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Is there a Causality between Economic Growth Variables and Derivatives Usage?

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Abstract: The study empirically tested the relationship between derivative markets growth and economic growth for the period 1996 to 2018. The direction of causality was tested utilising a South African data set. The Vector autoregressive model estimation technique and Granger causality test were employed to assess the relationship and direction of causality between the variables in STATA 15. The results firstly exhibit that derivatives and economic growth had a negative correlation with Vector autoregressive models, both in the short- and long-terms. Secondly, derivatives and economic growth had a unidirectional relationship from derivatives to economic growth with the Granger causality test. The explanatory variables, bank lending and firm value, had a bi-directional relationship with economic growth. Moreover, derivatives had a bi-directional causality for bank lending and firm value in South Africa. Based on the results generated, it is concluded that regulators and policy-makers should encourage the use of derivatives so that banks could efficiently provide funding and enhance liquidity on the capital market, which will increase economic activities. The model captured the liquidity channel and productivity of the industries through bank lending and firm value as a result of derivatives usage.

Keywords: gross domestic product; Granger; bank lending; firm value

JEL Classification: F43; G21; G23; O16; O40; O47

1. Introduction

In economics, economic growth determinants have created unresolved empirical and theoretically exciting formulations, models and topics. Theoretically, the co-fathers of economic theories: namely Adam Smith, David Ricardo and Robert Malthus defined classical economic growth as depending on the steady state of the gross

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domestic product (GDP) and any deviation will return to its fundamentals of normality (Pettinger 2019). They also postulate that economic growth had a direct relationship with population growth, whereas it has a constraining effect on the GDP, implying that the nation will suffer the scarcity effect on resources because with more people, more resources are needed.

Furthermore, the neo-classical theory, also known as the Solow-Swan (1956), contributed to the determinants of economic growth theory by highlighting that capital, labour and advancements in technology are the three main anchors in stimulating the growth of a nation. Neo-classical theory's main contribution emphasised the advancement of technology, which they refer to as the core factor, because if technology is advancing, then the other factors like capital and labour will automatically adjust accordingly. Contemporary theories posit that economic growth refers to an increase in the growth of the production of goods and services. Economic growth is defined by Agarwal (2019) as the increase in the production of goods and services within an economy, over a period of time. The inclination of countries to have stable and sustained economic growth has put pressure on policy-makers to find out which determinants need more attention so that they can be given priority for the development of nations. This has resulted an exponential growth in research on this field of economic growth (Polat *et al.* 2015).

It has been advocated through the seminal works of Schumpeter (1911) that financial system elements promote economic growth Emphasis is placed by Levine and Zervos (1998) that for economic growth to be achieved and sustained, there is a need for a well-functioning financial system in an economy. Haiss and Sammer (2010) also reinforced the view that derivatives promote capital formation, which was supported by Sill (1997) who claimed that derivatives make the financial system efficient, thereby boosting economic growth. Therefore, derivative markets have attracted media attention as a 'pandemic' which caused more benefits than danger in the financial system.

The main trading strategies in which derivatives instruments are used are hedging, speculation and arbitraging (Oliinyk *et al.* 2019). Derivatives returns are paying handsomely and are therefore pooling more investors and traders, which creates liquidity for the financial system within an economy. Furthermore, this creates the vital lifeblood for the industry to produce its products efficiently and leads to economic growth (Oliinyk *et al.* 2019). Efficiency and the smooth running of the financial system had led to the ease with which firms, governments and individuals are raising the much-needed capital which stimulates economic activities for the growth of the economy. Derivatives instruments are an asset class on its own which is growing at an alarming rate, as shown by the Bank of International Settlement (BIS) statistics that as of 2014, over-the-counter (OTC) total nominal value was US$630 trillion.

Bujari, Martínez and Lechuga (2016) strengthen the evidence by citing that derivatives volumes were estimated at US$592 trillion against US$13.8 trillion GDP of the world's largest economy (the United State of America) for the period 2007 and 2008. Lazovy and Sipko (2014) also noted that derivatives volumes were nine-fold the global GDP in the period 2012 and below. The recent evidence from the triennial of the Bank of International Settlement (BIS) shows that derivatives are eight times the size of the estimated global GDP, which is US$75 trillion (Bank of International Setlement 2016). The International Swaps and Derivatives Association (ISDA)'s (2019) key trends statistics supported the notion that derivatives are increasingly used in modern commerce by showing that OTC notional outstanding was standing at US$460.4 trillion, which was 7.7% greater compared to the same mid-year of 2018 and 17.8% greater to the end of the year 2018. These instruments have attracted a wide range of users in an economy which varies from financial institutions to government entities, corporates, hedge funds and companies that manage assets (Prabha, Savard and Wickramarachi 2014).

In South Africa, derivatives are increasingly used and traded as exhibited by the volume of transactions of foreign exchange derivatives (see Figure1 below). Statistics in Figure 1 below show the triennial turnover of foreign exchange derivatives for the period 1986 to 2019.

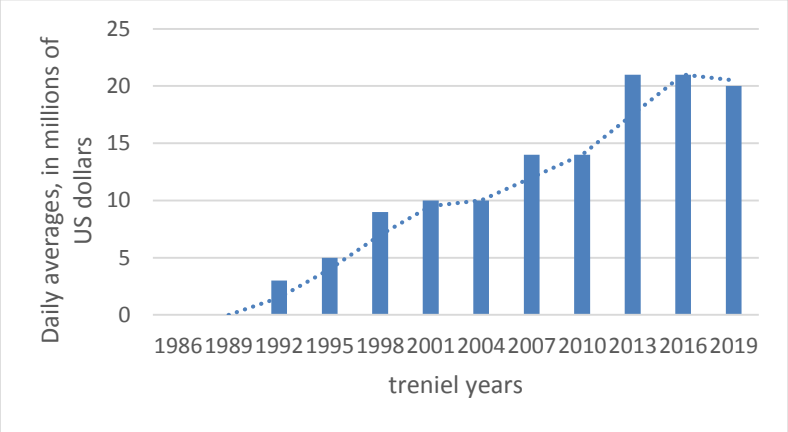

Figure 1. South African Turnover of OTC Foreign Exchange Instruments
Source: BIS Triennial OTC derivatives statistics (TRIENNIAL) 2019

Although there are many empirically differing results and existing literature ON the subject, what matters most is the weight of the evidence in the argument for economic growth. As Mulei (2019) asserts, derivatives support capital inflows, as well as help market participants to price, unbundle and transfer risks. The rapid development of the derivative markets prompted scientists to study the relationship

between the new segment of the financial market – the derivatives- and economic growth (Oliinyk *et al.* 2019).

The bulk of the empirical studies inquire about financial development with economic growth, but the variables that capture the explanatory variables which support the finance availability and funding for economic growth have not received much consideration. Much had been analysed regarding the capital market impact on the economic growth with finance nexus. However, empirics with South African data for derivatives and economic growth and its linkages with macroeconomics and the funding of key sectors of economic growth have not been sufficiently analysed. Capital-raising abilities that lead to trade openness, firm growth and corporate funding are the key variables which the current study addressed, and which are the main drivers of the economy. Moreover, if the economy allows the smooth and efficient accessibility of funding by the pillars of the economy which are firms, government and households. Therefore, this study seeks to find the direction of causality between economic growth variables and derivatives usage in South Africa.

Theoretically, Levine and Zervos (1998) explained that the efficiency of the financial system is anchored on the liquidity of the capital market. The capital market of a country symbolises the lifeblood of the economy, as claimed by Sill (1997) who stated that derivatives induce liquidity in the financial markets and improve trading within the country, whereby economic growth can be achieved. From this perspective, there is a need for a re-test of the effects of derivatives in South Africa through developing a model which caters for the liquidity and functioning of the financial system through providing funding for the economy (bank lending and derivatives usage) and performance of the private sector (firm value and derivatives usage).

The causality test between economic growth and derivatives usage was empirically examined through the following hypotheses: The first hypothesis tested was derivatives' impact on economic growth- that is, derivatives usage had a positive relationship with the growth of the economy. The second hypothesis tested derivatives and economic growth through the liquidity channel measured by bank lending- that is, bank lending has a positive impact on the derivatives-economic growth nexus. The third hypothesis also tested firm value and economic growth using derivatives.

The remainder of the study is as follows: the next section is a literature review, followed by the methodology, results and discussion of the study and the last section will be the conclusion and recommendation for further studies.

2. Literature Review

Theoretically, economic growth has been linked to the well-functioning of the financial system (Beck and Levine 2004). The basic components of a well-functioning financial system include banks, financial markets, financial instruments, financial services and money. Historically, banks were considered important due to their long arm of funding investments opportunities and their innovations which promote economic growth (Levine & Zervos 1998). Efficient and easy trading on the market or smooth intermediation in an economy is a good predictor of economic growth in the future. Levine & Zervos (1998) emphasise that liquidity in the long-term allows higher return projects which facilitate productivity growth. Liquidity models assert that it is the stock market that creates liquidity. King and Levine (1993) stressed that liquidity is an important factor in investment because long-term capital projects require a long-term commitment of capital. The liquid market makes investment more attractive and less risky because it can be easily sold, and savers acquire the asset at a low cost or even if the investor needs to alter the portfolio composition.

King and Levine's (1993) liquidity model indicates the boosting of investments in an economy, thus allowing the trading of equities easily, which is a factor of growth. Growth and innovation in the financial markets led to the birth of the derivatives market as a segment of its markets. According to Hull (1946), derivatives are financial instruments traded on the financial market which derive their value from the performance of the underlying assets traded in those financial markets. Sill (1997) praised derivative assets as vital instruments in the financial markets because they make the markets efficient. According to Sill's theory, derivatives make borrowing and lending smoother, with lower costs because of their benefit of reducing transaction costs. For instance, home seekers can borrow at a lower cost because of the efficiency in the mortgage markets and corporates can easily raise finances for capitalisation or capital expenditure when markets are efficient as a result of derivatives markets. Overall, this will boost economic activities and therefore economic growth.

2.1. Derivatives and Economic Growth

The world's big economies were used in assessing the impact of derivatives on their economic growth, through the use of dynamic panel data model with generalised methods of moments (GMM). Bujari, Martínez and Lechuga (2016) revealed a positive relationship between GDP growth to the volume of derivatives trading in the USA, Japan, China, India, Brazil and the EU. They concluded that a 1% increase in the volume of derivatives had a 0.17% impact on the GDP per capita. This implies that derivatives have a direct impact on the development of economies and growth.

For sustainability and stability of the economy, policy-makers and implementers are encouraged to seek instruments which promote derivative development so that they can boost economic growth.

With recent evidence, derivative markets in high-income countries exhibit bi-directional causality with economic growth, implying that both variables are complementary and can reinforce each other. In upper middle- income countries there was unidirectional causality from the dataset of 17 countries analysed by Hong *et al.* (2019). Further analysis proved that trade openness and government expenditure impacted more on derivatives than economic growth and inflation. Hong *et al.* (2019) conclude that derivative markets had a direct relationship with economic growth in high-income countries compared to their middle-income counterparts. From this analysis, South Africa was classified as a middle-income country, which implies that its derivative markets are not causing an impact on economic growth. The current study wishes to investigate if this 'theory' exists, using the dataset of a single country.

Vo, Huynh and Ha (2019) also inquired into the impact of derivatives development in the World's four largest economies to assess if there is a relationship. They utilised the vector error correction model (VECM) and found out that in the short-term, the US, Japan and India exhibit positive relationships but in the long-run, the effect disappears. Moreover, in China, there was a negative relationship.

Oliinyk *et al.* (2019) examined the US as a single country to ascertain the impact of derivatives on the economic growth and concluded that derivatives growth has a positive effect on the growth of an economy and gross capital formation. The positive results with domestic credit to the private sector by banks suggested that it is caused by the success of derivatives as institutions that allow the efficiency of the financial market in general. It means that loans and credits are carried at a lower price than it will be with financial derivatives, as derivatives allow a reduction in transaction costs as was claimed by Sill (1997), which then leads to an acceleration of transaction costs.

In the South African context, derivatives markets and economic growth analysis was examined by Marozva (2014) with the use of the Autoregressive distribution lag (ARDL)-bound test and the Granger causality test. Marozva's (2014) tests were on derivatives and capital market development and derivatives and economic growth for the period 1994 to 2012. The results confirmed that derivatives impacted the development of the capital market, but that influence is not extending to the development of the economic growth of South Africa.

Bekale (2014) also conducted research to find out if the trading of derivatives could enhance economic growth in South Africa. The study employed three estimation techniques [generalised method of moments (GMM), vector error correction method (VECM) and generalised autoregressive conditionally heteroscedastic (GARCH)]

and the results show no evidence of derivatives influence on economic growth for the period 1979 to 2012 in South Africa. Bekale (2014) concluded that since the results fail to exhibit evidence of economic growth through the development of derivatives markets and signs of financial development proxies which exhibit statistical insignificance, it means that the development of financial markets are not strong drivers of economic growth.

Therefore, the economy of South Africa could not reap the benefits of derivatives development in its capital market. The results reported by Bekale (2014) generated a gap which needed to be filled with more recent data that incorporates the over-the-counter derivatives data. The proposed model in the current study incorporated the (bank lending which measures bank efficiency) variable which captures the function of the financial system through the use of derivative instruments for carrying out the intermediation function. The credit extension which promotes the funding of companies, individuals and government so that they can produce for a nation and contribute to economic growth. The variable which also captures the liquidity enhancement by derivatives in the capital market through lending and allows investors to easily raise capital and finance for investment opportunities which boost the economic activity of a nation such as South Africa.

Mulei (2019) studied the trading of derivatives and economic growth in South Africa utilising GMM, VECM and GARCH estimating techniques. The study revealed no statistical significance between derivatives and economic growth in South Africa for the period 1970-2017. Mulei (2019) cited that the study only utilised a fraction of the available data, which might affect the quality of the results because of the exclusion of OTC derivatives in the analysis, which caters for the highest volume of transactions for derivatives traded in South Africa (Bank of International Setlement 2017). The study by Mulei (2019) exhibits a negative and insignificant relationship.

All empirical studies on the derivatives growth-nexus have yielded negative results in South Africa or, at best, an insignificant impact irrespective of different models and sample periods. However, the opposite is true for studies conducted in developed countries. Therefore, there is a need to conduct the study using a new set of variables, including bank lending, firm value and economic growth which is a new model to be tested with the dataset of a middle-income country, South Africa.

3. Methodology

The short-run and long-run effects of derivatives markets on economic growth were examined using time-series econometrics models. Firstly, the authors consider the stationarity of the data set of the four variables, testing co-integration amongst them. If the long-run is established, the authors apply the vector error correction (VECM) model or vector autoregressive model (VAR). Thereafter, the causality relationship

test between the derivatives market, economic growth, bank lending and firm value is employed.

3.1. Model Specification

Baluch and Ariff's (2007) Liquidity model assumed that derivatives markets allow the accumulation of capital in a financial system, which facilitates economic growth. To assess this linked growth with derivatives markets, credit to the private non-financial sector from banks and total market value as a percentage of GDP (LNONNFIN) is used as a proxy which measures the firm's value- that is capital investment in an economy through funding investment opportunities in the private sector in the model. The domestic credit to the private sector by banks as a percentage of GDP (LPVTB) was used as a proxy which measures bank lending (financial intermediation) in an economy. The assumption being made is that derivatives allow banks and financial systems to extend credit to productive sectors of the economy to boost production and investment opportunities. As was claimed by Levine (1993), financial intermediation is a long-run economic growth indicator. The growth of the economy is through the efficient funding of corporates, governments and households so that they can contribute to the GDP growth per period.

The VAR model estimation techniques depict that the dependent variable is a function of its lagged values and the lagged values of other variables in the model. Furthermore, the model is specified in levels because if specified in differences, it leads to mis-specification of the model (Anderson and Hsiao 1982). The VAR model is a set of linear dynamic equations where each variable is specified as a function of an equal number of lags *(k)* of its self and all other variables in the system (Gujarati and Porter 1999). Having four variables means having four equations and all variables are endogenous- that is, they are determined inside the system.

The general model of VAR is represented as follows,

$$Y_t = \delta + \sum_{i=1}^{k} \beta_i Y_{t-i} + \sum_{j=1}^{k} \emptyset_j X_{t-j} + \sum_{m=1}^{k} \vartheta_m R_{t-m} + \sum_{r=1}^{k} \lambda_r W_{t-r} + \mu_{it} \quad \text{(eq.1)}$$

Where,

$\boldsymbol{Y_t}$ is the *dependent variable,* $\boldsymbol{Y_{t-i}}$ the *lagged dependent variable,*($\boldsymbol{X_{t-j}}$, $\boldsymbol{R_{t-m}}$, $\boldsymbol{W_{t-r}}$)are *lagged independent variables,* $\boldsymbol{\delta}$ is the *intercept,* $\boldsymbol{\beta_i}$ $\boldsymbol{\emptyset_j}$ $\boldsymbol{\vartheta_m}$, $\boldsymbol{\lambda_r}$ are *short-run coefficients,* $\boldsymbol{\mu_{it}}$ *residuals* and$\boldsymbol{k}$ *number of lags*

The VAR estimation and model specification of the variables are specified below following the above discussion.

$$InGDP_t = \varphi + \sum_{i=1}^{k} \beta_i \, InGDP_{t-1} + \sum_{j=1}^{k} \emptyset_j InDER_{t-j} + \sum_{m=1}^{k} \vartheta_m InLPVTB_{t-m} + \sum_{r=1}^{k} \lambda_r InLNONNFIN_{t-r} + \mu_{1it} \quad \text{(eq 2)}$$

$$InDER_t = \alpha + \sum_{i=1}^{k} \beta_i \, InGDP_{t-1} + \sum_{j=1}^{k} \emptyset_j InDER_{t-j} + \sum_{m=1}^{k} \vartheta_m InLPVTB_{t-m} + \sum_{r=1}^{k} \lambda_r InLNONNFIN_{t-r} + \mu_{2it} \quad \text{(eq 3)}$$

$$InLPVTB_t = b + \sum_{i=1}^{k} \beta_i \, InGDP_{t-1} + \sum_{j=1}^{k} \emptyset_j InDER_{t-j} + \sum_{m=1}^{k} \vartheta_m InLPVTB_{t-m} + \sum_{r=1}^{k} \lambda_r \, InLNONNFIN_{t-r} + \mu_{3it} \quad \text{(eq 4)}$$

$$InLNONNFIN_t = \lambda + \sum_{i=1}^{k} \beta_i \, InGDP_{t-1} + \sum_{j=1}^{k} \emptyset_j InDER_{t-j} + \sum_{m=1}^{k} \vartheta_m InLPVTB_{t-m} + \sum_{m=1}^{k} \lambda_r InLNONNFIN_{t-r} + \mu_{4it} \quad \text{(eq 5)}$$

Where InGDP is the economic activity of a country measured by GDP; lnDER is the measure of the notional volume of derivatives markets, InLPVTB is the measure of bank lending, InLONNFIN is the measure of the firm value, k is lag length, β_i, $\emptyset_j$,ϑ_m, λ_r *are short-run dynamic coefficients of the model,* $\mu_{1,2,3,4}$, *residuals (stochastic error terms often called impulses or innovations or shocks).*

Data for the study were obtained from the world economic indicators that are the annual percentage growth rates of GDP; domestic credit to the private sector by banks (bank lending); and credit to the private non-financial sector from banks (firm value). In this study, derivatives markets data proxy as the outstanding amount of derivatives obtained from the Bank of International Settlement (BIS) database. Due to data restriction, the study was limited to only one country, South Africa. Table 1 describes the data of the variables used:

Table 1. Data Description

variable	*Obs*	*Mean*	*std.dev*	*Min*	*max*
GDPG	*25*	*2.75*	*1.7*	*-1.54*	*5.6*
Derivatives	*26*	*3904.66*	*5143.26*	*103*	*17851.5*
LPVTB	*25*	*66.61*	*5.99*	*56.03*	*78.29*
LNONFIN	*26*	*60.98*	*8.03*	*46.3*	*75.3*

3.3. Stationarity Testing

The study used time-series data, so the first step is to test the stationarity of the series. If the data were not stationary, the results of the regressions will be spurious and not exhibiting mean reversions (Heino 2005), meaning that the data generating process of the series does not revolve around zero. By utilising the VAR model, the variables are required to be stationary. The study adopted the augmented Dickey-Fuller test for the unit root test, which was advocated by Elliott, Thomas and James (1996)

3.4. Cointegration Testing

If variables are stationary, the next step is to establish if they have a long-run relationship or not. Johansen's (1991) tests for the co-integration approach was adopted in this study. This approach was proposed by Johansen (1991) and requires the variables to be in levels or log transformation if testing for a co-integration relationship. The relationship also implies that if there are shocks in the short-run which may affect movement in the individual series, they would converge with time (Gujarati 2009). The test statistics are rejected at the 5% significance level when trace and max statistics values are greater than the 5% critical value (Heino 2005).

4. Results and Discussion

4.1. Stationarity Test and Cointegration Test Results

Stationarity was checked as a prerequisite of dealing with time-series data for analysis in order to avoid spurious results. To determine the relationship between derivatives market and economic growth in South Africa, the augmented Dickey-Fuller test (ADF) for unit root was used. Eduard and Stefan (2009) proposed that the ADF test was a better approach than the general Dickey-Fuller test because it requires higher order autoregression to be tested.

Data were non-stationary in levels I (0). Therefore, the variables were converted to the first difference I (1) for it to be stationary. Table 2 shows the ADF test statistics for both levels I (0) and the first difference I (1) of the variables in the model. The results for both levels were not rejected because the test statistics for all variables were lower than the 5% critical value. Therefore, the variables are non-stationary. Furthermore, testing with the first difference, the results indicated that they are greater than the 5% critical value. The non-stationarity null hypothesis of the first difference is rejected at the 5% significance level and accepts the alternative hypothesis. Hence, this implies that the first difference results series are stationary. The ADF test decision criterion rejects the alternate hypothesis if the test statistics are lower than the 5% critical value and accepts the alternate hypothesis if the test statistics are greater than the 5% critical value. All test statistics at first difference are greater than the 5% critical value from the results in Table 2, meaning that the null hypothesis is rejected, and the variables are stationary.

Table 2. Stationarity Test Results

	ADF TEST Z(t)	*5% CRITICAL VALUE*
H0: The level of the variable is non-stationary		
GDPG	3.112	3.600
DERIVATIVES	1.567	3.600
LPVTB	2.444	3.600
LNONFIN	1.094	3.600
H0: The first difference of the variable is non-stationary		
GDPG_1	5.517	3.600
DERIVATIVES_1	4.314	3.600
LPVTB_1	5.635	3.600
LNONFIN_1	3.155	1.734

Source: ADF tests results from Stata 15.

After the stationarity test, the series are integrated after the first difference Therefore, it was necessary to perform a cointegration test amongst the variables to establish if there is a long-run relationship. The Johansen co-integration test was used and the results are presented in Table 2 below. According to Johnsen's co-integration test, the null hypothesis is rejected if trace and max statistics are greater than the 5 % critical value. Hence, the null and alternate hypotheses can be stated as follows:

H0: No co-integration amongst the variables;

H1: H0 is not true.

Table 3. Johnsen Cointegration Test Results

Maximum rank	*Trace statistics*	*Max statistics*	*5% CRITICAL VALUE (trace)*	*5% CRITICAL VALUE (max)*
0	111.9595	52.9851	47.21	27.07
1	58.9744	36.2451	29.68	20.97
2	22.7294	21.4628	15.41	14.07
3	1.2666	1.2666	3.76	3.76
4				

Source: Johnsen Cointegration Test in STATA 15

The results of the cointegration tests in Table 3 above at maximum rank 0,1and 2 indicate that both trace and max statistics were greater than the 5 % critical values. Therefore, the null hypothesis was rejected, which mean there was no cointegration question. At a maximum rank of 0, the null hypothesis means no co-integration, at 1 maximum rank, the null hypothesis means there is one co-integration equation, at 2 which means that there are 2 co-integration questions. Therefore, at a maximum rank

of 3, the null hypothesis means there are 3 cointegrating equations. The trace and max statistics are less than 5% critical value which implies there are 3 cointegrating series within our dataset. Based on these results, the authors concluded that the variables had a long-run co-integration relationship amongst economic growth, derivatives markets, bank lending and firm value.

4.2. Derivatives Effects on Economic Growth

With the exhibition of the long-run relationship amongst economic growth, derivatives, bank lending and firm value, the authors examined both effects (short-run and long-run) further.

Table 4. Var Estimates -Short Run Effects of Derivatives on Economic Growth

VARIABLES	*GDPG*	*DERIVATIVES*	*LPVTB*	*LNONFIN*
L.GDPG	*0.726****	*-215.4*	*1.470****	*1.088****
	(0.267)	*(230.1)*	*(0.34)*	*(0.183)*
L2.GDPG	*-0.244*	*189.4*	*-0.676***	*0.921****
	(0.218)	*(188.3)*	*(0.278)*	*(0.15)*
L.DERIVATIVES	*0.000568**	*0.538***	*-0.00035*	*0.001000****
	(0.00031)	*(0.268)*	*(0.0004)*	*(0.00021)*
L2.DERIVATIVES	*0.000522*	*0.23*	*-0.00025*	*0.00112****
	(0.00056)	*(0.483)*	*(0.00071)*	*(0.00038)*
L.LPVTB	*0.365****	*46.86*	*-0.592****	*-0.0157*
	(0.113)	*(97.98)*	*(0.145)*	*(0.0779)*
L2.LPVTB	*-0.211**	*139*	*-0.722****	*-0.156***
	(0.111)	*(96.24)*	*(0.142)*	*(0.0765)*
L.LNONFIN	*-0.700**	*-88.36*	*0.305*	*0.418**
	(0.358)	*(308.8)*	*(0.456)*	*(0.245)*
L2.LNONFIN	*0.692*	*11.92*	*2.692****	*0.730***
	(0.472)	*(407.9)*	*(0.602)*	*(0.324)*
Constant	*3.791*	*-9,541*	*106.3****	*32.65****
	-6.808	*(5,877)*	*(8.678)*	*(4.67)*

*Standard Errors in Parentheses *** p<0.01, ** p<0.05, * p<0.1*

The study estimated equation (1) utilising a short-run (VAR) model and a long- run (VECM) model. The results are presented in Tables 4 and 5, respectively. The results are consistent with the previously published results in South Africa which exhibit no evidence of either short-run or long run relationships between derivatives and economic growth. Marozva (2014) cited that there is no direct relationship between derivatives and economic growth, whilst (Bekale, 2014) observed that the derivatives do not contribute to the growth of the economy and (Mulei, 2019) show that the trading of derivatives did not affect economic growth. The first lag of derivatives has a positive significance at a 10 % level to the economic growth, with

0.000568 as the coefficient- but does not sufficiently convince about the effects of derivatives on economic growth as in developed nations.

In particular, in the short-run, Table 4's economic growth had a positive statistical impact on bank lending and firm value, which implies that if the economy is growing, banks can lend more and firms can do more production through the use of banks' capacity in extending credits, thus availing liquidity on the market. Additionally, the results reflect a positive statistically significant impact of derivatives on the firm value, which it supports the theory of Ayturk, Gurbuz and Yanik (2016),and Allayannis, Lel and Miller (2012) which reviewed that derivatives use increases the ability of firms to carry out their growth abilities. Derivatives with bank lending exhibit a negative impact, which suggests that derivatives affect banking industry lending activities in the short-run.

In the long-run, cointegration equation one (ce1) Table 5 shows that it has a negative statistical coefficient, which implies that the derivatives, bank lending and firm value had a long-run causality effect on the growth of the economy. Economic growth and bank lending and firm value's long-run impact diminished from the estimates of the VECM.

Table 5. VECM-Long Run Relationship between Derivatives and Economic Growth

VARIABLES	*D_GDPG*	*D_DERIVATIVES*	*D_LPVTB*	*D_LNONFIN*
L._ce1	*-0.904***	*206.2*	*-0.279*	*0.923***
	(0.309)	*(317.8)*	*(0.946)*	*(0.398)*
LD.GDPG	*0.339*	*-397.7*	*1.17*	*-0.179*
	(0.269)	*(277.4)*	*(0.826)*	*(0.348)*
LD.DERIVATIVES	*0.00024*	*0.129*	*-3.010-05*	*-0.0004*
	(0.0003)	*(0.258)*	*(0.00077)*	*(0.0003)*
LD.LPVTB	*0.183***	*-75.01*	*-0.388*	*-0.139*
	(0.0829)	*(85.41)*	*(0.254)*	*(0.107)*
LD.LNONFIN	*-0.17*	*-78.58*	*1.029***	*0.543****
	(0.159)	*(163.3)*	*(0.486)*	*(0.205)*
Constant	*3.090****	*0.0269*	*0.833*	*-2.738**
	(1.101)	*(1,134)*	*(3.377)*	*(1.421)*

*Standard Errors in Parentheses *** p<0.01, ** p<0.05, * p<0.1*

4.3. Granger Causality Test

Lastly, the authors estimated the direction of the causal relationship between economic growth and derivatives. Firstly, they observe a uni-directional causality between derivatives and economic growth, running from derivatives to economic growth in the short-run, which implies that derivatives are causing economic growth but with no effect in the opposite direction. Bank lending and economic growth

indicated a bi-directional causality. The results also show bi-directional causality between bank lending and firm value. There is also a uni-directional causality relationship running from derivatives to bank lending and firm value, as reflected in Table 6 below.

Table 6. Causality Test -VAR Model

Null Hypothesis	*chi 2*
DERIVATIVES does not granger cause GDPG	*11.172***
LPVTB does not granger cause GDPG	*12.871***
LNONFIN does not granger cause GDPG	*13.867***
GDPG does not granger cause DERIVATIVES	*4.7562*
LPVTB does not granger cause DERIVATIVES	*4.6034*
LNONFIN does not granger cause DERIVATIVES	*5.6216*
GDPG does not granger cause LPVTB	*79.492****
DERIVATIVES does not granger cause LPVTB	*50.832****
LNONFIN does not granger cause LPVTB	*135.84****
GDPG does not cause LNONFIN	*78.317****
DERIVATIVES does not granger cause LNONFIN	*23.717****
LPVTB does not granger cause LNONFIN	*54.025****

*Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1*
Source: Granger causality test in STATA

5. Conclusion

Derivatives have become the most-traded instruments on capital markets especially for hedging, speculation and arbitraging activities (Oliinyk *et al.* 2019). This study's findings also added to the existing literature on derivatives markets. Firstly, the study confirms that derivatives had a negative impact on economic growth both in terms of the short-run and long-run effects. Both the first and second lag of derivatives are positive and statistically significant to the firm value at the 1 percent significance level. Economic growth at its first lag is positively impacting bank lending and firm value at a 1 percent significance level. The direction of causality reveals that economic growth and derivatives had a unidirectional causality, which was consistent with empirical evidence in upper middle income countries (Hong *et al.* 2019). The unidirectional causality running from derivatives to economic growth with no reversal effect suggests that the development of derivatives markets could lead to economic growth through the demand for more innovative instruments in financial systems, like derivatives markets (Vo *et al.* 2019). Derivatives and bank lending also had a bi-directional causality with firm value. Based on the results which exhibit a unidirectional causality between the growth of derivatives market to the economic growth in South Africa it is suggested that the derivatives market in middle-income countries are not adequately mature so that their benefits can be traced to economic growth. Therefore, it is concluded that there should be incentives

for the development of the derivatives market so that the market can grow and be able to transform its growth nexus to the development of the economy.

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