JEL Classification: *G2; G22; G23* **DOI**: *https://doi.org/10.31521/modecon.V38(2023)-12*

Makeleni M., *Economics PhD candidate, Lecturer, Department of Economics, University of the Western Cape, Cape Town, South Africa*

ORCID ID: *0000-0002-7132-6935*
e-mail: *mmakeleni@uwc.ac.za*

Sheefeni J.P.S., *Doctor of Economics, Associate professor of the Department, Department of Economics, University of the Western Cape, Cape Town, South Africa*

ORCID ID: *0000-0001-7260-7811*
e-mail: jsheefeni@uwc.ac.za

Economic Growth and the Insurance Sector in South Africa: Toda-Yamamoto

Abstract. Introduction. *The connection between the real economy and the financial sector continues to be a subject of debate amongst scholars. There is a plethora of studies dedicated to unravelling the relationship between economic activity and financial progress. However, a large share of those studies has concentrated on banking and the capital market industries; the studies that have undertaken to decipher the connection between the insurance industry and prosperity in the economy are insufficient.*

Purpose. *This study attempts to explore the link between South Africa's insurance industry and economic growth. The study made use of secondary time-series quarterly data and employed the Toda-Yamamoto (non-Granger causality) test.*

Results. *Firstly, the findings show a uni-directional causal relationship running from long-term insurance to GDP per-capita. Implying that the South African long-term insurance sector is supply-leading. Secondly, the results revealed that GDP per-capita and the short-term insurance sector are interdependent (bi-directional relationship). Lastly, the findings showed a uni-directional causal relationship between GDP per-capita and total insurance assets.*

Conclusions. *The results imply that the South African total insurance sector is supply-leading.*

Keywords: *Economic growth, Insurance, ARDL, Cointegration, Toda-Yamamoto ausality.*

УДК *330*

Макелені М., *доктор філософії з економіки, викладач кафедри економіки Західно-Капського університету, Кейптаун, Південна Африка*

Шіфені Дж. П. С., *доктор економічних наук, доцент кафедри, Департамент економіки, Західно-Капський університет, Кейптаун, Південна Африка*

Економічне зростання та страховий сектор у Південній Африці: Тода-Ямамото

Зв'язок між реальною економікою та фінансовим сектором продовжує бути предметом дискусій серед науковців. Існує безліч досліджень, присвячених розкриттю взаємозв'язку між економічною діяльністю та фінансовим прогресом. Проте велика частка цих досліджень зосереджена на банківській справі та галузях ринку капіталу; Досліджень, проведених між страховою галуззю та процвітанням економіки та встановлення відповідного зв'язку між ними недостатньо.

У дослідженні зроблено спробу дослідити зв'язок між страховою галуззю Південної Африки та економічним зростанням. У дослідженні використовувалися вторинні часові ряди квартальних даних і застосовувався тест Тода-Ямамото (причинність не за Грейнджером).

Встановлено, що результати показують односпрямований причинно-наслідковий зв'язок від довгострокового страхування до ВВП на душу населення. Натякаючи на те, що південноафриканський сектор довгострокового страхування є лідером за пропозицією. Також, результати показали, що ВВП на душу населення та сектор короткострокового страхування взаємозалежні (двосторонній зв'язок). Результати показали односпрямований причинно-наслідковий зв'язок між ВВП на душу населення та загальними страховими активами.

З'ясовано, що південноафриканський сектор повного страхування є лідером за пропозицією.

Ключові слова: *економічне зростання; страхування; ARDL; коінтеграція; узальність Тода-Ямамото.*

JEL Classification: *G2; G22; G23*

Formulation of the problem. An understanding of the connection between the insurance industry and prosperity in the economy is immensely important to effect judicious policy making, which will enhance economic growth. The UNCTAD argued for the importance of a vigorous insurance sector as far back

[1]**Стаття надійшла до редакції**: *02.04.2023*
Received: *02 April 2023*

as 1964, stating: “a sound national insurance and reinsurance market is an essential characteristic of economic growth.” [17]. Expanding on the same logic, Skipper [13] advances that insurance development is more than just an important feature for economic growth, but it is a necessary and indispensable characteristic of economic growth. According to Pagano [6, p.613-622], financial intermediaries are instrumental to economic growth, due to their role of channelling savings into productive investment and providing mechanisms of risk transfer. More precisely, Arena [2, p.921-946] argues that insurance companies are essential as institutional investors, because of their ability to merge large volumes of funds, which are then invested in other firms, thereby enabling efficient allocation of resources for productive investment.

Analysis of recent research and publications. Extant research on the insurance-growth nexus in Africa produced mixed results. Aziakpono [3, 137-164] investigated whether financial intermediation had an impact on economic growth in the SACU region. In the case of South Africa, the study found compelling evidence for the existence of a strong relationship between financial intermediation and economic growth. On the other hand, the results were mixed in the case of Botswana. Finally, the study found weak results for the rest of the countries investigated. Alhassan & Fiador [1, p.83–96] studied the causal linkages between the insurance industry and prosperity in the economy of Ghana. Their results found that there is a positive long-run relationship and that causality runs from the insurance sector to economic growth. Furthermore; Chen, Lee & Lee [4, p.865-893] studied the life insurance industry in Africa (including South Africa) to determine its effect on economic growth. Their study discovered that life insurance development affects economic growth positively. Finally, Sibindi [11, p.319-330] analysed insurance industry trends in ten African countries (including South Africa). Firstly, the study found that all the African countries under consideration (except South Africa), have underdeveloped insurance markets and that their nonlife insurance sector is dominant over life insurance. Secondly, the study establishes that insurance development and economic growth have a long run relationship. Lastly, the study concludes that there is a strong impetus for the relationship of the insurance-growth nexus to be demand following in Africa.

As discussed earlier, given the significance of the South African insurance market, understanding how the sector impacts on economic growth is an imperative. Surprisingly, insufficient research has been conducted to unravel the link between South Africa's insurance industry and economic growth. Most of the studies that have been conducted were cross-sectional studies. As explained by Sibindi & Godi [12, p. 530-538], the drawback of conducting investigations using cross-sectional data methods is their susceptibility to ignoring or at worst leaving out effects that are unique to a specific country.

Formulation of research goals. Thus, it would be thought provoking to determine the relationship and impact of the insurance sector’s contribution to the South African economy. For that reason, this study intends to explore the link between South Africa's insurance industry and economic development. Particularly, the main objective of this study is to investigate whether there is a link between South Africa's insurance industry and economic growth. Specifically, to determine the direction of causality between economic growth and insurance proxies.

Outline of the main research material. To examine the relationship between insurance development and economic growth in South Africa this study made use of quantitative data. In particular, the data under consideration were: secondary time-series quarterly data on gross domestic product per capita, life-insurance, non-life insurance, total-insurance, foreign direct investment, government debt and labour productivity. Furthermore, this study specifically studied three different proxy variables which represent insurance development. The proxy variables evaluated were: penetration ratio, density ratio and total assets ratio. The study used data for the period 1994 to 2019. The data for gross domestic per capita, foreign direct investment, government debt, labour productivity, and insurance premiums were acquired from the South African Reserve Bank [8]. Finally, the data for population was sourced from Statistics South Africa (Stats SA) [14]. A GDP deflator has been applied to all the nominal values (2019 = 100).

Model specification

The study adopted and modified the model by Alhassan & Fiador [1, p.83–96] to fit the South African context to conduct a causality test between the variables concerned.

$$GDP=f(LTI, STI, TI, GDT, FDI, LP) \quad (1)$$

The transformation of equation (1) into a log-linear form is given below by equation (2).

$$\ln GDP_t = \alpha_0 + \alpha_1 \ln LTI_t + \alpha_2 \ln STI_t + \alpha_3 \ln TI_t + \alpha_4 \ln FDI_t + \alpha_5 \ln GDT_t + \alpha_4 \ln LP_t + \mu_t \quad (2)$$

Where:

Gross domestic product per-capita (GDP): Gross Domestic Product per capita is the total value of goods and services produced within an economy during a given period over total population. Real GDP growth rate is used as a dependent variable in this study.

Independent variables:

Life-insurance penetration ratio (LTI): This is a penetration rate given by total life insurance premiums over real GDP per-capita.

Nonlife insurance penetration ratio (STI): This is a penetration rate given by total nonlife insurance premiums over real GDP per-capita.

Total insurance penetration ratio (TI): This is a penetration rate given by the total sum of the life and nonlife insurance premiums over real GDP per-capita.

Foreign direct investment (FDI): This is a measure of gross net investment and asset ownership into the South African economy by foreign based entities.

Government debt (GDT): This is the gross outstanding amount of debt that a country's government or state owes to private institutions, individuals or other countries.

Labour productivity (LP): This is rate of output produced by each worker in an economy given by total output per period over total input .

Non-Granger causality test

The causality test will be evaluated in the Toda & Yamamoto [15, p.225-250] framework, which tests the null hypothesis that there is causality amongst the variables concerned. The Toda & Yamamoto [15, p.225-250] Granger causality framework is preferred due to its competency of testing causality even if the variables are not cointegrated Umar, Dayyabu, Gambo, Danlami and Ahmad [16, p.15-31]. Therefore, the characteristics of the Toda & Yamamoto [15, p.225-250] model are more conducive if the variables are found to be fractionally cointegrated. As proposed by Shrestha and Bhatta [9, p.71-89], time series data is more likely to be non-stationary and integrated of mixed orders, meaning it is more likely to be fractionally integrated.

As previously mentioned, the Toda & Yamamoto [15, p.225-250] framework is invariant to the cointegration of variables concerned. The model augments the Vector Autoregressive (VAR) model in its levels. The Toda & Yamamoto [15, p.225-250] model does not use the F-statistic as Granger causality methods traditionally propose. Conversely, the Toda & Yamamoto [15, p.225-250] model transforms the Wald test to obtain a modified test statistic (MWALD). The MWALD statistic is then used to test whether the restrictions of the un-augmented Vector Autoregressive (VAR) model's parameters are different from zero. The original un-augmented Vector Autoregressive (VAR) model uses the original lags as determined by any lag criterion VAR (k). Whereas, the augmented Vector Autoregressive (VAR) model augments the original VAR (k) model by adding the highest order of integration to the originally determined lag length VAR (k + dmax). Thus, the Toda & Yamamoto [15, p.225-250] framework evaluates the VAR (k + dmax) model using a modified Wald test statistic (MWALD). The test is based on the chi-square distribution.

The Toda & Yamamoto [15, p.225-250] model has the following fundamental steps in its evaluation. The best lag-length (k) and highest order of integration (dmax) amongst the variables needs to be determined. The efficient lag-length (k) is obtained in the VAR framework in levels, using the consensus of different lag-length criterions. Furthermore, the order of integration (dmax) amongst the variables is acquired through conducting unit-root tests.

The Toda & Yamamoto [15, p.225-250] model can be specified as follows:

$$\begin{aligned} \ln GDP_t &= \alpha_0 + \sum_{i=1}^{k} \alpha_1 \ln GDP_{t-i} + \sum_{i=k+1}^{k+dmax} \alpha_2 \ln GDP_{t-i} \\ &+ \sum_{i=1}^{k} \alpha_3 \ln LTI_{t-i} + \sum_{i=k+1}^{k+dmax} \alpha_4 \ln LTI_{t-i} + \sum_{i=1}^{k} \alpha_5 \ln STI_{t-i} \\ &+ \sum_{i=k+1}^{k+dmax} \alpha_6 \ln STI_{t-i} + \sum_{i=1}^{k} \alpha_7 \ln TI_{t-i} + \sum_{i=k+1}^{k+dmax} \alpha_8 \ln TI_{t-i} \\ &+ \sum_{i=1}^{k} \alpha_9 \ln GDT_{t-i} + \sum_{i=k+1}^{k+dmax} \alpha_{10} \ln GDT_{t-i} + \sum_{i=1}^{k} \alpha_{11} \ln FDI_{t-i} \\ &+ \sum_{i=k+1}^{k+dmax} \alpha_{12} \ln FDI_{t-i} + \sum_{i=1}^{k} \alpha_{13} \ln LP_{t-i} + \sum_{i=k+1}^{k+dmax} \alpha_{14} \ln LP_{t-i} + \varepsilon_{1t} \end{aligned} \quad (3)$$

$$\begin{aligned} \ln LTI_t &= \alpha_0 + \sum_{i=1}^{k} \alpha_1 \ln LTI_{t-i} + \sum_{i=k+1}^{k+dmax} \alpha_2 \ln LTI_{t-i} \\ &+ \sum_{i=1}^{k} \alpha_3 \ln GDP_{t-i} + \sum_{i=k+1}^{k+dmax} \alpha_4 \ln GDP_{t-i} + \sum_{i=1}^{k} \alpha_5 \ln STI_{t-i} \\ &+ \sum_{i=k+1}^{k+dmax} \alpha_6 \ln STI_{t-i} + \sum_{i=1}^{k} \alpha_7 \ln TI_{t-i} + \sum_{i=k+1}^{k+dmax} \alpha_8 \ln TI_{t-i} \\ &+ \sum_{i=1}^{k} \alpha_9 \ln GDT_{t-i} + \sum_{i=k+1}^{k+dmax} \alpha_{10} \ln GDT_{t-i} + \sum_{i=1}^{k} \alpha_{11} \ln FDI_{t-i} \\ &+ \sum_{i=k+1}^{k+dmax} \alpha_{12} \ln FDI_{t-i} + \sum_{i=1}^{k} \alpha_{13} \ln LP_{t-i} + \sum_{i=k+1}^{k+dmax} \alpha_{14} \ln LP_{t-i} + \varepsilon_{2t} \end{aligned} \quad (4)$$

$$\ln STI_t = \alpha_0 + \sum_{i=1}^{k} \alpha_1 \ln STI_{t-i} + \sum_{i=k+1}^{k+dmax} \alpha_2 \ln STI_{t-i}$$

$$+\sum_{i=1}^{k}\alpha_3 \ln GDP_{t-i}+\sum_{i=k+1}^{k+dmax}\alpha_4 \ln GDP_{t-i}+\sum_{i=1}^{k}\alpha_5 \ln LT$$
$$+\sum_{i=k+1}^{k+dmax}\alpha_6 \ln LTI_{t-i}+\sum_{i=1}^{k}\alpha_7 \ln TI_{t-i}+\sum_{i=k+1}^{k+dmax}\alpha_8 \ln TI_{t-i}$$
$$+\sum_{i=1}^{k}\alpha_9 \ln GDT_{t-i}+\sum_{i=k+1}^{k+dmax}\alpha_{10} \ln GDT_{t-i}+\sum_{i=1}^{k}\alpha_{11} \ln F$$
$$+\sum_{i=k+1}^{k+dmax}\alpha_{12} \ln FDI_{t-i}+\sum_{i=1}^{k}\alpha_{13} \ln LP_{t-i}+\sum_{i=k+1}^{k+dmax}\alpha_{14} \ln L \quad (5)$$

$$\ln TI_t=\alpha_0+\sum_{i=1}^{k}\alpha_1 \ln TI_{t-i}+\sum_{i=k+1}^{k+dmax}\alpha_2 \ln TI_{t-i}+\sum_{i=1}^{k}\alpha_3 \ln$$
$$+\sum_{i=k+1}^{k+dmax}\alpha_4 \ln GDP_{t-i}+\sum_{i=1}^{k}\alpha_5 \ln LTI_{t-i}+\sum_{i=k+1}^{k+dmax}\alpha_6 \ln LT$$
$$+\sum_{i=1}^{k}\alpha_7 \ln STI_{t-i}+\sum_{i=k+1}^{k+dmax}\alpha_8 \ln STI_{t-i}+\sum_{i=1}^{k}\alpha_9 \ln GDT_{t-i}$$
$$+\sum_{i=k+1}^{k+dmax}\alpha_{10} \ln GDT_{t-i}+\sum_{i=1}^{k}\alpha_{11} \ln FDI_{t-i}$$
$$+\sum_{i=k+1}^{k+dmax}\alpha_{12} \ln FDI_{t-i}+\sum_{i=1}^{k}\alpha_{13} \ln LP_{t-i}+\sum_{i=k+1}^{k+dmax}\alpha_{14} \ln LP_{t-i}+\varepsilon_{4t} \quad (6)$$

Above is a Toda & Yamamoto [15, p.225-250] model relating the dependent variables — $\ln GDP_t$, $\ln LTI_t$, $\ln STI_t$, $\ln TI_t$ to the specified independent variables, where:

k = Lag length
$(\alpha_1 - \alpha_{14})$ = Model's parameters
dmax = Highest order of integration
α_0 = Drift component
$(\varepsilon_{1t} - \varepsilon_{4t})$ = White noise error-term

Empirical Results for long-term insurance

Table 1. **Long-run estimated coefficients (dependent variable: Real GDP Per-Capita)**

Dependent variable: LNGDP	**Chi-sq.**	**Df.**	**Prob.**
LNFDI does not Granger cause LNGDP	22,75	5	0,000*
LNLTIA does not Granger cause LNGDP	18,777	5	0,002*
LNLTID does not Granger cause LNGDP	21,492	5	0,000*
LNLTIP does not Granger cause LNGDP	21,542	5	0,000*
Dependent variable: LNLTIA	**Chi-sq.**	**Df.**	**Prob.**
LNGDP does not Granger cause LNLTIA	7,583	5	0.180
LNFDI does not Granger cause LNLTIA	21,462	5	0.000*
Dependent variable: LNLTID	**Chi-sq.**	**Df.**	**Prob.**
LNGDP does not Granger cause LNLTID	2,279	5	0.809
Dependent variable: LNLTIP	**Chi-sq.**	**Df.**	**Prob.**
LNGDP does not Granger cause LNLTIP	2,168	5	0.825

*Note: * means the rejection of the null hypothesis at 5%*
Source: Author's computations

Table 1 presents the Granger causality long-run estimated coefficients of the variables investigated in this study, particularly the long-term insurance variables. Pertaining to the variables of interest, the results show that long-term insurance total assets, density and penetration ratios Granger cause GDP per-capita in the long-run. As observed in table 1, the long-term insurance ratios are all highly statistically significant. On the other hand, GDP per-capita does not Granger cause long-term insurance. These results imply that the South African long-term insurance sector is supply-leading. These findings are in contrast with a study by Sibindi & Godi [12, p.530-538] and Sibindi [10, p.7-15] who found that the South African insurance sector is demand-following. The results are harmonious with the study by Olayungbo [5, p.248-261], which established that the insurance sector in South Africa is supply-leading. These results lend credence to a study conducted by Patrick [7, p.174-189], which asserted that during the early stages of development of a country financial development leads to economic growth and not the other way around.

Table 2. **Short-run estimated coefficients (dependent variable: Real GDP Per-Capita)**

Dependent variable: D(LNGDP)	**Chi-sq.**	**Df.**	**Prob.**
D(LNFDI) does not Granger cause D(LNGDP)	15,253	5	0,009*
D(LNLTIA) does not Granger cause D(LNGDP)	1,077	5	0,022*
D(LNLTID) does not Granger cause D(LNGDP)	17,123	5	0,004*
D(LNLTIP) does not Granger cause D(LNGDP)	16,686	5	0,005*
Dependent variable: D(LNLTIA)	**Chi-sq.**	**Df.**	**Prob.**
D(LNGDP) does not Granger cause D(LNLTIA)	12,841	5	0,024*
D(LNFDI) does not Granger cause D(LNLTIA)	24,737	5	0,000*
Dependent variable: D(LNLTID)	**Chi-sq.**	**Df.**	**Prob.**
D(LNGDP) does not Granger cause D(LNLTID)	2,952	5	0,707
Dependent variable: D(LNLTIP)	**Chi-sq.**	**Df.**	**Prob.**
D(LNGDP) does not Granger cause D(LNLTIP)	3,052	5	0,691

*Note: * means the rejection of the null hypothesis at 5%*
Source: Author's computations

Table 2 presents the Granger causality short-run estimated coefficients of the variables investigated in this study, particularly the long-term insurance variables. Pertaining to the variables of interest, similarly to the long-run Granger causality results; the short-run Granger causality results illustrate that long-term insurance total assets, density and penetration ratios Granger cause GDP per-capita. As observed in table 2, the long-term insurance ratios are all highly statistically significant. On the other hand, GDP per-capita Granger causes long-term insurance in the short run, according to the long-term insurance total assets ratio. These results imply that in the short run, the relationship between GDP per-capita and the long-term insurance sector is supply leading. Nonetheless, as it pertains to the long-term insurance total assets ratio the relationship is bidirectional, supposing interdependence between economic growth and the long-term insurance sector in South Africa.

Empirical Results for short-term insurance

Table 3. **Long-run estimated coefficients (dependent variable: Real GDP Per-Capita)**

Dependent variable: LNGDP	**Chi-sq.**	**Df.**	**Prob.**
LNFDI does not Granger cause LNGDP	19,953	5	0,001*
LNSTIA does not Granger cause LNGDP	7,766	5	0,169
LNSTID does not Granger cause LNGDP	21,591	5	0,000*
LNSTIP does not Granger cause LNGDP	20,887	5	0,000*
Dependent variable: LNSTIA	**Chi-sq.**	**Df.**	**Prob.**
LNGDP does not Granger cause LNSTIA	25,020	5	0,000*
LNFDI does not Granger cause LNSTIA	26,898	5	0,000*
Dependent variable: LNSTID	**Chi-sq.**	**Df.**	**Prob.**
LNGDP does not Granger cause LNSTID	11,715	5	0,038*
Dependent variable: LNSTIP	**Chi-sq.**	**Df.**	**Prob.**
LNGDP does not Granger cause LNSTIP	12,082	5	0,033*

*Note: * means the rejection of the null hypothesis at 5%*
Source: Author's computations

Table 3 presents the Granger causality long-run estimated coefficients of the variables, specifically the short-term insurance variables. The results depict that short-term insurance density and penetration ratios Granger cause GDP per-capita in the long-run. The previously mentioned short-term insurance ratios are all highly statistically significant. Conversely, the short-term insurance total assets ratio does not Granger cause GDP per-capita. On the other hand, GDP per-capita Granger causes short-term insurance. These results imply that the South African short-term insurance sector is bi-directional, economic growth and the short-term insurance sector are interdependent. These findings are in contrast with a study by Sibindi & Godi [12, p.530-538] and Sibindi [10, p.7-15] who found that the South African insurance sector is demand-following. Furthermore, these results are in disaccord with the findings of the study by Olayungbo [5, p.248-261], which established that the insurance sector in South Africa is supply-leading.

Table 4. **Short-run estimated coefficients (dependent variable: Real GDP Per-Capita)**

Dependent variable: D(LNGDP)	**Chi-sq.**	**Df.**	**Prob.**
D(LNFDI) does not Granger cause D(LNGDP)	11,971	5	0,035
D(LNSTIA) does not Granger cause D(LNGDP)	2,6242	5	0,757
D(LNSTID) does not Granger cause D(LNGDP)	16,628	5	0,005
D(LNSTIP) does not Granger cause D(LNGDP)	16,272	5	0.006
Dependent variable: D(LNSTIA)	**Chi-sq.**	**Df.**	**Prob.**
D(LNGDP) does not Granger cause D(LNSTIA)	22,715	5	0,000
D(LNFDI) does not Granger cause D(LNSTIA)	19,470	5	0,001
Dependent variable: D(LNSTID)	**Chi-sq.**	**Df.**	**Prob.**
D(LNGDP) does not Granger cause D(LNSTID)	10,402	5	0,064
Dependent variable: D(LNSTIP)	**Chi-sq.**	**Df.**	**Prob.**
D(LNGDP) does not Granger cause D(LNSTIP)	10,516	5	0,061

*Note: * means the rejection of the null hypothesis at 5%*
Source: Author's computations

Table 4 presents the short-run Granger causality estimated coefficients of the variables, paying attention to the short-term insurance variables. Referring to the variables of interest, similarly to the long-run Granger causality results; the short-run Granger causality results illustrate that short-term insurance density and penetration ratios Granger cause GDP per-capita. The estimated coefficients of the short-term insurance ratios are highly statistically significant. On the contrary, GDP per-capita Granger causes short-term insurance in the short run, according to the short-term insurance total assets ratio. These results imply that in the short run, the relationship between GDP per-capita and the short-term insurance sector is supply-leading.

Empirical results for total insurance

Table 5. **Long-run estimated coefficients (dependent variable: Real GDP Per-Capita)**

Dependent variable: LNGDP	**Chi-sq.**	**Df.**	**Prob.**
LNFDI does not Granger cause LNGDP	22,734	5	0,000
LNTIA does not Granger cause LNGDP	16,713	5	0,005
LNTID does not Granger cause LNGDP	22,777	5	0,000
LNTIP does not Granger cause LNGDP	22,539	5	0,000
Dependent variable: LNTIA	**Chi-sq.**	**Df.**	**Prob.**
LNGDP does not Granger cause LNTIA	7,849	5	0,164
LNFDI does not Granger cause LNTIA	21,306	5	0,000
Dependent variable: LNTID	**Chi-sq.**	**Df.**	**Prob.**
LNGDP does not Granger cause LNTID	1,533	5	0,909

Dependent variable: LNTIP	**Chi-sq.**	**Df.**	**Prob.**
LNGDP does not Granger cause LNTIP	1,565	5	0,905

*Note: * means the rejection of the null hypothesis at 5%*
Source: Author's computations

Table 5 presents the Granger causality long-run coefficients estimated for the variables studied in this analysis, particularly the total insurance variables. Pertaining to the variables of interest, the results show that total insurance total assets, density and penetration ratios Granger cause GDP per-capita in the long-run. As observed in table 5, the total insurance ratios are all highly statistically significant. On the other hand, GDP per-capita does not Granger cause total insurance. Expectedly, these total insurance results mirror the results of the long-term insurance sector. The results imply that the South African total insurance sector is supply-leading. These findings are in contrast with a study by Sibindi & Godi [12, p.530-538] and Sibindi [10, p.7-15] who found that the South African insurance sector is demand-following. The results are harmonious with the study by Olayungbo [5, p.248-261], which established that the insurance sector in South Africa is supply-leading. These results lend credence to a study conducted by Patrick [7, p.174-189], which asserted that during the early stages of development of a country financial development leads to economic growth and not the other way around.

Table 6. **Short-run estimated coefficients (dependent variable: Real GDP Per-Capita)**

Dependent variable: D(LNGDP)	**Chi-sq.**	**Df.**	**Prob.**
D(LNFDI) does not Granger cause D(LNGDP)	15,403	5	0,008
D(LNTIA) does not Granger cause D(LNGDP)	11,155	5	0,048
D(LNTID) does not Granger cause D(LNGDP)	18,139	5	0,002
D(LNTIP) does not Granger cause D(LNGDP)	17,281	5	0,004
Dependent variable: D(LNTIA)	**Chi-sq.**	**Df.**	**Prob.**
D(LNGDP) does not Granger cause D(LNTIA)	13,673	5	0,017
D(LNFDI) does not Granger cause D(LNTIA)	22,804	5	0,000
Dependent variable: D(LNTID)	**Chi-sq.**	**Df.**	**Prob.**
D(LNGDP) does not Granger cause D(LNTID)	2,383	5	0,793
Dependent variable: D(LNTIP)	**Chi-sq.**	**Df.**	**Prob.**
D(LNGDP) does not Granger cause D(LNTIP)	2,625	5	0,757

*Note: * means the rejection of the null hypothesis at 5%*
Source: Author's computations

Table 6 presents the Granger causality short-run coefficients estimated for the variables studied in this study, particularly the total insurance variables. Pertaining to the variables of interest, similarly to the long-run Granger causality results; the short-run Granger causality results illustrate that long-term insurance total assets, density and penetration ratios Granger cause GDP per-capita. As observed in table 6, the long-term insurance ratios are all statistically significant. On the other hand, GDP per-capita Granger causes total insurance in the short run, according to the total insurance total assets ratio. These results imply that in the short run, the relationship between GDP per-capita and the total insurance sector is supply leading. Nonetheless, as it pertains to the total insurance total assets ratio the relationship is bidirectional, supposing interdependence between economic growth and the total insurance sector in South Africa. Just as it was the case with the long run relationship, total insurance results of the short run causal relationship mirror the short run causal long-term assets results.

Conclusions. The research attempted to investigate whether there is a connection between the insurance industry in South Africa and economic growth. Subsequently, the study aimed to shed light on the causal linkages between the insurance industry and the country's economic growth. Owing to the fact that there have only been three time-series studies carried-out on the impact of the insurance industry to economic growth in South Africa, this study holds an important value in the South African insurance-growth nexus knowledge area. The study made use of secondary time-series quarterly data and employed times-series technique of causality analysis.

Pertaining to the variables of interest, the results show that long-term insurance total assets, density and penetration ratios Granger cause GDP per-capita in the long-run. These findings are all statistically significant. On the other hand, GDP per-capita does not Granger cause long-term insurance. Furthermore, the results depict that short-term insurance density and penetration ratios Granger cause GDP per-capita in the long-run. These results are also statistically significant. Conversely, the short-term insurance total assets ratio does Granger cause GDP per-capita. On the other hand, GDP per-capita Granger causes short-term insurance. Lastly, the results show that total insurance total assets, density and penetration ratios Granger cause GDP per-capita in the long-run. These results are also statistically significant. On the other hand, GDP per-capita does not Granger cause total insurance.

The study successfully addressed the research questions as intended. The results of the study have policy implications that can be supportive in improving the economic growth rate of South Africa. Policies which encourage the advancement of the insurance industry would meaningfully contribute to economic growth. However, the scope of this study was limited, as such there are more questions pertaining to how the study arrives at its conclusions which were not addressed in the study. The contrasts between the long-term, short-term and total insurance proxies require further research. Particularly, the relationship between the insurance sector proxy variables with other financial institutions that pool funds such as banks. It would be elucidating to know whether there is complementarity or a substitution effect between those institutions and the insurance sector.

References:

1. Alhassan, A. L. & Fiador, V. (2014). Insurance-growth nexus in Ghana: An autoregressive distributed lag bounds cointegration approach. *Review of Development Finance,* 4(1), 83 - 96. DOI: https://doi.org/10.1016/j.rdf.2014.05.003 [in English].
2. Arena, M. (2008). Does insurance market activity promote economic growth? A cross-country study for industrialized and developing countries. *The Journal of Risk and Insurance,* 75(4), 921-946. DOI: https://doi.org/10.1111/j.1539-6975.2008.00291.x [in English].
3. Aziakpono, M. (2005). Financial Development and Economic Growth in Southern Africa. In N. Pinaud, & M. Grandes, *Development Centre Studies Reducing Capital Cost in Southern Africa,* 137-164. OECD Development Centre [in English].
4. Chen, P.-F., Lee, C.-C., & Lee, C.-F. (2011). How Does the Development of the Life Insurance Market affect Economic Growth? Some International Evidence. *Journal of International Development,* 24(7), 865-893. DOI: https://doi.org/10.1002/jid.1765 [in English].
5. Olayungbo, D. O. (2015). Insurance and Economic Growth Nexus in Nigeria: Asymmetric Non-Linear Relationship under Heterogeneous Agents. *African Development Review,* 27(3), 248-261. DOI: https://doi.org/10.1111/1467-8268.12144 [in English].
6. Pagano, M. (1993). Financial markets and growth: An overview. *European Economic Review,* 37(2-3), 613-622. DOI: https://doi.org/10.1016/0014-2921(93)90051-B [in English].
7. Patrick, H. T. (1966). Financial development and economic growth in underdeveloped countries. *Economic Development and Cultural Change,* 14(1), 174-189. DOI: http://dx.doi.org/10.1086/450153 [in English].
8. SARB. (2020). Category archives: Statistics. Retrieved from : SARB: https://www.resbank.co.za/en/home/what-we-do/statistics/releases/online-statistical-query [in English].
9. Shrestha, M. B., & Bhatta, G. R. (2018). Selecting appropriate methodological framework for time series data analysis. *The Journal of Finance and Data Science,* 4, 71-89. DOI: https://doi.org/10.1016/j.jfds.2017.11.001 [in English].
10. Sibindi, A. B. (2014). Life insurance, financial development and economic growth in South Africa. *Risk governance & control: financial markets & institutions,* 4(3), 7-15. DOI: http://dx.doi.org/10.22495/rgcv4i3art1 [in English].
11. Sibindi, A. B. (2015). Insurance market development: an empirical study of African countries. *Risk Governance & Control: Financial Markets & Institutions,* 5(4), 319-330. DOI: http://dx.doi.org/10.22495/rgcv5i4c2art6 [in English].
12. Sibindi, A. B., & Godi, N. J. (2014). Insurance sector development and economic growth: evidence from South Africa. *Corporate Ownership & Control,* 11(4), 530-538. DOI: https://doi.org/10.22495/cocv11i4c6p3 [in English].
13. Skipper, H. D. (1997). Foreign Insurers in Emerging Markets: Issues and Concerns. *International Insurance Foundation*. Retrieved from : http://rmictr.gsu.edu/Papers/FOREIGN.pdf [in English].
14. STATSSA. (2020). *Category Archives: Industry*. Retrieved from : STATSSA : http://www.statssa.gov.za/?cat=32 [in English].
15. Toda, H. Y., & Yamamoto, T. (1995). Statistical inference in vector autoregressions with possibly integrated processes. *Journal of Econometrics,* 66(1–2), 225-250. DOI: https://doi.org/10.1016/0304-4076(94)01616-8 [in English].
16. Umar, M. B., Dayyabu, S., Gambo, A. U., Danlami, M. R., & Ahmad, A. U. (2015). An Empirical Study on the Relationship between Financial Intermediaries and Economic Growth in Nigeria : A Cointegration and Causality Analysis. *IOSR Journal of Economics and Finance,* 6(4), 15-31. DOI: http://dx.doi.org/10.9790/5933-06431531 [in English].
17. UNCTAD. (1964). *First session of the United Nations Conference on Trade and Development (UNCTAD I).* Retrieved from : UNCTAD : https://unctad.org/meeting/first-session-united-nations-conference-trade-and-development-unctad-i [in English].

Ця робота ліцензована Creative Commons Attribution 4.0 International License