in their share. The remaining classes, including Engineering, Fire Domestic, Fire Industrial, Liability, Marine, Theft, and Miscellaneous, showed no changes. In terms of Claims Incurred, the Miscellaneous class exhibited the most substantial increase, with a 29% rise in share. This was followed by Motor Commercial PSV, Medical, Workmen's Compensation, Personal Accident, Liability, Marine, Fire Industrial, and Fire Domestic, which experienced increases of 24%, 8%, 5%, 3%, 2%, 2%, 1%, and 1% respectively. Aviation, Engineering, and Theft classes showed no changes.

In summary, the results suggest that the COVID-19 pandemic impacted the percentage share of insurance classes differently per class , leading to significant shifts in their respective percentage shares, which is consistent with the research by Worku and Mersha (2020)[6].

Table 3. Actual percentage share per class minus expected percentage share per class

Class	Gross Premium Income	Claims Incurred
Aviation	1	0
Engineering	0	0
FireDomestic	0	1
FireIndustrial	0	1
Liability	0	2
Marine	0	2
MotorPrivate	-1	-33
MotorCommercial	-1	10
MotorCommercialPSV	0	24
PersonalAccident	-1	5
Theft	0	0
WorkmensCompensation	2	3
Medical	1	8
Miscellaneous	0	29

(a) % share per class for Gross Premium Income

(b) % share per class for Claims Incurred
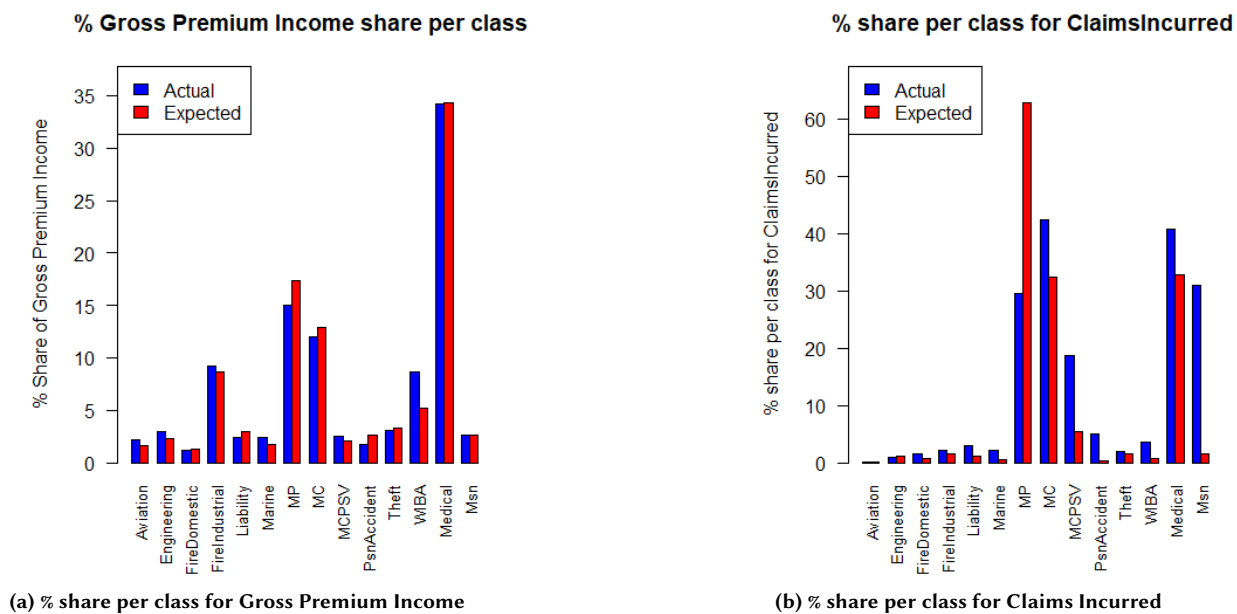
Figure 3. % share per class of Gross Premium Income and Incurred Claims

5   CONCLUSION

Our study aimed to evaluate the impact of the COVID-19 pandemic on non-life insurance companies in Kenya through an analysis of gross premium income and claims incurred. By dividing the data into pre-pandemic and pandemic-affected periods, we employed SARIMA models to forecast expected values for 2020 and 2022, and subsequently used the Mean Percentage Error (MPE) metric to quantify the pandemic's specific impact.

Regarding gross premium income, our analysis revealed a negative impact during the year 2020, with the actual total gross premium income falling short of the expected amount by -3.1%. However, the industry demonstrated resilience in the post-pandemic years, as the actual total gross premium income exceeded the expected values by 4.5% in 2021 and 5.3% in 2022, indicating a promising recovery.

Conversely, our examination of claims incurred displayed a contrasting pattern. In 2020, the total claims incurred were slightly lower than the expected claims by -0.019%, indicating a positive outcome during the pandemic as the actual claims were lower than initially anticipated. However, in 2021 and 2022, non-life insurance companies in Kenya had to bear higher claim payouts than initially anticipated, with actual claims incurred surpassing the expected claims by 0.644% and 0.757%, respectively.

The findings also indicate that COVID-19 impacted the percentage share of insurance classes differently per class, with some experiencing notable changes in their percentage share while others experience little to no changes.

Overall, our findings suggest that the COVID-19 pandemic had a significant impact on the non-life insurance industry in Kenya, with disruptions in gross premium income and claims incurred. The industry experienced challenges during the pandemic, but it showcased resilience and demonstrated signs of recovery in the post-pandemic years. The contrasting trends observed in gross premium income and claims incurred highlight the complexities and uncertainties that insurers faced during this period. Understanding the specific impacts of the pandemic on the insurance sector is crucial for stakeholders and policymakers in developing strategies to support the industry's stability and growth in the face of future challenges. Further research and analysis are warranted to assess the long-term implications and trends in the non-life insurance industry post-pandemic.

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